

‘A Holistic Framework for Environmental Change - Socio-Environmental
Cohesion for Sustainability’

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by

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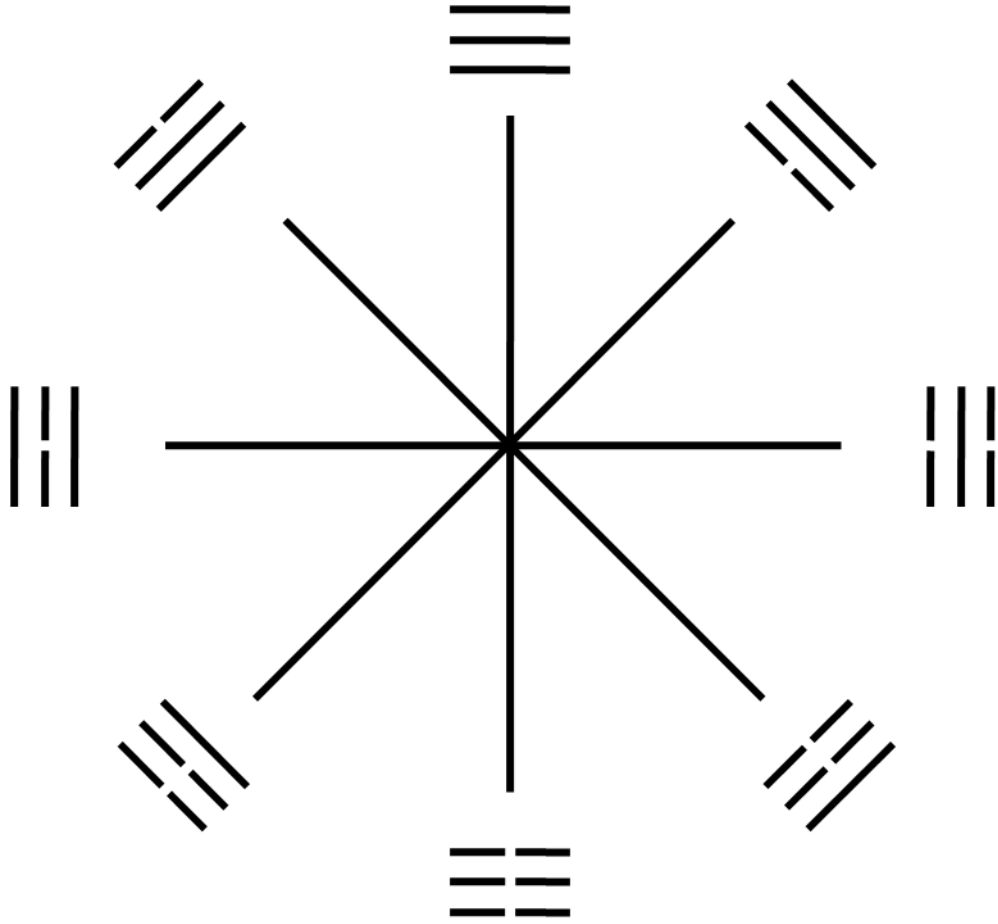


Figure 1: The Natural Order.

Adapted from Capra (1976, p.309)

Dedicated to my husband Alan.

Acknowledgments

Firstly, I would like to thank the staff within the case study organisation used in this research (OrgX), for providing me with all the support needed to complete this thesis. I am highly grateful to OrgX for its commitment to the project and willingness to participate in the different research tools that were used. Most specifically I am thankful to the informal environmental group (EWG) within the organisation who continued to drive practical changes within the organisation. The EWG made the research a highly enjoyable experience.

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Abstract

Research Purpose: Environmental issues have become a regular debate within social, business and political arenas. The need to combine social, environmental and economic systems to achieve a sustainable future (Triple Bottom Line), is gaining prominence within many international development projects. The study of traditional business Environmental Management Systems (EMS) leads to the observation that such systems place primary emphasis upon economic and environmental factors. The project begins with the proposal that an EMS built by an organisations employees' has a greater potential to identify practical environmental impacts and reduce social resistance to change.

Methods: This thesis details the development of a seven-stage framework for environmental change referred to as Socio-Environmental Cohesion for Sustainability (SECS). The framework is trailed within a case study organisation (OrgX) using an interpretivist philosophy of social constructionism to guide the research. An action research project is conducted with the researcher acting as an observing participant of the change process. The developed framework follows a multimethodology design of organisational engagement, with strong emphasis placed upon the social values that can drive environmental management practices. The combination of cybernetic and social tools of organisational analysis is shown to provide a unique approach to environmental strategy design; Viable Systems Model, Team Syntegrity, Cultural Analysis, Social Network Analysis.

Results: The Cultural and Social Network Analyses provide evidence of an informal environmental network (EWG) contained within OrgX, and identify the core social environmental values of the employee group. A Team Syntegrity workshop is performed and develops a bottom-up participatory approach to environmental

strategy designs between the EWG and business management. Following the workshop, OrgX is shown to implement 56% of the developed environmental strategy within eight months. The Viable Systems Model is used to diagnose the organisations structure, which is then combined with the Social Network Analysis to establish the outreach of the EWG.

Conclusions: The recognition of the informal environmental network as an official management committee, improvements to operational efficiency and practical benefits to onsite biodiversity, indicates that the SECS framework is capable of addressing all aspects of the Triple Bottom Line.

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List of Publications

1. Knowles, K. (2010), An Holisitc Framework for Environmental Change to Enhance Organisational Sustainability, Business and Organisational Survival and Sustainability. Paper from the Northern Leadersip Academy Fellows 2009 Conference, Leeds University, Leeds, Chapter 3, pp. 31-54.
2. Knowles, K. and Espinosa, A. (2009), Towards an Holistic Framework for Environmental Change: The Role of Normative Behaviour and Informal Networking to Enhance Sustainable Business Practices, Systems Practice and Action Research, 22: 275-291.

Chapter 1

Introduction

This thesis details the development of a seven stage model for environmental change within a higher education establishment. Using the principles of systems thinking the work focuses upon generating a holistic strategy for change within an organisation. Autonomy, capacity building and organisational viability are used as core drivers to the change processes. This chapter introduces the background to the work and summarises the layout of the thesis.

The conceptual basis for this thesis is that of a systems approach, where organisations (governments, businesses, societies, individuals) are seen to require holistic management in order to perform optimally with external environments. The use of a systems approach within the developed model for environmental change provides a context in which all aspects of the Triple Bottom Line are accounted for in future design strategies; economic, social and environmental factors.

Environmental management is a relatively modern business concept that is being adopted by many organisations, typically within the generic area of Corporate Social Responsibility (CSR). Within businesses CSR initiatives are often adopted to satisfy public pressure for organisational accountability for their actions, and to gain a degree of social goodwill (Bhattacharyya et al., 2008). With media attention

bringing environmental issues to the fore of public debate, the majority of people within the UK have formed an opinion of the topic, ranging from committed eco-activism to avid disinterest.

Many individuals tend to pick and choose which ‘environmental interests’ they support, dependent upon the degree of self-advantage inherent with the activity (Gärling et al., 2003). As a result the UK is presently within a transition period where the typical citizen is prepared to partake in easy environmental activities, as long as there is a tangible reward for doing so; referred to as a ‘value-action’ gap (Barr, 2004) or the limits of ‘willingness to pay’ (MacKerron et al., 2009).

Environmental monitoring is essential to the preservation of the natural world in a state that is comfortably habitable (clean air) and provides adequate sustenance (clean water) for future generations. The dependence of humans upon the natural world is highly intricate, with the earth providing all aspects of our basic needs for survival (food, shelter, ozone) and it is pivotal that it remains in a state that supports human physiology (Lovelock, 2006).

Human impact upon the environment is inevitable as we are a part of the natural world system. This has resulted in our actions causing instability to natural food cycles, biodiversity and the abundance of natural resources (Folke et al., 2002; Rooney et al., 2006). To clarify, the context of this research is not to suggest that human activity should quickly diminish in order to protect the natural environment, but to advocate systemic monitoring of human activity to minimise environmental degradation.

The attainment of environmental accreditations such as the Fair-trade, Ecolabel or Forest Stewardship Council, provide consumers with a clear visual representation of an organisations ethical focus. Such standards register the management standards of specific products/services (EP, 2009; FSC, 2009), but do not in fact reflect the environmental standard of all organisational activities. The international standards

ISO 14000 (BSI, 2004b) and EMAS (EC, 2001b) are renowned Environmental Management Systems (EMS), that are used to certify that an organisation is monitoring its environmental impacts and has sufficient monitoring procedures to maintain clear records of performance.

To both consumers and businesses these accreditations demonstrate the clear commitment of an organisation to minimise the environmental impact of its operations, products and services. The broad range of accreditation schemes (UoCambridge, 2006), complex scientific studies (IPPC, 2007), conflicting terminologies (Norgaard, 1992) and media scaremongering (Pearce, 2010) can cause confusion to organisations and individuals that are attempting to understand the importance and meaning of principles such as sustainable development. Most news sources now have a dedicated environmental section but the abundance of articles that refute scientific analyses of climate change (DailyMail, 2007; McCarthy, 2010), make it difficult for the general public to both trust and completely grasp the relevance of the topic.

The contradiction between academic and media publications tend to act as ammunition for eco-activists and their opposition, each taking any new research that support their assertions and using it to start a fresh debate about the topic. This can be counterproductive as the community does not move past the debate arena, with non-believers making small concessions and pursuing easy environmental activities, much to the dislike of eco-activists who feel that anything less than full commitment is worthless.

With regards to environmental management the research will explore the potential benefits of using more holistic perspectives of accountability and responsibility of human action; for example, government development of environmental legislation (Ross, 2008), use of best practical environmental options (OPSI, 1999), business CSR (Alexander and Smaje, 2008), consumer choice of eco-products/services (ES, 2010). With regards to sustainable action, responsibility and accountability can be

difficult to establish when much of society depends upon unsustainable resources e.g. oil (Mason, 2005).

Further to this, it can also be a personal disadvantage to accept responsibility and alter behaviour to minimise environmental impacts, if the majority of our neighbours refuse to alter their behaviour in turn (Cannibal and Winnard, 2001). Presently, international efforts are being made to develop a united global effort to effectively monitor and reduce environmental degradation; for example, the Kyoto Protocol (UN, 1998) and UN Climate Change Conference 2009 (UNFCCC, 2009). The continued difficulty of international efforts for a consensus on environmental value and action stems from the necessity to instigate mutually cooperative behaviour with neighbour nations.

Reciprocity within international efforts is inherently complex as there are large discrepancies in the standards of living between different countries (UNDP, 2007), and cooperative action requires trust and fair distribution of benefits and trade-offs (Ostrom, 2003). Cooperative action can be difficult to maintain as economic, social and environmental resources are valued differently by social groups, and presently financial resources are the dominating variable. With regards to businesses that are primarily focused upon financial procurement, it is intriguing as to why some choose to adopt a mixture of social and environmental activities, whilst others opt to pursue neither activity (Evangelinos and Halkos, 2002).

One purpose of this project is to understand the role of social norms (Cialdini, 2003), systems thinking (Jackson, 2003) and social networking (Buck and Endenburg, 2006) in the development and continued use of environmental activities within businesses. Continued use referring to the active involvement of staff to maintain environmental standards e.g not become bored with the new recycling system and forget to segregate personal waste. With the intention that by understanding social opinion towards environmental activities an organisation will be able to develop activities in line with social interest, simultaneously improving employee goodwill

and system efficiency. Social interest can often be seen within informal networking, and it is through such networks that innovative approaches to organisational strategies are found (Granovetter, 1983).

Business management participation with employee social networks provides access to ‘hands-on’ knowledge and experience of operating procedures; with the potential to access local environmental knowledge (Marshall, 2008). Grassroots social action is gaining momentum in many countries with local communities starting to self-organise their actions for a sustainable future (Seyfang and Smith, 2007). Such groups are starting to demand energy efficient technologies (Scott, 2009), organic and local food produce, and the development of eco-villages and transition towns (Walsh, 2007).

The development of legislation regarding animal rights (OPSI, 2009a), sites of specific scientific interest (OPSI, 2002), water and countryside protection (OPSI, 2003), demonstrates the growth of society into a more ethically-conscious system. The continued presence of environmental lobbyists such as the WWF, Friends of the Earth and Greenpeace are also clear indicators of continued social pressure for international policy development (Mazey and Richardson, 2005). The concept of combining social norms, environmental issues and the complete business workforce to produce a holistic environmental management system will be the core focus of the research (Knowles and Espinosa, 2009).

This project aims to establish methods by which to successfully engage a business, and the employee community, in an environmental transition. It is intended that the change will be gradual and a somewhat subconscious process, focusing specifically upon developing initial ‘easy’ alterations in line with both the employee/social and business/structural needs (Olli et al., 2001). Specifically, this project focuses upon developing an EMS that is not based upon generalised areas of best practice, but rather upon an environmental strategy designed for the business by its own

employees, who will inherently support the new procedures more effectively as it is their own creation.

The development of such an EMS is dependent upon there being some form of ethical conscience within an organisation and/or community, in relation to environmental value and conservation (Brans, 2002). Efforts to minimise the environmental impact of human activity can be met with questions such as ‘What is the practical social, environmental and financial benefit to myself, and society, from adopting a more environmentally-friendly lifestyle?’.

At the present time it is difficult to define the precise local impacts that humans have upon the environment, or establish the exact benefits of both short-term and long-term environmental activities. Similar confusion is found when trying to establish whether global warming and climate change are the result of human activity, a natural evolution of the earth or a combination of the two (Hulme et al., 1999; Whitmarsh, 2009). However it can be considered that regardless of whether these environmental changes are a natural evolution or not, humans can take efforts to reduce the acceleration of these changes.

In many ways, the natural world is presently too complicated for humans to understand the holistic interconnectivity of its component parts. In order for a system to function effectively it is essential that the embedded components communicate with one another, to ensure that the whole system is working towards the same goal and each sub-system is performing a specific activity to reach the desired result (Beer, 1981). Ideal forms of interaction are often visible within the natural world and when studied can lead to exemplary examples of optimised methods and networks of communication e.g. bee and ant colonies (Capra, 1997; Detrain and Deneubourg, 2006).

With regards to EMS and sustainable development, communication is a key aspect of understanding social drivers to environmental change and the dissemination of

consistent information to businesses, communities and individuals. Sustainable development is often categorised into economic, social and environmental variables (the Triple Bottom Line (TBL)) (Midgley and Reynolds, 2001). Using the approach of Systems Thinking these three elements of sustainable development are seen to be intertwined, inseparable, with any projects designed to influence any aspect of the TBL directly impacting upon the other two areas.

For example, a project for sustainable food production will have ramifications to production costs (economic), agricultural planning (environment) and end-product costs (social). This form of holistic overview can be difficult to comprehend within real-world situations, as the domino-effect of causal interactions can seem somewhat insurmountable. This research combines the economic, social and environmental factors of sustainable development specifically within the business domain. This defined boundary enables the analysis of social norms (social variable) and their influence upon environmental management (environmental variable) within a business system (economic variable).

The project focuses upon the development of an environmental framework for change that accesses social networks to instigate bottom-up strategies for environmental management within a business. The thesis presents the findings of implementing the researcher's framework within a real-world business and closes with recommendations for future applications of the research.

1.1 Thesis Structure

Chapter 2 Literature Review

The literature review presents the justification of the research through the study of current knowledge within the area of environmental management and the identification of current developments within the field; such as the significance of

social learning (Blackmore, 2010). The chapter begins with an introduction to sustainable development and a broad overview of present international, national and individual-person arguments to support either pro or anti environmental movements. Sustainable development is described as a strategic game that is dependent upon social decisions to cooperate or defect from normative group behaviours.

The review then progresses to understand the role of ethical business practices within sustainable development. The traditional business approaches to environmental management (ISO 14000 and EMAS) are analysed to establish the advantages and disadvantages of the systems' structure. Such management systems focus upon minimising the environmental impacts of a business where practicable, but continue to put the business interests before environmental values. Scientific approaches to environmental management (natural resource management, etc) are also analysed to understand the processes by which to produce effective environmental benefits.

These systems place a greater value upon the natural environment, seek methods to reduce the impact of all human activity within the environment, and aim to create a more symbiotic relationship between human and environmental interactions. Natural forms of environmental management (ecosystem self-regulation) are analysed in order to understand how natural systems are able to sustain themselves. The presence of feedback loops and emergence of self-organisation within natural systems are then considered to be vital contributors to the development of social environmental activities.

The tendency to cooperate with other social actors leads to reciprocal interactions between different social groups, and defines the ability for multiple cultures and societies to work together effectively. This leads to the discussion of the role of social norms within the adoption of environmental activities, comparing the influence of traditional Eastern and Western philosophies in reference to social values of the

natural world. The dependence of sustainable development upon both social norms and environmentally-accountable methods of organisational practices is explored.

In order to understand the complex interaction of humans and the natural world, the interconnections and commonalities between the two domains are analysed. The chapter then introduces the concept of organisational cybernetics as a potential method to effectively grasp the holistic perspective of sustainable development, natural environment and social norms. The role of self-organisation and informal networking as indicators and mechanisms to combine social norms into organisational practices is explored. The chapter closes with the identification of the research questions, aims and objectives developed from the literature review.

Chapter 3 Research Approaches

Multiple research philosophies are presented and analysed, to determine the most useful approach to the research based upon the findings of the literature review. The use of interpretivism, phenomenologist ontology and social constructionism are chosen for the research to effectively accommodate the strong social context of the study; pragmatism is also used in a supportive function. The chosen philosophical approaches focus upon social perceptions of reality and the values that drive social action.

Social constructionism holds the deeper assertion that any form of organisation (community, business, government) is a social construct and is therefore inherently laden with cultural values and normative behaviours. To complement the adoption of an involved axiology an ethnographic approach to the study is pursued, using a specific organisation of study for an extended period of time with the researcher acting as an ‘observing participant’. The project is primarily concerned with a subjective understanding of the case study organisation, focusing upon engaging social perceptions of environmental value and transferring these values into business operations.

The researcher acts as a facilitator of change within the organisation by providing a supportive function to employee-directed project developments, whilst deliberately refraining from imposing personal perceptions of best practices. A triangulation of research methods is chosen with qualitative research seen as the primary source of data collection, and quantitative data being used primarily to validate qualitative analyses. The project combines theory, action research and the researcher's framework for social and environmental development. Data collection tools include observations from action research, interviews, questionnaires, rich picture analyses and business workshops.

The ethical implications of the research are explored and related to typical issues with case study anonymity, respect of participants' opinions and researcher subjectivity. Due to the ethnographic nature of the research it is inevitable that the researcher will have some form of impact upon the organisation that is being studied, and vice versa. The strengths and weaknesses of the chosen research approaches are discussed with the core contexts of research reliability and validity.

The chapter closes with the brief identification of conceptual methodologies that are to be used to conduct the action research within the case study organisation. The tools are then placed within a multimethodology table to demonstrate the combination of the methods to address the social, personal and material world. The chosen methods of organisational engagement are designed to create a framework for change that can be adapted to different organisations. Each method that is chosen for the framework focuses upon developing environmental activities in line with social needs and 'wants'.

Chapter 4 Conceptual Framework

Within the fourth chapter the conceptual theories that underpin the multimethodological approach to the research are presented. The use of systems thinking and cybernetics are defined as the dominating principles throughout the

study. Cybernetics is chosen as the leading systems approach as it is inherently suited to analyse and develop the necessary communication channels, both formal and informal/social, to holistically disseminate environmental information throughout the organisation. The Viable Systems Model (VSM) is chosen to establish the case study organisations purposeful activities, administrative functions, internal and external analyses, and authority systems.

Cultural analysis is determined to provide an insight into current social normative behaviours and identify present levels of value attribution placed upon the natural environment. Following the earlier identification of environmental dependence upon social action, Social Network Analysis (SNA) and Team Syntegrity (TS) approaches are chosen as methods to engage the case study organisation. SNA is identified as a tool to access the informal environmental network within the organisation and diagnose the state of the official communication structure.

Social networks are determined to be a source of innovation in which individuals with like interests (but different social positions and status) interact. TS is chosen as the tool to develop practical business strategies for change, with the intention of a broad representation of organisational employees attending a specifically designed workshop. The use of the TS protocol provides a bottom-up participatory approach to environmental strategy design that is developed solely by employees.

To progress the theoretical background of the research this chapter closes with the presentation of the framework for change to be used within the case study organisation. A seven stage process of environmental transition is defined, with the core concepts of cultural engagement and enhanced communication structures as key drivers to effective change processes. The framework is defined as a cyclical learning process in which each method of organisational engagement supports and strengthens observational analyses.

The structure of the framework is designed to initially engage social groups and their values, leading to the development of strategies for practical environmental benefits, culminating in the establishment of operational changes to support a self-regulatory environmental management system.

Chapter 5 Case Study

The application of the developed environmental framework for change within the case study organisation is discussed throughout this chapter; Socio-Environmental Cohesion for Sustainability (SECS). Each stage of the framework is thoroughly analysed with relation to the efficiency of the technique in reaching the initial goal of its application, and the response of the organisation to the adopted processes. The chapter begins with a brief introduction of the events that led to the researcher becoming engaged with the case study organisation.

The first two stages of SECS provide cultural, social and networking analyses that are used to determine the most effective avenues of community engagement within the change process. The ability to tailor organisational engagement to promote the combination of environmental activity into present social norms is seen as a pivotal goal of these initial stages. The third and fourth stages of SECS detail the combined focus of community engagement, participative decision making, normative behaviours and environmental strategy development.

The use of the TS workshop is shown to develop a future environmental strategic plan that has been designed by employees, for employees. Employee design of future strategies generates a sense of empowerment, accesses innovative strategies, identifies real-world issues and also results in lower resistance to change. The validity of the developed framework for change is strongly embedded within stage four, with the value of using bottom-up strategies for organisational change fully tested.

It is at this stage that the employee designed environmental action plan will be implemented, and the breadth at which these strategies are adopted will determine if

successful organisational engagement has occurred. The fifth stage of SECS provides a brief VSM diagnosis of the system in focus. The analysis of levels of recursive viability within the business, are combined with the SNA diagrams to produce a map of the organisational position of the environmental action group.

Within stage six a new Environmental Management System (EMS) structure is developed in which organisations gain accreditation based upon a scoring system of practical environmental action. EMS scoring is based upon operational adaptations, development of environmental building facilities and social awareness training. Following the strong presence of social values and behaviour throughout the project, the EMS is designed so that higher accreditation levels can only be achieved through continued social engagement activities.

The framework concludes with the establishment of mechanisms by which to allow the self-regulation of the EMS, through the use of early response systems that alert any discrepancies in business, social or environmental monitors. The chapter summarises with a brief recap of each stage of the SECS framework.

Chapter 6 Conclusion

The thesis concludes with the determination of how SECS has satisfied the original aims and objectives of the research. The researcher's opinions as to the advantages of using the framework for change as a whole, and the general experience of acting as an observing-participant are provided. A critical analysis of using systems thinking and social analyses within a multimethodology approach to support environmental change processes is presented.

The tools used within each stage of the developed framework are analysed and improvements for their future use suggested. Further developments and improvements to the research are suggested, alongside specific recommendations for the case study organisation in continuing its environmental efforts.

References and Appendices

The thesis closes with a complete glossary of terms and reference list. Appendices are included to provide additional social network analyses, rich picture analyses and interview summaries that were not included within the main text of the thesis but still offer a valuable set of data. A complete record of the employee involvement and design of the TS workshop is provided.

An environmental audit of the case study organisation is conducted using the new EMS structure to demonstrate the scoring and accreditation system. The practical environmental changes implemented within the case study organisation during the project are summarised against an initial baseline audit.

This chapter has provided an initial overview of the background to the research topic and defined the structure of the thesis. The following chapter provides a review of literature pertaining to social and environmental action, sustainable development, organisational behaviour and systems thinking. The research questions, aims and objectives are presented at the end of the chapter to define a clear focus for the research project.

Chapter 2

Literature Review

This chapter defines the current knowledge and practical activities pursued in the name of sustainable development and environmental management. Initial focus is placed upon debates surrounding the validity of environmental action with regard to both scientific evidence and social normative behaviour. Traditional Environmental Management Systems (EMS) are analysed to determine the benefits and disadvantages of applying generic methodologies within UK organisations. Business and scientific examples of EMS are then compared and a more holistic context for EMS presented using the concept of systems thinking. The implication of sustainable development, social norms and informal networking upon business practices is explored. The interdependence of social normative behaviour and environmental action is analysed with reference to the causal relationships of interaction between humans and the natural world.

2.1 The Environmental Debate

Sustainable Development (SD) was originally pioneered by Reverend Thomas Malthus towards the end of the 16th Century, who took the view that a sustainable

society was not possible with limited agricultural capacity and an exponential growth in population (Malthus, 1798); Malthus viewed the concept of charity (social welfare) as a perpetuate of high fertility rates in the lower classes. Malthus' view of the 'poor' as a detriment to sustainability of the population as a whole was mirrored by Daily and Ehrlich's (1996) assertion that lower classes have higher fertility rates; as seen in fertility studies comparing Western societies and developing countries (Sugawar, 2010).

The basic concept underlying this perspective of sustainability was based upon the assumption that the consumption patterns of lower income families (with inherently larger family sizes), results in shortages of natural resources. However it is suggested that within terms of environmental preservation in modern society, the rich are equally responsible for the depletion of natural resources (IPPC, 2007); with lower incomes focused upon survival-consumption and higher incomes with material-consumption. This concept of a broader social responsibility is more allied with Marxist theory of communism, where equality of the populace is the priority of the social system (Marx and Engels, 1848).

With regards to sustainable development this goal of collective social equality is problematic with different nations able to input different aspects of economic, social and environmental resources; with economic resources presently awarded the highest value (Harrison, 2007). Even so, sustainable development does require a global unity of human responsibility to preserve the natural world (Hardin, 1968), as there is a finite limit of natural resources for the entire global population to share.

Further to this there is limited environmental benefit that can be sought from one select nation becoming carbon-neutral (e.g. Vatican City (Wenski, 2009)) if all other countries continue to pollute the same atmosphere. As such it is desirable that all nations make an effort to adopt sustainable mindsets, cooperate with international projects for sustainability, and attempt to preserve the natural environment within their political borders. A key developer of conservation strategies within the

United States was Gifford Pinchot who focused his career upon effective forestry management eventually gaining government support for his projects.

This resulted in the establishment of National Forestry policies to benefit both local communities and corporate bodies in natural resource management (Pinchot, 1910). According to Sierra Club (1999) Pinchot was often criticised by John Muir, a founder of the Sierra Club and core driver to the establishment of numerous national parks e.g. Yosemite, who believed that natural environments should not be subjected to any form of commercial exploitation. Both of these individuals can be seen to have made significant achievements in the development of environmental activities and it is arguable that they both represented two vital perspectives of environmental ethos: anthropocentric and ecocentric (Schultz et al., 2000).

SD is a merger of both human (anthropocentric) and environmental (ecocentric) needs, combining the mutual interdependence of humans and the natural world within sustainability practices. Rachel Carson's 'Silent Spring' (Carson, 1962) is often heralded as one of the iconic publications in Western society, that brought environmental concerns to the forefront of global social debates. Carson described the dramatic effects caused by pesticides and other chemical usage upon the natural environment, and how this is transferred to humans; through close proximity to industrial air pollution and the digestion of common food and water sources.

This book formed a kind of merger between the anthropocentric and ecocentric doctrines, providing an initial demonstration of the circular causality embedded within human interactions with the natural world. In 1972 the first international conference was held by the United Nations to confront growing concerns that the human environment was deteriorating (UNEP, 1972). At the same time Curitiba (Brazil) began its development into a sustainable city, that by 1992 had a public transport system which operated between 0.2-1.8% costs of an underground metro system (Rabinovitch, 1992).

In the same year the Club of Rome published the influential book, ‘The Limits to Growth’, detailing the work of Jay Forrester, Donella Meadows and colleagues within the field of sustainability (Meadows et al., 1972). The book focused upon the realisation that human economic growth is not sustainable within a world of finite resources. Meadows (2007) found the concepts presented by Forrester as a clear influence in her understanding of sustainability and summarises his early discussions as:

“Our only option is to choose our own limits, or let nature choose them for us” (Meadows, 2007, p.193).

Meadows (1999) identifies ‘growth’ as a leverage point within economic systems that is governed by the somewhat simple rule: for every benefit (wealth) there is a cost (poverty) somewhere else in the system. Meadows used computer models to simulate the sustainability of social systems dependent upon different parameters of growth (economic, population size, resource and ecological limits). The conclusion of the models was the determination that the effective management of a system requires thorough social policy developments (Meadows and Robinson, 2002; Seville et al., 2001), to enable learning and transformation within the system.

In 1979 James Lovelock published his book ‘Gaia: A New Look at Life on Earth’, presenting his theory of Gaia: the concept that the Earth and all living systems on it are part of one large superorganism. Gaia proposes that “the total ensemble of living systems in the biosphere can act as a single entity to regulate chemical composition, surface pH and possibly also climate” Lovelock and Margulis (1974, p.3). This regulation has been likened to the process of internal regulation within the human body, where organs (individual components) react and support one another to maintain stability within the whole system (Levine, 1993).

Similar to Meadows, Lovelock produced a model of the Earth called ‘Daisyworld’ in an attempt to “observe the circulation of air, the oceans, and the rocks” (Lovelock,

1995, p.42). The Daisyworld simulation was used to demonstrate that a planet naturally self-regulates (adapts) its climate and ecosystem in order to survive, by reaching a homeostasis (stability) between all elements within the system (Lenton and Lovelock, 2001; Watson and Lovelock, 1983). In order to reach this stability the Earth may undergo either subtle (global warming) or dramatic (volcanic eruptions, tsunamis) changes.

Lenton and Lovelock (2001) present Daisyworld as a demonstration of Darwinian concepts of natural selection; with the development of ecosystems that complement climate conditions, with fluctuations in the climate leading to the competition of species adaptability. Lenton (1998) has provided additional support to the Gaia theory by producing more complex models of the Daisyworld experiments, demonstrating that self-regulation naturally occurs to favour specific environmental mutations and does not require conscious planning. Lapenis (2002) presents a similar theory to Gaia developed within Russia during the 19th century called biogeochemical selection.

This would suggest that natural selection favours those organisms that are capable of contributing to global recycling systems. For example, an organism will survive if it consumes the waste of another animal, and produces by-products that are usable by other species. Kirchner (2002) criticised the Gaia theory of homeostasis as too ambitious, with the argument that organisms cannot alter the environment to make it more habitable. Barlow and Volk (1990) uses Bertalanffy's thermodynamics (energy flow of living systems) to refute the notion of Gaia as a living entity.

Lovelock (2003) responded to such criticisms as a result of reductionist thinking that has dominated science, with the focus of studying small/narrow phenomena before looking at the whole picture; removing the ability to see the world as one large complex system. This would suggest that a Gaia-based approach requires the view of the Earth as one large system of interrelated components; a holistic perspective (Ulrich, 1993). However, critics of Gaia continue to view Lovelock's work as one

that requires a degree of conjecture to support theories of causal coupling within the Earth system, rather than strong scientific reasoning (Volk, 2003).

In 1984 the Brundtland Commission developed the ‘Our Common Future’ report (UN, 1987), in which sustainable development was defined as development that:

“meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 1987, p.54).

This is considered to be the initial definition of sustainable development and has formed the basis for preceding international meetings. Hildebrand (2005) refers to the post-1985 period as the initiative phase of policy development within the European Community, with the merger of the Fourth Environmental Action Plan into the newly formed single European market. In Rio de Janeiro 1992 the United Nations Earth Summit was held and paved the way for international commitments to sustainable development.

The summit contained international representation of governments and Non-Governmental Organisations (NGOs), focused upon generating a global effort to enact sustainable change (Roddick, 1997). Rooy (1997) suggests that the British government restricted the presence of its NGOs within summit proceedings, which hindered the ability for social values to influence the proceedings. The greatest achievements of the summit were the commitment by attending nations to tackle climate change, improve biological diversity and forestry standards, and implement Agenda 21 (Cicin-Sain, 1996).

The Kyoto Protocol was established in 1997 as an international effort to reduce greenhouse gas emissions (GHGs) to the levels recorded in the year 1990 (IISS, 1997). According to Lund (2006), an interesting connotation of the Kyoto targets was that Denmark began to increase its GHGs as its original emissions statistics were far below the Protocol’s set standards; a counterproductive strategy of

sustainability. Additionally, Álvarez (2008) notes that as of 2008 Spain has ratified the Kyoto standards whilst the USA has not, despite its greater economic capacity and larger contribution to GHGs.

The Kyoto Protocol established 2012 as the target year for GHGs to be returned to manageable levels, and at the present time 186 countries have ratified the treaty (UN, 1998, 2009). The World Summit for Sustainable Development that was held in Johannesburg in 2002 identified that little international change had occurred since 1992, and again focused upon political agreements of best practice (Najam and Cleveland, 2003). The most recent attempt to develop international treaties involved the Copenhagen Climate summit in 2009 that primarily involved a review of the Kyoto Protocol and resultant changes.

Following this summit the EU agreed to the voluntary commitment of reducing its GHG emissions between 20% and 30% compared to 1990 levels, by the year 2020 (Jurado and Falkenberg, 2010). Jurado and Falkenberg (2010) concludes the commitment to this treaty by indicating that the participation is based upon the trust that other nations will follow suit and adhere to the Kyoto targets, otherwise the EU states will withdraw commitment. A study in 2000 showed that the USA emits double the amount of carbon emissions to its closest counterpart (China), and 40% more than Western Europe in total (Bernstein et al., 2006).

Such variances in international pollution provide contradictory information to global citizens as to the worth of the natural environment and the degree of preventative measures needed to reduce environmental degradation; attitude-behaviour gap (Hares et al., 2010). It is suggested that whilst environmental education is abundant in the UK there is often insufficient support mechanisms for individuals to pursue ‘greener’ activities e.g. efficient public transportation. Many societies are now aptly aware of the environmental consequences of human activity, but communities and individuals are not provided with the necessary tools to understand how they can easily change their lifestyles.

Meadows (1989) suggests that within an industrial paradigm (developed societies) it is a common belief that any and all economic growth is always justifiable; a perspective that Meadows personally refutes. Max-Neef (1995) uses a forty year analysis of five developed nations to demonstrate that continued economic growth reaches a threshold (1970s) at which point social and environmental welfare begin to suffer.

There have been instances where humans have attempted to improve the environment and human living. An example is evident with Dr Muller who won a Nobel Prize in 1948 for the development of DDT to combat malaria (Zetterström, 2007), only to discover many years later the disastrous effects these chemicals have upon the ozone and humans (Carson, 1962). The DDT debate continues to gain international attention over fifty years after it was initially used (Danley, 2002; Walker et al., 2006), with the near impossible task of deciding between the use of environmentally devastating chemicals or a widespread malaria pandemic. This decision then falls upon the choice of short-term (malaria) or long-term (environmental) benefits to humans.

Within environmental debates there is a consistent lack of coherence in the environmental terminology used by businesses, governments and academia, with each adopting a range of basic and highly complex terms to relate their knowledge. Further confusion can then be found within academia when analysing the difference between the arts and science domains (Jacobson et al., 2007; Simon, 2006; IPPC, 2007). To progress society towards a deeper understanding of environmental concerns it will be necessary for a common narrative to be developed for the topic as a whole (semantic alignment (Raskin and Pan, 2005)).

The term ‘Environmental Management’ has completely different connotations between business and scientific operations e.g. operational impact upon the surrounding ecosystem and conservation planning, respectively (EC, 2001b; Curry-Lindahl, 1972). Similar discrepancies can be seen within the use of terms such

as sustainable development (inherent with viability concepts, yet rarely linked together), climate change (often marginalised to reference global warming) and environmental offsetting (commonly restricted to carbon footprint measures). A common discourse is essential to the interaction and effective communication of human groups, to enable us to relate to one another our opinions and knowledge of the surrounding environment.

In modern democratic society it is inherent that all individuals have a right to choose to support, be passive or act against social actions of interpretive importance; Bhattacharyya and Hodler (2010) find that democratic societies are less likely to pursue corrupt natural resource rents (excessive profit) than others. The atmospheric effects of greenhouse gases, genetically modified organisms, human versus environmental value, are all examples of topics that gain varying degrees of support across many societies (Damro and Mendez, 2005; Patterson and Josling, 2005; Vogel, 2005).

In order to enable effective discussion about such topics clear definitions of each specific ‘act’ are required, to allow individuals to debate upon their own interpretations/opinions of the same described activity; language defines society (Maturana and Varela, 1987)). It would not serve any useful purpose to establish a debate about genetically modified food, if one group understood this to mean groceries that had been grown in a science laboratory, and the other understood this to mean any food that was not organically cultivated.

An additional difficulty in generating support for environmental activities is the lack of statistical information relating to the exact cause of current levels of ecosystem degradation; human or natural planetary evolution. Most governments and industrial sectors base their actions upon research studies that are business-orientated as eco-activists cannot typically fund such studies (Midgley, 2000). The business-biases behind environmental studies coupled with media scaremongering do not serve to develop public trust in scientific evidence of environmental degradation.

For example most scientists claim that humans are partially responsible for climate change (IPPC, 2007; Thomas et al., 2004; Le Treut et al., 2007), whilst media outlets feed the public with different interpretations (or ‘codswallop’ (Mackay, 2009)) that suggest changes in the Earth’s atmosphere are natural phases of evolution in the planet (DailyMail, 2010; Express, 2009). According to Pala et al. (2003) it is human nature to seek evidence that supports our original perceptions of specific phenomena; eco-activists (academic journals), eco-skeptics (media articles). Environmental issues often require a certain level of ‘faith’ in the negative connotations of human activity that are not easily evidenced to our sensory understanding of the world; individuals cannot typically see GHGs in the atmosphere.

It is suggested that for many individuals there is a perception that numerical evidence can be ‘trusted’ more than a sociological study “because social systems are so bewilderingly complex that mathematical models are turned to in the first place” (Meadows and Robinson, 2002, p.275). This was likely influenced by Locke (2004) who stated that quantitative knowledge is always objective, and qualitative subjective. The common tendency to overlook the subjective nature of research projects (human design and analysis) can limit research understandings.

For example, it would be possible to analyse the removal of flora and fauna within a given location at a specified period of time to allow a researcher to claim the loss of biodiversity in the area. However it is plausible that the study site could have been prepared for the reintroduction of indigenous plants enabling a different researcher to claim the restoration of the local ecosystem. These issues are similar to logical paradoxes such as Hempels Ravens (Gardner, 1998), Theseus’ Ship (Hughes, 1997) and the Liar Paradox (Martinich, 1983); where reductionist and inductive reasoning can be applied to the same situation, produce different results, yet both be equally correct.

The influence of human judgement upon statistical figures should not be ignored: it is the human who decides what and why they are investigating the subject, the

methodological and analytical tools to be used, and the audience to whom they will direct their research findings. As such there is a necessity to merge qualitative and quantitative reasoning into a holistic perspective of the world; aptly referred to by Ackoff (1999) as the Scianties (Science and Humanities).

2.1.1 The Environmental Game

Each country belonging to the European Community is ruled by the legislation approved by the European Parliament, including environmental legislation (OPSI, 2006) that has developed through identified social needs or pressure (Guibentif, 1996). Preliminary analyses by Esty and Porter (2005) link positive national environmental performance to rigorous regulations, private sector support and international networks. A study by Saida (2009) identified that European multinational businesses are more willing to disclose obligatory and voluntary environmental information than American counterparts.

The presence of such voluntary disclosure could be the result of the EU approach of multilateralism towards sustainable development (Vogler and Stephan, 2007). The EU uses New Environmental Policy Instruments (NEPIs) to develop general standards of action within its member states; including environmental taxes, eco-labelling standards and voluntary agreements (Jordan et al., 2005). According to Kärnä et al. (2003) the UK has the least proactive environmental industries when compared to Finland, Germany and Sweden; with Weale (2005) referring to the UK as the awkward partner of the EU.

Börzel (2005) identifies that the UK could be considered as a ‘fence-sitter’ that prefers voluntary environmental agreements. Studies conducted by EUROPA (n.d) found that the UK has far less businesses (62 in total) with EMS registration than Austria (255), Germany (1372), Italy (1035) and Spain (1217); with the UK ranked 9th within the EU country comparison (EUROPA, 2010a). A recent report by the

European Commission (EC, 2007a) found that at the end of 2007 the UK had the 4th highest cases of environmental legislation infringement of the EU-27.

This indicates that the UK has a lower value of environmental responsibility than most of its EU-27 counterparts, with much fewer sanctions or punishment mechanisms to deter environmental damage. Within 2008 the UK sent 55% of its waste to landfill, 12% to compost and 23% was recycled (registering as 11th best in EU-27), and 10% to incinerators (EPO, 2010). Conversely, in the same year the UK also exceeded all EU targets of recycling rates, with an overall score 5.7% above set targets (INCPEN, n.d.b).

This would suggest that while the UK still needs to develop and strengthen its environmental activities, it is doing so at a faster rate than expected. The highly interpretative and voluntary policies of the UK environmental sector still do not serve to encourage organisations to pursue activities beyond minimum compliance specifications (DEFRA, 2010a, 2008; Ross, 2008). It is reasonable to wonder if political backing of environmental activities actually produces significant changes; it is forty years since the first international environmental conference and the UK still opts for voluntary agreements.

Yandle (1999) proposes that political involvement within environmental developments leads to low efficiency, high cost strategies. Without a conscious social ‘environmental revolution’ (Fuchs, 2006), there is no need for the UK government or business institutions to adopt environmental practices above the minimum requirements of international regulations. O’Brien (2005) even suggests that for some businesses there is a direct benefit to ignoring and refuting environmental impacts, so as to reduce the need to alter product materials or operational processes.

Within the current global economic crisis, it is highly unlikely that any organisation will actively pursue voluntary environmental activities without clear social pressure from its customers (Penn, 2003). Businesses are currently faced with a broad range

of consumer pressure: individuals who want environmentally-friendly products, those who are happy to purchase eco-alternatives if they have equal function to normal products, and those who want luxurious items regardless of environmental consequences. As there is no uniform social behaviour to environmental issues, businesses are required to provide products and services that satisfy each of these consumer demands.

Using Rapoport's example of the Prisoners Dilemma (Rapoport and Chammah, 1965), social choice with regards to sustainable development can be modelled upon game theory (Figure 2.1). Expanding upon Cannibal and Winnard (2001) discussions of the Prisoners Dilemma and Tragedy of the Commons, it is proposed that at the present level of social confusion surrounding the environment and state of the planet, we have now entered a form of game in which the global community is placing humans as a 'stake' within the 'Earth Survival Ante'.

	Cooperate	Defect
Cooperate	Win, Win Sustainable Development	Lose, Win Society is fragmented – some live in squalor, some live in luxury
Defect	Win, Lose Society is fragmented – some live in luxury, some live in squalor	Lose, Lose Tragedy of the Commons

Figure 2.1: Prisoner's Dilemma of Sustainable development (Knowles & Espinosa, 2009, p.279).

Using the Spaceship Earth analogy, Fuller (1971) explains that in human society we will either all succeed or all fail to effectively operate the planet/machine. In order for societies to flourish and become viable, humans need to aim for the 'Win, Win' scenario, where sustainable development is a normative community ethos. For many this may seem untenable, a utopian society of selflessness (eco-communalism (Raskin et al., 2002)), an unrealistic goal when matched to the human ego.

As such it is proposed that sustainable development needs to be viewed as a driver to both individual and group action, with no false assumption that the concept is infallible and everyone will live happily ever after. Aras and Crowther (2007) suggest that for a business to be sustainable it needs to place equal value upon social influence, environmental impacts, organisational culture and finances. The ‘Win, Lose’ box can be viewed in real-world terms of ‘Western Society, Developing Countries’ where resources are exploited by some and quality is reduced for all.

The ‘Win, Lose’ scenario can also be viewed in terms of free-riders (Wiser and Pickle, 1997) and cooperators (respectively), in which the former benefits from market improvements without contributing to the system. The adoption of cooperative action requires a significant degree of faith in one’s neighbours to opt to reciprocate (trustworthiness-cooperation (Ferrin et al., 2008)), otherwise one community moves to a ‘Lose’ status and future relations of trust are compromised (all links are jeopardised (Spagnolo, 1999)).

The growth of Ecovillages (Gaviotas in Colombia (Kaihla, 2007), Findhorn in Scotland (Walsh, 2007)) alongside national projects (ECTOS in Iceland (Sigfusson, 2007), PROALCOOL in Brazil (Schaeffer et al., 2005), Pico Island in Portugal (Cruz and Silva, 2001), ZERI in Colombia (Capra, 2003)), are prime examples of how communities are able to become self-sufficient. From these examples it is clear to see that with effective management, technology procurement and social determination it is possible for a society to become self-sufficient, whilst still functioning as a regular member of broader social systems.

Many environmental activists attempt to instigate sustainable change through the use of revolutionary tactics such as mass protests, boycotts and other forms of radical action. Some environmental activists e.g Ivar Mysterud (Naess, 2003), choose to play the political and economic game that is necessary to engage and support the social change. By focusing upon subtle change Mysterud was able to gradually engage large social groups in eco-action, leading action from within.

Social networks are laden with innovative approaches to change processes, that have been modelled to suit the present community and normative rules (Granovetter, 1983). It is therefore proposed that such informal networks can be an ideal method of instigating bottom-up change in normative behaviours, with such behaviours then narrowed into a set of metanormative rules agreed to by the majority of society. Within a democratic society such metanorms are challenged whenever governmental elections take place (Eichenberger and Oberholzer-Gee, 1998), with politicians advertising their parties set of normative policies and society choosing the party that represents their interests most.

Elster (1989) identifies the following forms of normative behaviour: consumption, natural behaviours, money, reciprocity, retribution, work, cooperation and distribution. Each of these norms can be seen to collectively fill at least two aspects of the Triple Bottom Line (TBL): economic, social and environmental variables (Willard, 2002). At the present time many individuals would easily identify the economic and social attributes of these norms and it is now time to establish the environmental ramifications of such behaviours.

2.1.2 Understanding The Need for Sustainable Development

The true reality of human interaction with the natural environment is that as a species we have relatively little history of existence when compared with the grand age of the Earth (NG, 2011). Environmental discussions often reach no practical conclusions of action or common understanding because we are debating about an unknown, from multiple perspectives of ecological value (Regan et al., 2006). Intellectually we have advanced a great deal in our understanding of the natural world, but we cannot predict or foresee the holistic consequences/repercussions of our actions.

Sustainable development is further hampered by the tendency of individuals to respond negatively when their knowledge and beliefs are challenged, resulting in people actively seeking evidence that supports their own viewpoint (Pala et al., 2003). It is through a lack of clear evidence (Simpson, 1996), pro-environmental self-identity (Whitmarsh and O’Neil, 2010) and understanding of holistic principles, that individuals are able to ignore their contribution to negative environmental actions. We have been able to reach a certain level of understanding of the Earth and how it has transformed over millennia, but it is difficult to quantify whether current environmental changes are the direct result of human activity or a natural stage of planetary evolution.

In either instance the Earth is quickly becoming a planet that has fewer habitable locations (Munday, 2004), natural resources and ecological diversity (Grosjean et al., 1997), and greater occurrences of non-indigenous ecological contamination (Hughes and Convey, 2010) and widespread disease (Zanakis et al., 2007). It would be counterproductive to attribute any one of these aspects of environmental degradation to one individual or society, but it is fair to suggest that the collective human mismanagement of the Earth has contributed to such damage. Lamont (1998) suggests that human freedom of choice is entwined with the personal responsibility of any ensuing consequences.

It is inevitable that humans will have an impact upon the natural world, but it is individual choice of how to pursue everyday activities that will determine whether such impacts are environmentally beneficial or disadvantageous. Using Capra’s (1976) analogy of the cosmic dance of the universe as a description of the interconnectivity of all matter, it is suggested that at the present time we are attempting to learn and master a dance without instructions or a teacher, whilst our partner/‘nature’ performs an endless routine of rhythmic/interconnected stability. Media propaganda could be considered a form of instruction as it is through this medium that many individuals base their assumption, opinions and actions upon. However, the lack of in-depth scientific knowledge contained within such

publications results in continued debate as to the validity of calls for environmental change; a critique identified by Harbemas of the Public Sphere where rational-critical debate is overtaken by private influences on mass media (Habermas, 1991).

Let us take three examples studying human influence upon the future state of the natural world. In scenario one if we assume that humans are the direct cause of global warming and other environmental catastrophes, it is reasonable to suggest that changing current activities to more environmentally-conscious alternatives will reduce planetary degradation. In scenario two if we assume that current environmental changes are the sole result of a natural phase of planetary transformation, it is reasonable to suggest that it is the responsibility of humans to minimise activities that speed up this process. In scenario three if we assume that environmental degradation is a completely natural phase of the planets evolutionary cycle, it is reasonable to suggest that humans should attempt to establish ways to reduce this degradation in order to keep the planet hospitable.

However, there is already sufficient evidence to attribute a great deal of environmental degradation as the direct result of human activity (IPPC, 2007). According to Schultz et al. (2000) Western societies have been built upon the Christian Bible, with the common misinterpretation that the Earth was given to Man to rule, to support our development and continued survival (Pattberg, 2007). This has led to the embedded misconception that humans are a form of higher authority on the planet, when realistically we often forget that the Earth could easily continue to exist if humans became extinct (Tickell, 1993).

Traditional Eastern philosophy is inherently focused towards systemic principles with the view that all living creatures are part of a large group of interdependent entities; similar to the non-anthropocentric focus of deep ecologists (Fox, 2003). This holistic perspective is not necessarily prevalent within modern Eastern societies that have followed Western ideas of technological growth and material wealth. Capra (1976) regularly credits traditional Eastern philosophies of holistic

interconnectivity as strengthening his understanding of physics. This approach is embedded with the notion that the human mind is limited and it is impossible to fully understand or indeed comprehend the complexity of our surrounding environment.

Even though these traditional philosophies are losing presence within modern societies, it is proposed that the core principles of individual and group action contained within them are of benefit to systemically understanding social phenomenon. The concepts of interconnectivity within humans (mind, body and spirit), humans with one another (companionship, sanity and species survival) and humans with the environment (responsibility, sustainability and co-dependence) (Billington, 1997), are all necessary elements of a holistic view of society. This perspective of holistic interdependence forces humans to analyse the connotations of their actions, and assess the value that they place upon material, social and environmental resources.

Many countries have the disadvantage that the actions and wealth of celebrities and religious individuals (typically elevated to an iconic status) are often desired/emulated by the general population; for example private airplane travel, home spa equipment, multiple cars. Additionally the statement by Mother Theresa: “Why should we care about the Earth when our duty is to the poor and sick among us. God will take care of the Earth.” (Lovelock, 2006, p.2), does not serve to encourage pro-environmental attitudes. This last example is far removed from the teachings of icons such as Mahatma Ghandi who stated:

“The Earth has enough for everyone’s need but not for everyone’s greed.”
(Myers, 1997, p.1).

This statement is highly resonant with Western societies’ materialistic demands and individual tendencies to spend money beyond their means (Bansal and Srivastava, 2008); SBC (2009) attribute credit-based businesses as a contributor to failings

within sustainable development. Beer (2004) describes the onset of this ‘greed’ within the UK during the 1980s and the political attempts to regulate society through monetarism; lacking the necessary variety to handle the range of complex social issues that a nation faces.

It can be easy to judge businesses for wasteful overproduction and excessive packaging (INCPEN, n.d.a), while simultaneously being frustrated if items we desire are unavailable or found to be even slightly damaged upon purchase. There needs to be a mental shift to avoid this contradiction, with the adoption of a lifestyle perspective that realises that when necessary humans need very few material resources to survive; easily simplified into Maslow’s classification of physiological needs (Maslow, 1943).

It is suggested that sustainable and environmental action require a certain degree of understanding in the nature of complexity management entwined with the motivation of human survival. Jackson and Marks (1999) indicate that the social mindset of ‘want’ rather than ‘need’ has developed since the 1950s within the UK. It is unrealistic to assume that an environmental revolution will occur quickly and without some degree of change in accustomed social behaviour; social norms (Kandori, 1992).

Socio-environmental behaviour requires sufficient support mechanisms from businesses and political institutions in order to effectively pursue desirable activities. Businesses and political institutions control the key resources needed to pursue environmental activities including research and development of alternative technologies (e.g. biodegradable plastics), implementation of sustainability projects (e.g. public transport improvements) and financial incentives (e.g. heating grants) for individual activities. This suggests that in order for the social ethic of environmental responsibility to gain prominence within a system, it is necessary to translate social demands into business and political operations.

2.1.3 Translating Ethics into Sustainable Business Practices

Moneva et al. (2006) claims that the UN definition of SD continues to be misinterpreted and its intended purpose to encompass all aspects of the TBL have been lost: unity of economic, social and environmental variables. However, there is a tendency for each of these areas to be specifically nurtured within certain working sectors; economics in private sector, social aspects in the public sector, and environmental aspects in the voluntary sector. Present day attempts to merge the TBL into a practical aspect of business functionality has seen the development of corporate social responsibility (CSR) (van deVen and Jeurissen, 2005).

CSR is typically linked to projects that engage with a “specific system of stakeholders” (Vos, 2003, p.142), which is often the surrounding local communities (Missens et al., 2007). It is suggested that for many organisations such activities are mere goodwill gestures and not acts of enhanced morality, which is supported by Crowther and Martinez’s (2007) perspective of stakeholder demands as a drive for CSR and not embedded managerial ethics. Businesses often vie for advertising avenues with great amounts of economic resources channelled to secure corporate sponsorship of popular sporting events, that leads to improved brand image and stock value (Cornwell et al., 2005).

The same degree of contention or financial outlay is not witnessed between businesses to support social and environmental charities. This would suggest that whilst businesses do provide valuable benefits to communities through CSR projects, social and environmental ethics still remain a lower priority than more ‘fun’ activities. This is more of a reflection upon the values present (responsive CSR (Porter and Kramer, 2006)) within the society in which a business operates, than upon the business itself. Castaldo et al. (2009) identify that when consumers want a product and quality and convenience are of high importance, CSR bares little worth.

Genuine efforts by employees to improve the meta-ethical (Haigh, 2006) operations of their employer can prove to either empower or dishearten the workforce. For example, employees of the American company Wal-mart established a community fund to help fellow employees in financial difficulty. In one year the organisations employees donated over five million dollars to the fund, whilst the family who own the company (all ranked within the USA Top 10 richest people) collectively donated six thousand dollars (Wal-Mart: The High Cost of Low Price, 2005).

The discrepancy placed within social value between employees and business management in this instance, can only serve to adversely affect employee goodwill (Child and Rodrigues, 2004) and lead to system inefficiencies. This criticism of business motivations to pursue social development activities should not deter from the practical social benefits gained from such projects. Examples include the diversion of money saved from reducing plastic carrier bags to revitalising natural environments (MS, 2010), promoting and supporting healthy lifestyle choices to children (JS, 2010), gender equality and small business support (HSBC, 2010), and sole provision of ethically sourced products (ES, 2010).

Each of these activities results in some form of community regeneration where benefits can be directly experienced by most individuals in the area. This is far different to activities such as tree planting for carbon offsetting that produces an indirect holistic social benefit. Hill (1999) suggests that a symbiosis is needed between social and institutional economics, in order to effectively combine social value within pragmatic designs for organisational strategies. It is suggested that this symbiosis is somewhat untenable within business organisations as the very nature of a business is to procure economic resources, and financial instabilities will result in the reduction of all 'wasteful' activities to preserve primary system functions; for example employee downsizing (Datta et al., 2010).

Even so it is suggested that with effective communication and access to financially viable alternative methods of operation, an organisation can maintain regular

business functions with a higher degree of social responsibility (Ali et al., 2010). Fair-trade activities are a socially responsible business standard that ensures fair wages and working conditions for employees, gender equality and sustainable production activities (FF, 2010b). Traditionally fair-trade items (often food products such as chocolate (GE, 2005)) are more expensive than regular alternatives and the choice to purchase such products is a clear demonstration of commitment to support socially responsible business practices.

Another indicator of a business' social ethic is whether they decide to absorb the added costs of providing fair-trade items to consumers or increase product prices. The social popularity of fair-trade items within the UK has led to entire cities (e.g. Newcastle (NCC, n.d.) and Bristol (BCC, n.d.)), educational institutions (e.g. University of Hull (UoH, 2008b) and Durham University (DU, 2009)), places of worship (e.g. Birmingham Progressive Synagogue (FF, 2010a) and Huntingdonshire Community Church (HCC, 2009)) attaining fair-trade status. At the present time the UK contains sixty percent of the world's fair-trade accredited towns (FT, n.d.).

Fair-trade practices are beneficial but there is a limit to the degree of social improvement that can be provided within different countries. It would not be possible to pay employees in the third world the same basic employment wage as the UK, as it would be highly disproportionate to the general economic wealth of the country. For example, in the year 2008 Zimbabwe held 314 GDP (USD) with 66% of the nation working, whereas the UK held 43,544 billion GDP (USD) with 62% of the nation working (UNSD, 2009).

This results in consumers being faced with a dilemma as to whether to support fair-trade (third-world social betterment) or local sourced (UK-based social and environmental benefit), both of which have strong ethical arguments for support. It is possible that some businesses may have the social impetus to adopt more sustainable business practices and wish to offer more ethically responsible products

and services, but be met with owners or stakeholder groups who simply do not share the same ethical values (Carroll, 1991).

Therefore in order to fulfil the ethical drive of the organisation the primary option that is left is to make changes to internal business operations that will not negatively impact upon the economic value of corporate assets, stakeholder dividends or quality of consumer services. The purchase of onsite renewable energy sourcing and energy-efficient equipment, alongside the adoption of paperless office systems, carpool schemes and video-conferencing, are a few examples of sustainably-orientated operational changes.

It is suggested that the core barriers to adopting these activities are individual resistance to change (confusion, stress and culture (Lozano, 2006)) and long payback periods (Dahle and Neumayer, 2001). On the other hand some companies choose to design their entire business model upon the principles of sustainable development. For example, Interface is a carpet manufacturer within the USA that uses a closed loop recycling system within carpet production; used carpet tiles are reprocessed and developed into new tiles with no waste (Posner, 2009).

The cosmetics retailer Lush uses vegetarian and organic ingredients in their products, popcorn for product packaging instead of Styrofoam, and uses one hundred percent recycled plastic for cosmetic containers (Lush, n.d.). The ability for organisations to adopt such sustainable practices requires a degree of innovation (van Kleef and Roome, 2007) within their operational activities and product designs. The continued growth and economic prosperity of such organisations are clear indicators that there are many consumers who will choose to buy ethically sourced products if they are available.

This section has focused upon providing a background to sustainable development practices and explored the current debate as to the ethical responsibility of humans to one another and the environment. Consumer demand for ethical businesses

has been discussed and different approaches by businesses to meet these demands explored. The following section focuses upon current popular Environmental Management Systems, analysing their effectiveness to engage businesses to adopt practices that improve their ecological footprint. Particular attention has been made upon the ability of such management models to effectively engage the social requirements of all stakeholder groups, to create bespoke environmental actions for the actual needs of the studied system.

2.2 Traditional Environmental Management Systems Business vs. Science

Environmental Management Systems (EMS) have typically fallen within one of two categories: business or science. Business EMS are relatively modern systems that have been devised to help organisations reduce their environmental footprint. Such EMS focus upon altering business operations and facilities to minimise negative environmental impacts, under the premise that best alternative approaches be considered wherever possible. Lancet (2009) state that industrialisation is the cause of 80% of the worlds carbon dioxide levels, with approximately 450 billion tonnes of the element trapped within the atmosphere.

Businesses of any scale and within any industry can implement an EMS but there is conflicting evidence as to the positive (Melnik et al., 2003) or negligible (Morrow and Rondinelli, 2002) economic benefits of implementation. Science-based EMS tend to focus primarily upon the conservation of indigenous species and natural resources, to restore and maintain the natural balance of the studied ecosystem. Scientific EMS are often reactive systems that attempt to reverse the negative impacts of human activity upon the environment.

Both of these EMS are subject to social demands: businesses face customer needs alongside stakeholder pressures for environmental accountability (Delmas and Toffel, 2004), and conservation bodies are restricted by the practical needs of a growing society (Callicott and Mumford, 1997). The following section compares the two forms of EMS and presents some natural forms of environmental management.

2.2.1 Environmental Management Systems - Business

“An Environmental Management System (EMS) is a structured framework for managing an organisation’s significant environmental impacts” (IEMA, 2009).

UK businesses that wish to implement an EMS tend to adopt the ISO 14001 system, Eco-Management and Audit Scheme (EMAS) or a bespoke set of policies (Walker et al., 2007). The first two options provide a consistent format of assessment that allows other organisations, employees and individuals to compare multiple businesses easily. A bespoke set of policies provide an organisation with the ability to either greenwash present activities (exaggerate claims of sustainability (Lightfoot and Burchell, 2004)), or implement in-depth strategies that are highly tailored to the organisations unique structure.

The level of EMS compliance adopted by an organisation is inherently linked to stakeholder norms with the ethics of associates, employees and customers, determining the degree of socially acceptable operational changes. Midgley (2000) suggests that the ISO 14000 and EMAS systems can be viewed as ‘cosmetic’ projects, with key variables acting as assessors of time and money requirements. Traditional Environmental Management Systems (EMS) aim to provide generic frameworks for environmental change within organisations, regardless of whether they are within international/national arenas, or are SMEs/large corporations.

Current international standards focus upon operational efficiency, sufficient reporting procedures and the ability to integrate an effective EMS within the existing management structure (ISO, 2002b; EC, 2003). The purpose of traditional EMS is to monitor the impact of operational activities upon the environment and develop internal auditing procedures to effectively record standardised monitors.

It is inevitable that business operations will have some form of impact upon the environment, so it is not feasible to assume or aim for an absolute symbiosis between the two. However it is possible to encourage a precautionary approach that will alter business operations to reduce environmental damage (McDonach and Yaneske, 2002). It is suggested that an EMS based upon the notions of sustainability, should award equal priority to social, environmental and economic dimensions of a business; with the initial use of cultural engagement techniques used to minimise the social impact of the implementation of innovative strategies.

It is proposed that an EMS should be able to diagnose and monitor the impact of operational activities upon the environment, prioritise strategies based upon employee needs and desires, establish the limit of financial commitment to related activities and produce effective reporting and feedback procedures throughout the employee community. The traditional EMS discussed below fulfill most of this criteria but it will be shown that social actors and groups within businesses are not adequately represented within the standards; undervaluing the social aspect of the TBL.

2.2.1.1 ISO 14000

ISO 14000 series of standards includes an EMS (ISO 14001) that provides organisations with a generic international standard for environmental assessment. The standard is designed to be implemented for self-declaration of compliance, or external auditor certification of procedural conformity (BSI, 2004a, p.v). According

to BSI (2004b) the ISO 14001 EMS system follows the Plan-Do-Check-Act system (ISO, 2002c; Sarksis, 1998). The BSI standards for ISO 14001 make reference to using a 'systemic manner' (BSI, 2004b, p.vi) during the EMS implementation process.

This method is an iterative technique of monitoring and regulating system practices, but it does not provide explicit details as to 'how' to manage the cyclical evaluation. It is suggested that this framework cannot be considered systemic as it does not promote the holistic environmental development of an organisation: employees are not involved within policy designs or evaluation processes, certification can be restricted to individual operating units (BSI, 2004b, p.4,9,10). The framework provided by this system focuses upon effective auditing procedures that follow the same structure as the ISO 9000 system that is widely used within industry.

ISO 14001 is one of the most widely used EMS in the world, with the core principles and strategy implementation applicable to any organisation regardless of size, economic resources and external influences (ISO, 2002a). In order to implement a system appropriate for the ISO guidelines, Edwards (2001) suggests that a ten stage project is enacted: Commitment, Resources, Communication, Management Objectives, Procedures, Writing the Manual, Launching the System, Auditing, Choosing the Assessor and Assessment.

The prime goal of the ISO 14001 EMS is to establish that an organisation is effectively monitoring its environmental impacts in line with relevant legislation (EC, 2008a), and not the reduction of negative environmental impacts. The ISO 14001 system includes a generic guide of assessment to those areas of organisational activity that include: air, water, land, raw materials, local communities, energy input and output, waste and physical attributes (BSI, 2004a, p.12).

The primary focus of time and resources are required for the establishment of relevant procedures, writing the manual and official ISO audit; Sammalisto and

Brorson (2006) recount the case study of the nine year project of ISO EMS implementation within the University of Gavle, Sweden. A significant degree of the EMS is focused towards the development of Registers of Environmental Aspects (environmental impacts), Environmental Legislation (international (Sinha-Khetriwal et al., 2005) and national (NetRegs, 2010)), and an Index of Operating Procedures (internal activity monitors) (Edwards, 2001); with accreditation focused upon ‘if’ these assessments have taken place, not ‘what’ is included in the reports (Midgley, 2000).

Edwards (2001) suggests that an ISO audit of business impacts within the environment should identify the environmental aspect (e.g Life Cycle Assessment), source of aspect (e.g. products), impact (e.g. cradle to grave degradation), significance (e.g. severity and regularity of activity), comments (e.g. potential improvements), responding operational procedures and legislation. Operating procedures are then developed in response to the environmental aspects to establish management responsibility, monitoring records and mechanisms to ensure continued compliance with the EMS.

The flexible nature of the EMS that enables global implementation, regardless of national resources or cultural requirements, presents the significant disadvantage that a holistic analysis of the organisation can be overlooked. An example being that the ISO 14001 framework is applicable to both an organisation treating bio-hazardous waste and one that delivers natural energy resources e.g. hydro-electricity, with the presented guidelines for internal auditing the same for each organisation.

In effect there are no standardised limits of environmental impacts (Puller, 2006), which is not aided by the continued development of international policies that are unclear of the line between environmental efficiency and equity (Laan and Nentjes, 2001). The level of environmental impact from each example will significantly differ, but the suggested aim of the reduction of by-products for both organisations will

be the same. Hypothetically, if one company produces 1,000 tonnes of carbon per year and another produces 1 tonne of carbon per year with an example reduction rate of ten percent, the new levels of pollution would be 900 tonnes and 0.9 tonnes of carbon, respectively.

These figures demonstrate how the broad applicability of the EMS can result in huge discrepancies in the actual level of environmental impact and supposed achievements of an organisation. This generic applicability of the standard enables the adoption of the EMS across multiple private and public sectors: automobiles, banking, charities, cities, energy, hospitality, leisure providers and universities (ISO, 2007), aviation (PA, 2008), chemicals (AkzoNobel, 2007), computer technologies (IBM, 2009), amongst others. The broad applicability of the EMS provides a uniform approach to environmental monitoring that is beneficial for organisational comparison, but fails to account for the severe discrepancies in environmental impacts between industries e.g. aviation versus charitable organisations.

According to BAB (2010) there is no centralised record of ISO registered companies with each individual certification body keeping its own individual records; at most we are able to establish that at the end of 2007 there were over 150,000 organisations registered with ISO certificates in the world. This lack of record keeping between ISO certifiers seems to contradict one of the core purposes of the EMS: the development of rigorous record-keeping and reporting systems.

Upon studying the guidelines further it appears that there is little necessity or impetus to include employees within the EMS project (EC, 2008a). According to Block and Marash (1999) it is essential to communicate the EMS to all employees with links to environmental activities, and external entities who may be interested in the businesses' operations. However there is no specific measure within the ISO 14001 system to determine the effectiveness of such communications, no definitive requirement for feedback monitors, and limits employee outreach to those individuals directly involved in related environmental operations.

Block and Marash (1999, p.37-38,151) manual of implementation only refers to employee training where significant environmental aspects are part of the job role; but training is considered to be interchangeable with education and/or experience. Similarly Block and Marash (1999, p.71) also propose that training is undertaken by those “employees whose work affects quality and/or the environment”. Linked with prior assertions that environmental values are dependent upon an individual’s or group’s value-action gap, the interpretive nature of this statement will lead to different organisations adopting a varied degree of training schemes.

Tinsley (2001, p.29,31,40) suggests that generic questionnaires and surveys are distributed to all employees, monthly meetings for all staff and focus groups are established that provide inter-department and inter-hierarchical employee representation in order to access the practical knowledge of all staff. However this is not a requirement of the ISO standards and is dependent upon the attitude of the EMS manager/auditor. The current requirement of environmental awareness building does not span the entire workforce, indicating that environmental action is the responsibility of a select few individuals rather than the social collective.

This also has potential negative connotations for the business in respect to environmental performance statistics, as employees (outside of the EMS’ suggested remit) may have first-hand experience of how their jobs could be practicably changed to enhance the EMS without hindering operational efficacy. A pivotal aspect of the corporate business plan should be to establish networks within the external community to gain access to local resources (e.g. reduced transport), knowledge transfer (e.g. environmental awareness) and community development (e.g. social goodwill).

Further to this Block and Marash (1999, p.10-11) identify that within the ISO 14001 audit employees are required to show an understanding of the environmental policy within the organisation, under the assumption that ‘communication’ (term used within official document) will result in understanding. It is proposed that

the communication of a policy document set is not sufficient to develop an understanding; individual and group tacit knowledge (practical experience) is more likely to improve employee learning (Erden et al., 2008). Tinsley (2001, p.27-28) suggests that an Environmental Working Group (EWG), containing at least one senior manager, be established to conduct an 'Initial Environmental Review' of the organisation, design the EMS and encourage communication with employees in the organisation.

The actual ISO 14000 standards and supporting books do not provide a methodology of how to conduct the audit; organisations are told 'what' should be audited and evidenced, not the 'how'. With the main focus of the ISO 14001 EMS based upon internal auditing and reporting, the significant role of community involvement to improving system efficiency can be easily overlooked. Potoski and Prakash (2005) identified that whilst public reporting is not required within the ISO 14001 framework, organisations still continue to improve their environmental performance for third-party audits; voluntary assessment rather than metanormative requirement.

This lack of public reporting seems to contradict Strachan et al. (2003) analysis that within the UK oil industry the ISO 14001 EMS is implemented for reputation building purposes. Tinsley (2001) suggests that the EMS implementation phase can be significantly aided by the identification of key political individuals in the business: the company baron, the visionary, the traditionalist and the team coach. This complements the previous identification of cultural engagement as a core aspect of environmental strategies (Section 2.1).

Employee engagement as a 'suggestion' within the ISO 14001 system, is viewed as an ineffective requirement of social accountability. The importance of human resources within change strategies has been documented in community risk assessments (van Aalst et al., 2008), corporate social responsibility (Ako et al., 2009), critical learning

systems (Bawden, 2005), social capital networks and entrepreneurship (Berggen and Silver, 2009).

2.2.1.2 EMAS

According to EC (2007b) since 2000 the core fifteen countries of the EU have continued to show a yearly increase in the amount of EMAS registered organisations; approximately doubling between the period 1998 and 2010 (EUROPA, 2010b). Nevertheless the statistics also clearly show that the total global amount of organisations registered with EMAS between 2001 and 2006 actually decreased. As of 2009 the UK currently contains 64 registered EMAS certified organisations which is far lower than the following EU counterparts: Austria (254), Germany (1382), Italy (991), and Spain (1157) (EC, 2009).

These statistics would suggest that the UK community either places lower social value upon the environment than the aforementioned countries, or does not have sufficient national mechanisms to support environmental issues. The EMAS regulation has a narrowed focus upon environmental management within the EU based upon the guidelines of the ISO 14001 framework i.e. auditing and monitoring (EC, 2008b). The EMAS standards place added focus upon compliance mechanisms, reporting, best practices in environmental management, community and national engagement, and reduced administrative tasks (EC, 2008b, p.8-9).

Similar to the ISO 14001 EMS there are no standardised environmental targets required for the accreditation of EMAS (EU, 2003), with the priority goal of the EMAS scheme being the establishment and implementation of effective top-down management strategies, operational audits, record keeping, internal and external communication (EC, 2001b). EC (2008a) lists the comparisons between the ISO and EMAS standards, including the added EMAS requirements of improvement

of environmental performance, government review of legislation compliance, public reporting, and employee involvement.

EMAS certification requires more formal assessments than its ISO counterpart, including an initial environmental review, environmental performance audit, system audit and environmental compliance audit (EC, 2008a). Strong emphasis is also placed upon the triennial external verification of audits and annual internal audits (EC, 2008b), that are only advisory within the ISO 14001 framework. The increased need for external auditing and continued environmental performance improvements ensures that an organisation that implements the EMAS framework must maintain efficient monitoring procedures (same as ISO), whilst also making clear reductions in the environmental impact of operations (additional to the ISO).

This results in the EMAS producing a network of environmentally certified organisations, standardised to a more stringent set of auditing procedures than the ISO framework; presently EMAS has not gained as many followers as ISO 14001 (BAB, 2010). A clear distinction between the two EMS (ISO/EMAS) is that EMAS contains specific requirements for the engagement of employees within the organisations transition, with the necessity for assessments of workforce training needs, continued workforce inclusion in environmental strategies and the ability to produce evidence of such activities (EC, 2008a).

The EMAS guidelines indicate the need for complete employee involvement in the construction and attainment of continued environmental strategies as “they are the driving force and prerequisite for continuous and successful environmental improvement” (EC, 2008b, p.53). The EMAS guidelines for employee involvement are somewhat confusing as they state that the inclusion of the entire workforce is necessary for a successful EMS, but then refer to many activities as ‘should involve’ employees and make no specific requirement for employee input into EMS design (EC, 2001a).

Espinosa (2007) suggests that bottom-up management strategies are a far more effective method of embedding new policies and working practices into an organisation; employees are far less likely to rebel against change if they feel that they have created or contributed to the design process. The EMS suggests the use of employee committees, suggestion boxes or project-based work as potential avenues for employee participation within the continued improvement of the organisations environmental performance (EC, 2008b, 2001b, p.55).

The EMAS structure also suggests that organisations compare its environmental impact statistics against benchmarks set by research within the sector, business or region in which they operate (EC, 2003, p.29); comparisons include measures such as electricity consumption per employee. According to (EC, 2003, p.23) taking the overall electricity consumption of the organisation and dividing it by total employee numbers, does not necessarily account for differences in job roles e.g. IT, catering, manufacture, senior management.

It is suggested that while the production of such statistics is beneficial for simple external comparisons it fails to provide an in-depth account of internal employee performance, potentially overlooking individuals or employee groups who are reluctant to conform to the EMS. Upon reading the full EMAS standard employee involvement is omitted from its recommendations of participation (Article 3), which contradicts earlier assertions of high social engagement; despite this section including the environmental review, audit, statement, verification, registration and amplification of results to the public (EC, 2001b, p.4-5).

EC (2003, p.20,25) identifies a distinction of the EMAS standard from ISO 14001 with the specific recommendation of employee involvement as an indicator of management system performance. When this recommendation EC (2003) is coupled with the regulation EC (2001b), the required element of employee involvement can still be seen as restricted to those with jobs related to significant environmental aspects. This suggests that the distinction of EMAS as an EMS with strong

employee engagement could be interpreted so that environmental responsibility lies within those actions with ‘direct’ impacts; a reductionist approach.

It is essential that those individuals with direct impacts are quickly engaged, but it is also necessary to progress towards holistic engagement of the employee community. The EMS calls for the continued effort by certified organisations to encourage their suppliers and customers to adopt more environmentally-friendly practices (EC, 2008a). There is also an added need to produce public reports of environmental performance indicators, enabling consumers to assess the validity of an organisations claim to corporate social responsibility.

This need for public access to such reports is only truly beneficial to those who understand EMS terminology and care enough about environmental issues to analyse a business’ activities. EMAS accreditation requires that the environmental statement of intent produced by the organisation is externally verified and available for public scrutiny (Evangelinos and Halkos, 2002). This verification ensures that an organisation’s environmental objectives meet a standardised norm set by accreditation bodies, rather than the ISO 14000 where objectives are determined and approved internally by members of management.

Iraldo et al. (2009) identify that whilst the EMAS standards improve environmental impacts there is no clear indication that they increase market performance or resource productivity. This would suggest that there is no direct business-benefit from implementing the EMAS standard; beyond social goodwill. Therefore it is plausible that organisations have adopted the EMAS standards in response to perceptions of social environmental values (customer and stakeholder demands), rather than as a strategy for enhanced operational and resource efficiency.

Both of the discussed EMS demonstrate a clear dependence upon reporting procedures, but it is suggested that this reduces the goal of the standards to that of stringent management manuals rather than effective change. The main criticism

of these EMS is that there are no standardised environmental targets within the accreditation system, as long as an organisation demonstrates that it is monitoring its activities in the necessary format and can show that it is attempting to improve its practices, it will receive the desired certification.

Aragón-Correa and Rubio-Ópez (2007) identify the scenario that organisations can in fact self-certify themselves as ISO 14001 accredited. According to Balzarova and Castka (2008) businesses can lose the motivation to maintain EMS standards once certification is awarded; it is suggested that thorough social engagement through environmental norms could help sustain business motivation (EC, 2001a). The latest draft revision of EMAS makes specific reference to providing employees with the facilities to contribute to the EMS design and implementation process, but it still does not provide a clear indication as to how many employees should be involved (EC, 2008b).

The present alternative to traditional EMS is the development of a bespoke system for the business. This is likely to involve a similar process to the ISO 14000 and EMAS standards, in that business operations will be reviewed and strategies developed to minimise the environmental impacts of organisational activities. As this form of EMS does not require financial commitment to external accreditation bodies and has no external regulation of timeframes, it can prove to be more of a goodwill statement. However Rondinelli and Vustag (2000) provide the same criticism of ISO 14001 as merely useful as a public relations activity, rather than a serious form of environmental management.

Traditional EMS are also closely allied with Health and Safety Regulations that can result in a joint management system between the two areas. This can be beneficial during the initial stages of EMS implementation as many organisations will already have the framework and analyses from the health and safety audits to compile the majority of the EMS assessment. This can also prove to have a negative connotation for environmental activities as it can be absorbed into health and safety

management, with the potential result that it will become forgotten amongst the more dominant/legislated area of organisational practices.

2.2.2 Environmental Management Systems Science

Many businesses can have what Clarke (2006) refers to as organisational autism, where there is an inability to look at the external environment without economic motives/drivers. In contrast with business models, scientific EMS focus primarily upon the maintenance, monitoring, conservation and restoration of ecosystems. Concepts such as the Tragedy of the Commons (Section 2.1.1), have traditionally been led by the social sciences with the core analysis of conflicts between community and individual consumption patterns (Hardin, 1968).

According to Milton (1996) within the UK the ideal of ecological responsibility is lost within advertising language/discourse, due to a lack of understanding in the community culture that is being targeted. The following subsections provide an overview of current scientific approaches to environmental management and the lessons that can be learnt from studying the self-organisation of natural systems.

2.2.3 Human Management of the Natural World

Following Carsons assertions that human activity, lack of knowledge and related mismanagement of natural resources has caused the current decline of the Earths' climate (Section 2.1), Hunt (2007) suggests that suchlike mismanagement can be evidenced at the once habitable Easter Island. Hunt proposes that the fall of the Easter Island civilisation occurred through the introduction of non-native species (rats), felling and fires; all of which are attributed to the irresponsible actions of the present society rather than the limitations or evolution of the natural environment.

Reuveny and Decker (2000) use Easter Island modelling scenarios to demonstrate that technological development would not have prevented the civilisations demise, which contradicts modern focus upon technological growth as a driver of sustainability. A few modern examples of such consequences of mismanagement can be seen in the development of Africanized Bees (North and South America), DDT resistant mosquitoes (Africa) and acidification (Global) (Pinto et al., 2005; Wang et al., 2008; Gorham, 1998); the increase of Red Fire Ant populations (Global), Cane Toad (Australia), Signal Crayfish and Grey Squirrel in the UK (Gutrich et al., 2006; Letnic et al., 2008; Bremner and Park, 2007); and the extinction of the Dodo, Sea Mink, Turanian Tiger amongst hundreds of other species across the world (Janoo, 2005; Vermeij, 1993; Pryde, 1986).

The conservation of biodiversity and restoration of indigenous ecosystems is gradually gaining added support in many countries with the establishment of legislation (OPSI, 2009a) and international voluntary agreements (CITES, n.d.) to prevent the intentional destruction of certain endangered species; for example the Yellowstone Grey Wolf (Vonholdt et al., 2008), Galapagos Giant Tortoise (Gibbs et al., 2008), European Bearded Vulture (Hirzel et al., 2004). Natural restoration activities are designed by humans to revert the negative impact of society upon the natural world, with the primary goal of improving biodiversity through the reintroduction of indigenous wildlife.

Light (2003) discusses the need for ‘Environmental Pragmatism’ in natural restoration with the realisation that the new environment is man-made not natural, whilst also recognising the influence of public demands upon project designs. The accountability of public needs results in projects being designed in line with human wants rather than the needs of the local ecosystem; for example, a community may decide to restore a local wildlife area, but if the area was naturally populated by wolves there may be some objections to full restoration (Newman, 2000).

Natural restoration activities are only able to reverse the effects of human impact within limits. Katz (2003) also presents the argument that restoration cannot be truly effective as it is impossible to know how the natural environment would have evolved to the present day without human involvement. van den Berg et al. (2003) highlight the benefits of natural environments in relation to the alleviation of stress and fatigue in modern society; this adds a new dimension of direct social well-being from restoration projects.

Cannibal and Winnard (2001) describes the need for a management model that can handle the chaotic interrelations of social and biophysical aspects of the environment that is not performed in current EMS. Common-Pool Resources (CPR) is a concept that if used effectively could help to avert irreversible damage to natural world resources; strongly linked to the Tragedy of the Commons and Prisoner's Dilemma (Hess and Ostrom, 2003). The 'Common-Pool' refers to any system resource that is shared by the public including terrestrial and marine ecosystems, earth-systems and products of civilisation (Ostrom et al., 1999).

Earth Report 2008 (2008) analysis showed that in the sixty years prior to 2007 humans had consumed 100 million years of carbon resources. The concept is intrinsically linked to the principles of coordination in group behaviour and individual social responsibility; far removed from business EMS that focus primarily upon effective reporting procedures (Section 2.2.1). Ostrom et al. (1994) refers to CPRs in terms of stock flow appropriation and provision, with renewable resources analysed by regeneration rate and exhaustibility; providing a contextual link to business approaches to EMS.

Dietz et al. (2003, p.1910) suggests that a robust and adaptive governance system for environmental resources should include analytic deliberation, nested governance systems, institutional variety, sanctions, low-cost conflict resolution, accountability of monitors, clear boundaries and rules matching ecological conditions. Bru et al. (2003) present the results of a CPR game that demonstrated the social tendency to

cooperate, when the capacity to extract resources is close to the permitted group resource quota. This would suggest that when we are able to see a large yield of resources it is easy to use more than is necessary as there is so much spare, whereas if we secure fewer resources we are careful to ration the amount we use.

This has a direct connotation for the ‘disposable’ culture often exhibited within Western societies, where it is relatively easy to overindulge and purchase items that go far beyond our basic needs for survival. Penn (2003) asserts that environmental degradation is due to consumption patterns rather than overpopulation and is linked to some basic instinctual need to impress peers and gain higher social position. Therefore effective CPR management is dependent upon capacity reduction in resource attainment, to prevent social consumption exceeding desirable limits; this is impractical within an economically-driven society.

Janssen and Anderies (2007) describes Social Ecological Systems (SES) as a more holistic perspective of EMS, with focus placed upon resource allocation, ecological surroundings and community participation. Nijland (2002) defines four key aspects of SES: empiricism, value attribution, pragmatism and theoretical reasoning. SES attempt to understand the mutual effects that humans and ecosystems have upon one another (Seixas and Davy, 2008), analysed through the evaluation of “robustness, resilience, vulnerability and adaptability” (Young et al., 2006, p.308). SES merge the needs of the present ecosystem with that of socio-economic incentives (Gordon, 2007).

Projects are developed with the participation of local communities to ensure that social expectations of the quality-of-life are not compromised (McClanahan et al., 2009). Anderies et al. (2004) suggest that a robust SES should have the capacity to adapt with fluctuations in the social and environmental dynamics of the system by having: defined boundaries, allocation of resources proportional to prior contributions, local community rule creation, monitoring, sanctioning, conflict

resolution and formal rights of users. This is similar to Dietz et al. (2003) rules for the effective governance of CPR.

Lee (2005a) claims that Natural Resource Management (NRM) can be difficult to establish in developing countries as the economic profit of non-sustainable activities often far outweighs the personal benefits of 'greener' alternatives. Anderies et al. (2007) find that there are no panaceas to NRM and it is necessary to embed robust control and learning systems, to fully address social and ecological issues. It is suggested that implementation barriers are equally prevalent in developing countries and Western communities, with significant social dependence upon economic variables in both societies; one as a means of maintaining current standards of living, the other as a means of survival.

Hannoura et al. (2006) present a Sustainable Development Model (SDM) that focuses upon resource use determinates and patterns, water quality management, environmental indicators, and appropriate feedback systems. The model is designed to provide a whole system perspective of the natural environment. However the claim of a holistic ecosystem approach seems to be contradictory to the models structure, as added value is placed upon water quality management. Liebl (2002) proposes a novel approach of 'gesture assessment' as a means to analyse modern companies, that can account for tangible (industrial) and virtual (technological) operations that cause environmental impacts.

The involvement of local communities in ecosystem conservation can be highly beneficial as the present vernacular/local knowledge is likely to contain the most appropriate control mechanisms for the region. Local knowledge must be managed (Hammer et al., 2003) and prioritised using importance filters to ensure that projects are designed to incorporate scientific understanding into community expertise. It is also necessary to ensure that local community knowledge is used to develop environmental activities that complement the normative standards of the overarching social system; coexistence of multiple norms (Fent et al., 2007).

2.2.4 Natures Examples of Management

The evolution of species on the Earth has resulted in the development of natural self-regulatory mechanisms that ensure the most viable species survive. Human intervention within natural evolutionary cycles does not often account for the repercussions of such activities upon the viability of the ecosystem. Bateson (2002) presents the fable of the polyploid horse that had its 'size' subsystem altered so that it grew to the height of an elephant, but as all of the other subsystems (muscles, heart, skin, etc) were not adapted, it could not survive due to the increased weight upon its bones, nutritional demands, pressure upon its heart.

It is not possible to change just one system activity and assume that regular functioning of the system will continue. The remainder of this section focuses upon the description of altruism, reciprocity and indirect reciprocity due to their prevalence in scientific studies. In order to move society away from the focus of 'oneself' to that of a community actor, it is essential that the concepts of altruism, reciprocity and indirect reciprocity need to gain increased awareness in social interactions.

According to Saunders (2003) understanding reciprocal actions of environmental sustainability requires the use of conservation psychology. Altruism is a term used to describe an individual's actions that has an 'intended' benefit of another, and there is a direct or indirect personal sacrifice from conducting the activity (Monroe, 1994). Within humans this concept can be difficult to attribute to specific actions, as most activities will result in some form of reward e.g. 'ego stroking' and reputation building (indirect reciprocity); Kennet (1980) refers to this as individual welfare maximisation.

Despite Maturana and Varela (1987) assertion that animals are universally altruistic, there are few clear examples of altruism taking place; the most obvious being that of feral children (Arshavsky, 2009). Riedman (1982) reports a study of

120 mammalian and 150 avian species that demonstrate a reciprocal (non-altruistic) benefit to alloparenting/adoption of another's' young. Thierry and Anderson (1986) refers to this as reproductive error where an individual is attracted to species young regardless of genetic connection. Conceptually, altruism is an ideal approach to sustainable development but fails once imminent survival is at stake and 'selfish' tendencies surface.

As a rather crude example Lovelock (2006) refers to the process of urination as an altruistic act with 'Gaia', where disposed nitrogen is nutritional for plants. This notion looks at the described activity as a static event, without incorporating the holistic cycle of urine production e.g. eating plants produces urine, urine promotes plant growth, plants are then eaten, etc. This narrow perspective removes the cyclical benefit of human and plant interaction in this activity; due to the mutual benefit exhibited in the process the act can no longer be deemed as altruistic.

Dawkins (1976) refers to reciprocal altruism in the context of memetic transitions; where cultural evolution is viewed as imitation and replication of observed systems without any immediate payback. If one adopts a new normative behaviour pursued by the present culture, then an individual is positively stating that they want to belong to the group, and society will then treat the individual positively for conforming to its beliefs; which is once again a mutually-beneficial relationship and therefore not altruistic.

Bateson (1972) describes reciprocity as symmetrical (international) and complimentary (national) schismogenesis/differentiation, where actions are responded to by like actions. The process involves the interaction of multiple social entities where positive action receives a positive response, and negative action receives a negative response. Ostrom (2000) discusses the distinct personal advantage of conducting trust analyses before interacting with another individual. Linking back to Section 2.1.1, it is beneficial to be aware of an individuals' tendency to cooperate or defect before distributing resources.

This leads to the most prevalent indicator of social cooperation being that of indirect reciprocity (Tullberg, 2005), where community observation and reputation building establish the level of trust awarded to certain actors (Nowak and Sigmund, 2006). Businesses rely heavily upon the history of their reputation to maintain professional networks and retain customers; a clear example of this can be seen within the online retailer eBay where customers rate suppliers on service and product quality. Within the concept of the Prisoners Dilemma reciprocity can be seen if all players choose to cooperate, but holistic contribution is seldom achieved in a first-run/static application of the games' rules.

When game players are able to follow an iterated cycle of the game indirect reciprocity is often displayed; players who behave cooperatively gain an increased reputation and stronger social network, whereas those who act selfishly are typically shunned by the group (Kerr et al., 2009). Gintis (2008) claim that social reciprocity occurs when individual sacrifice is low and group benefit is high; evidence suggests that mutual cooperation is achieved when punishment for selfish action is enforced. Koopmans and Rebers (2009) showed that there is a distinct cultural tendency to be more cooperative with ingroup individuals than outgroups, whilst also demonstrating that ingroup punishment is far more severe than outgroups.

Therefore once there is an ingroup majority demand for a certain activity (norm), it will become a standardised expectation of the community with non-compliance likely to result in strong punishment (metanorm). Kitcher (1993) does suggest that the Prisoners Dilemma should be viewed as an optional game, as within many social actions players can choose to opt out or renege upon social interactions. However the context in which the game has been used in this thesis is that of the sustainable development of human life on the Earth, which is not optional.

Science-based EMS provide a valuable understanding of appropriate ecosystem management, the complex intricacies of biodiversity, conservation, restoration and social interactions. Natural resource management suggests the need to find methods

by which to improve renewable resource technologies, so that dependence upon depleting resources is reduced. This has the additional political connotation of reducing dependence upon international energy sourcing (Boyle, 2004).

The use of local environmental knowledge to aid conservation projects improves the practical worth of design strategies, with embedded social actors being more familiar with real-world problems of the system (Coburn, 2003). The identification of indirect reciprocity as the normative process of social interaction, leads to the realisation that environmental issues are dependent upon trust building exercises of social commitment to support related activities.

The traditional EMS discussed within this chapter (business and science) provide valuable approaches to environmental management spanning each aspect of the Triple Bottom Line. Socio-Ecological Systems appear to have an ideal set of objectives in developing environmental management projects, but lack clear guidance as to how to structure an environmental management system. It is proposed that SES and the EMAS framework both provide necessary dimensions to EMS, but where one lacks in structure the other lacks in strength of social objectives.

2.3 Environmental Management A Holistic Perspective

This section focuses upon exploring the literature related to understanding the holistic interrelation of social and environmental systems. Fuenmayor (2001) recalls Churchman's theory of systems thinking as a potential avenue to understand world problems during the mid 20th Century. Capra (1997) uses the concept of systems thinking in its original context, to understand ecological systems by focusing upon understanding the 'whole picture' rather than one specific component. Leonard and Beer (1994, p.1) define systems approaches as:

“...the emphasis on ‘the big picture’ or the whole and considering the functions of a system’s parts based on their relations with one another and within the system’s larger context.”

This is somewhat similar to the biological concept of symmorphosis where “animals must provide their complex systems with a functional capacity that can cope with the highest expected functional demands” (Weibel, 2000, p.19). Systems thinking follows the perspective of an organisation (e.g. government, business, social group, individual person) as an entity with interdependent parts, whose components can effectively work in isolation (Beer, 1981). According to la Cour (2006) systems thinking provides a beneficial method by which to understand an organisations external environment, by having the capacity to accommodate the autopoietic nature of systems.

Defined by Maturana and Varela (1987), autopoiesis is based upon the characteristics and interactions of biological entities that enable self-regeneration. The purpose of using systems thinking relates to its ability to produce a clear holistic account of an organisation’s procedures (Ackoff, 1971), enhancing the breadth of information available to strategic decision makers. Meadows (2001) suggests that the discipline of systems thinking requires the recognition of certain wisdoms; including the patience to observe before conducting system interventions, the ability to support embedded practices of self-regulation, realisation of one’s own limits in conceptualisation, and the ability to learn.

Jones et al. (2002) suggested that the ability to manage a system with finite resources requires the combination of future forecasting and effective learning processes. Without complete understanding of the activities performed within each subsystem of the whole organisation, strategies would be created upon restricted knowledge without understanding the repercussions for the rest of the organisation. For example a business could face difficulties if it installed glass, paper and food

recycling facilities onsite, whilst ignoring the development of internal logistics to coordinate waste collection and storage before official disposal.

This requires the ability to view a system as an entity that contains a range of interdependent subsystems, that must work efficiently together and share resources in order to maintain operational stability (Reynolds, 2002); similar to the ideals of Social-Ecological Systems (Section 2.2.3). To maintain internal stability within any independent system, there is an inherent reliance upon its individual capacity to ‘adapt, influence, reconfigure and contribute’ to the whole system (Schwaninger, 2000). Naroll and von Bertalanffy (1973) presents this concept of interconnectivity in terms of evolutionary allometry, where changes in internal dynamics of a subsystem require a response from other subsystems e.g the polypoid horse.

The variety of activities undertaken by an organisation must be sufficient to monitor and adapt to fluctuations in the external environment, so as to maintain internal stability (Lowe and Tinker, 1976). Ashby (1957, p.207) encapsulated this within the Law of Requisite Variety (LRV), establishing the principle that only “variety can destroy variety”. Laszlo (2001) expands this into the concept of evolutionary systems theory, in which organisations are seen to be human systems that learn and adapt to survive. When analysing the basic rules of interaction (human to human, human and nature, nature to nature) there are two schools of thought on the process of engagement: linear and circular causality.

Linear causality (space/time-flow (Granger, 1980)) follows the notion that any cause/action will result in an effect/change in the observed system, whereas circular causality (‘multi-loop nonlinear feedback’ (Forrester, 1971-72)) adopts the perspective that the observed effect will alter the state of the initial cause. By adopting the view of systemic interconnectivity and circular causality it is assumed that any action a human makes, individually or as part of the greater whole, will produce a change within the environment that affects the human instigator. Circular

causality forms the fundamental basis of feedback and self-regulation contained within organisational cybernetics (Whitaker, 2003).

2.3.1 Organisational Cybernetics

Churchman (1970, p.39) explains how the application of operational research focuses upon the “securing of improvement in social systems by means of scientific method”. Midgley and Reynolds (2001) have used soft operational research approaches to develop environmental planning in numerous organisations. Norbert Wiener developed the concept of cybernetics (a sub-discipline within operational research) in the mid 20th Century in order to understand purposeful behaviours without teleological stimulus (Umpleby, 2005). Most specifically the similarities of living organisms (ontogeny and phylogeny) and machines (Newtonian processes) (Wiener, 1966).

Directly linked to the control aspect of cybernetics, Ashby’s (1957) LRV defined the need for control-systems to have an equal or greater variety than the controlled-system to ensure optimal regulation. Within systems thinking the need to understand the interrelations of all subsystems within an organisation does not mean that all aspects of the organisation should be under strict control; as long as a subsystem operates within the rules set by the whole system it should be able to behave autonomously.

Leonard (2004, p.14) defines cybernetics as the study of “...the behaviour of wholes and parts in interaction rather than of parts isolated and measured”. The core strength of cybernetics comes from its understanding of communication systems, with effective output/amplifier and feedback/attenuation monitors providing the essential information for organisational adaptation and learning. Cybernetics can be used to analyse and develop the necessary control and communication systems

for complex adaption, focusing upon the creation of viable systems (Jackson, 2003) through internal self-regulation (Schwaninger, 2006b).

Cybernetics directs organisational analysis towards the processes of control, steering and regulation of system activities (Schwaninger, 2006c); this identifies what the present system is capable of achieving if optimised. Turchin (1977) uses the principles of cybernetics to explain the evolution of life on Earth, identifying the presence of natural feedback loops and self-regulation within the environment. Prigogine (1997) explains that the non-linearity of life (evolution/emergence) is developed within dissipative structures, which are viewed as those systems that are not in equilibrium.

Complex Adaptive Systems (CAS) are seen to have no regulatory function and operate 'far-from-equilibrium' (Bonabeau, 1998a, p.438), with focus placed upon autonomy from an agent-based perspective. The Viable Systems Model (VSM) aims to maintain an internal equilibrium by dampening the affects of external fluctuations, whereas traditional CAS perspectives view equilibrium as a form of 'death'. CAS are viewed in terms of tension and conflict that develop/evolve into new emergent behaviours (Smith and Stacey, 1997), in response to internal and external stimuli. Lenton and van Oijen (2002) identify Lovelock's Daisyworld experiments as an example of CAS (Section 2.1).

CAS gained a strong focus within the Santa Fe Institute during the 1990s. Gell-Mann (1990) explains the Institutes aim of understanding the processes by which CAS assess external fluctuations, learn and adapt to such stimuli. Holland and Miller (1991, p.365) detail CAS as a complex system containing adaptive agents, networked so that the environment of each adaptive agent includes other agents In the system. In this instance CAS are seen to operate at the edge of chaos, whereby the complexity of the system is so intricate that any changes made by an agent can throw the system into chaos, and require sufficient capacity to adapt in order to survive (Kauffman, n.d.).

CAS are identified as having three potential states: a stable equilibrium (conformity/negative feedback), unstable behavior (nonconformity/positive feedback) and bounded instability (transition between stable and unstable/nonlinear feedback) (Smith and Stacey, 1997). McMillan (2002) accepts that the concepts used in the creation of the VSM complement the basis of CAS, where multiple interdependent systems synchronise their operations to maintain stability with external entities. Espinosa et al. (2007) identify that the VSM recognises the recursive nature of complex adaptive systems, that is often overlooked by CAS. Cyberneticians tend to believe that all cybernetic models are complex adaptive systems, but that CAS are not always cybernetically sound.

Jackson (2003) discusses complexity theory as opposed to systems thinking (the basis of cybernetics), due to CAS principles of focusing upon organisations as processes rather than systems. Cybernetics aims to unify the role of individualism within interdependent systems, actively striving to accommodate individual autonomy within the holistic system. Espejo (2003a, p.69) states that “autonomy emerges as the engine for social development”, linking this concept to prior discussions of the role of social action (Fox, 2003; Leonard, 1992) and engagement in effective EMS (Section 2.1).

With regards to environmental action Brand (2007) suggests that neoliberalist principles of autonomy can aid social organisation. Autonomous activity is identified by the ability of a system to self-regulate, in which each component is able to acclimatise and absorb new variety within its external environment (Espejo, 2000), while maintaining its own identity. Such autonomy can be seen within Amish communities that display a great deal of self-governance and autonomy whilst operating within a broader social group (Dana, 2007). Animal colonies often epitomise this philosophy, by assessing the external environment as a collective and instigating an instinctual response e.g. organisation of ants and bees in the defence of the colonies (Whitehouse and Jaffe, 1996; Couvillon et al., 2008), pack behaviour of wolves and lions (Mech, 1992; Dereck, 2006).

Further developing the principles of systems thinking, McCulloch's identification of second-order cybernetics focuses organisational analysis upon the study of effective communication, by understanding the observations of multiple actors within the system (Umpleby and Dent, 1999). Scott (2008) refers to this as part of sociocybernetics, in which attempts to create a sustainable society must account for the belief systems of the observers. Effective communication channels are required to coordinate different levels of recursion within an organisation and the use of cybernetic VSM can significantly aid in the diagnosis and design of structural networks (Espejo, 1999).

The VSM accounts for the differing interpretations of organisational problems from multiple observers by accessing the 'soft issues' contained within the system (Espejo and Gill, n.d). The developed holistic analysis of the organisation can accommodate inputs from numerous individuals across the system in focus. It is vital that communication channels are optimised within an organisation to ensure that new strategies, social values and business directions are transmitted holistically. This tool for analysis is modelled upon the human central nervous system (Beer, 1981), as the interconnections of each component within the body are an ideal template for optimal communication processes.

Using the characteristics of synaptic relays to respond to both internal activities and external stimuli enables a reactive and eventual learned preventative action to be taken. An example being when one encounters a new experience e.g. 'What will happen when I touch an open flame?', the obvious result is that one is burnt. Therefore upon the second encounter of an open flame our learned experience informs us to avoid the fire and prevent being burnt. What seems inherent to this analogy is the concept of personal experiences as it does not appear to be sufficient to observe others being burnt.

One of the core aspects of cybernetics is its capacity to understand the recursive nature of nested viable systems. This is achieved through the principle that a viable

system belongs to and consists of other viable systems; is organisationally recursive (Beer, 1981). The concept of the Russian Doll metaphor, initially presented by Stafford Beer (Beer, 1979), highlights the ideal interconnectivity of systemic recursion (Midgley, 2000). Figure 2.2(a), provides a clear visual representation of how the similar structure of each object makes each level of recursion easier to fit within the whole collection.

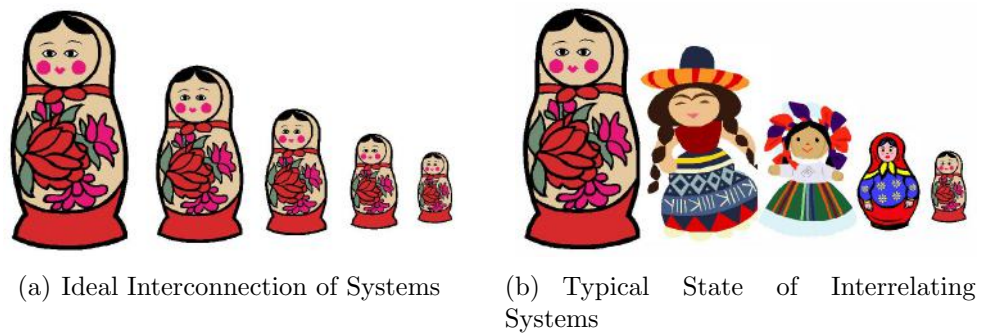


Figure 2.2: Russian Dolls.

Each doll is structurally identical to the others enabling each smaller/lower level of recursion to easily fit into its larger/higher counterparts. Figure 2.2(b), depicts the structure of many real-world organisations whereby the general characteristics of the observed systems meet the same criteria i.e. each have a head, arms, face, dress, etc, but are inherently different. The prime difficulty of nesting such systems is the lack of consistent patterns/interpretations of the core organisational structure. Communications between each level of recursion must account for the different structure of other levels.

Within human and man-made systems this form of systemic disparity is common, due to the conflicts that arise from individual human interpretation of the construct/purpose of the systems to which we belong. Maturana and Varela (1987) define the development of social behaviour as actions that are adopted across multiple generations and attributed to some form of linguistic value. The capability to understand the complexity of system interactions is developed over time and strengthened with experience.

One of the main problems surrounding environmental issues within society is that the subject has gained global attention, but there is no consistent language used to explain the topic (Gibson, 2008-2009); examples include carbon footprint/environmental footprint, sustainable development/social-ecological systems, etc. The integration of environmental ethics within a society should not be undertaken instantaneously (jumping on the 'bandwagon'), but with clear preparation and long-term phases of progression. According to Espejo (1999), current methods of cybernetic methodologies could benefit from the added focus of social accountability and the ethical design of organisations.

The incorporation of normative behaviours within the structure of a system requires specific analysis of workforce attitudes, and the respective design of bespoke strategies for change. There is a limit to the amount of influence norms should be awarded, clearly if the majority of an organisations workforce were racially biased this behaviour could not be included as acceptable values. This example defines the difficulty and unpredictability of allowing human characteristics to dictate procedural activities.

Therefore when applying normative attitudes to organisational practices the determination of acceptable behaviours should not contradict the established norms of the society in which it operates. In order for EMS to also become a standard feature within common business activity, a clear cultural shift is required towards community-based conservation (Seixas and Davy, 2008); as long as it is feasible to change internal social norms, and be compatible with external social norms. A cultural shift amongst the workforce will inherently be transferred to employees' personal lifestyles, fed into and adapted to home-based communities, and brought back to the business with added variety/diversification.

This is a cyclical process with employees acting as constant amplifiers/broadcasters of the business ethic into their home communities and local environmental knowledge into the workplace. Kelly (1998) links the need for such feedback

loops and learning processes as an effective method to engage social groups within sustainably-orientated activities. The process requires that sufficient attenuation/importance filters are in place to accommodate the variety of information brought to the business by employees (Espejo, 2003a), thus developing avenues for bottom-up innovations that could benefit the organisation.

For example, an individual discusses their employers new environmental management scheme with friends (amplification of policy to a broader external audience), the discussion develops and the group identify numerous eco-activities that could be relevant to the business and the employee reports the suggestions to the environmental manager. The environmental manager would then assess the feasibility of the suggested activity within the business' remit (attenuation of external information to relevant department/employee).

The adoption or avoidance of the activity will be promoted by the employee back into the social group (amplification of change into broader external audience): thus instigating the cyclical feedback loop. Insufficient feedback loops are barriers to inter-subsystem communications that can lead to resource mismanagement, time delays and uncontrolled autonomy, amongst others. An effective VSM diagnosis can improve operational efficiency and adaptability, be scaled to any size organisation and develop unity between multiple autonomous groups (Leonard, 2008).

2.3.2 Social Norms and Environmental Action

Social networking within communication systems is now considered a valuable contributor to organisational efficiency with informal inter-departmental discussions often the prime source of innovation (Granovetter, 2005). Informal networking is primarily a bottom-up approach to organisational analysis and design, and it is suggested that this could prove highly beneficial in the optimisation of social communication within EMS. Modern attempts to deepen the social knowledge and

global outreach of the environmental debate have taken the form of cinematic productions such as Al Gore's 'An Inconvenient Truth' (An Inconvenient Truth, 2006) and 'Erin Brokovich', television documentaries (The Insider: Packaging is Rubbish, 2007; How Green is Your High Street?, 2007; Human Footprint, 2007) and international through to local news outlets (Connor, 2007; Tempest, 2007; NYTimes, 2007; BN, 2007).

Meadows (1996) identified that Sustainable Development (SD) is often termed within contexts of catastrophe and survival that distorts the vision held by many environmentalists. SD is an ideal which focuses upon minimising the negative ecological impact caused by any organisation, most specifically its procedural activities, with the view to maintain the natural resources of the planet for future generations (Dresner, 2002). Boulding (1973) epitomised the concept of SD with his theory of 'Spaceship Earth' in which the sun is our only power source and the planet is viewed as one large ship that must recycle its materials; similar to Lovelock's Gaia Theory (Section 2.1).

The underlying principle embedded within these concepts is the perspective of an environmentally-dependent community (shared resource consumption and recycling responsibility); with a global goal of environmental responsibility as the societal dogma (Penn, 2003). Such perspectives of social responsibility in regards to preserving the natural environment are dependent upon multiple cultural values of ecological worth to human needs. Developing upon the environmental debate and the interdependence of sustainable development, social capacity to change and individual empowerment (Ravetz, 2000), it is necessary to understand the rules that govern individual and group behaviours.

Therefore it is proposed that any form of environmental project must analyse and account for multiple cultural values to develop strategies that complement priority variations. According to Olli et al. (2001) it is through the use of easy/small-scale tasks that engagement with individual Attitude-Behaviour-Correspondence (ABC)

is improved; developing upon Ajzen (1977) identification of actions, targets, context and time as precursors to ABC. Social engagement activities such as informative posters are extremely cost-effective, but put the onus of action within the employee community. Operational changes to reduce carbon dioxide emissions are far more expensive to implement and do not offer any immediate benefit to the business (primarily due to the lack of national legislation governing this field of operations (McCormick, 2002)).

Once again it can be difficult for an individual to comprehend the group benefit of adopting environmental activities, when businesses continue to produce such greater levels of environmental damage. The difference between individual and organisational behaviour is the degree at which one adapts their behaviour to the higher social order so as to remain a member of the group; an individual is required to conform to the rules of their community, an organisation to the national/international governing body to which it belongs.

To a certain extent individual decisions are easier to make and assess, as it depends mostly upon the individual to enact and self-evaluate the activity; Tullberg (2006) refers to this process as one of individual rationality, where action is based upon one's own self-interest. Organisational or group action is far more complex in that it requires multiple individuals to reach agreements of appropriate action or follow the direction of a higher social authority. Beer (1970a) likens group activity to that of esoteric boxes where internal connections are more stable than external links.

Such group connections may be either deterred or fostered by tacit norms that are the set of rules which ensure that the majority of people present within a particular community conform to the same ethical values. "A norm exists in a given social setting to the extent that individuals usually act in a certain way and are often punished when seen not to be acting in this way" (Axelrod, 1986, p.1097). This concept is supported by the 'name and shame' principle (EUROPA, 2006) and

follows the fundamental rule of most criminal justice systems, whereby a person is as culpable for failing to prevent/resolve a crime as the actual perpetrator.

On an individual basis, norms are linked to the physiological response of guilt (Trivers, 1971) and emotional response of self-respect (Rege and Telle, 2004). Many modern societies pride themselves on their ability to allow freedom of individual choice, even so there is a limit to the range of actions one can pursue before the authority of the ‘umbrella community’ punishes those behaviours considered undesirable. Ethnic cleansing, gender preference, disability discrimination and child exploitation, are just a few examples of practices that are no longer acceptable due to the normative adaptation of society (Liebl, 2002).

Creppell (1996) identifies that Locke’s theory of toleration is based upon the right for an individual to act freely (autonomously) within a group, as long as this freedom is constrained to complement system rules. This freedom results in a democratic society that can accommodate a diverse range of cultural values and opinions (heterogenetic diversity (Ruttan, 2004)), as long as they complement the core set of social norms. Maturana and Varela (1987) suggest that third-order structural/behavioural coupling is the process by which we teach younger generations to interact effectively with other entities within their immediate environment; essentially building normative behaviour awareness.

Dawkins (1976) referred to such cultural evolution in terms of memetic transitions, in which oneself and/or a community adopts new behaviours in order to survive within the changed society. Humans are creatures of habit and like to be able to maintain regular routines of behaviour and where possible have the freedom to pursue activities that they find interesting. It is necessary to understand that some individuals simply do not care about the environment of future generations and feel that they have a right to live their life without limitations; the natural world is seen as a supportive facility not a luxury (Pattberg, 2007).

The present patterns of human activity in the Western world typically favours materialism above social cohesion (Eckersley, 2006), which has led communities away from the basic constructs of a sustainable society: altruism or ethical interdependence as a normative behaviour (Potocan and Mulej, 2007). According to Capra (1983, 1976) Western society has been developed upon the Cartesian perspective of the human mind/‘conscious thought’ as the core distinction of a person’s individuality. This conceptual separation of the mind and human body resulted in the prevalent approach to reductionism as the primary way to understand our interaction with our surroundings (Meadows, 2001).

Western society functions primarily under the assumptions of a dualistic reality such as the mind-body (Buckle, 2007) and subject-object dichotomies (Hamilton, 2002); where the ‘self’ is embedded within the mind, with little sense of personal identity attributed to any other aspect of the human body or external environment. This has led to the loss of holistic perceptions and systemic interconnectivity of the human body, broader social communal groupings and human co-dependency with nature. Without some level of community kinship and common understanding/experience of cooperative action, often exhibited in animal communities (Borrello, 2005; Hare et al., 2007), the ability for a society to move away from its current status of ‘me and myself’ to the ideal of ‘group survival’ is unlikely.

Kilbourne and Pickett (2008) also consider the individualistic and materialistic attitude within Western cultures as the main deterrent to sustainable development. Unless it is restricted by law (metanorms (Ehrlich, 2002)) or social rules, we put our private needs and desire above any other (social) needs. This can also be linked to Debeljak and Krkac’s (2008) concept of ethical egoism where businesses are seen to have the ‘right’ to act in their own self-interest as it is their nature to do so. Many people may fear that in order to be ‘green’ they will need to reduce the use of certain luxuries they have become accustomed, potentially losing social competitiveness through a perceived drop in social class; Dickens (2004) refers to

the work of Bourdieu who postulated that material consumption is used to define social standing.

Such assertions are typically unfounded as there is a limit to how much ‘green action’ a single person is willing to undertake without significantly affecting activities of self-interest (Gärling et al., 2003; Seip and Strand, 1992). It would be naive to expect that an entire society will become eco-warriors overnight. Granovetter (1978) refers to this limitation as an individual’s variation threshold from standard behaviours. However it is not unrealistic to presume that with proper education and social incentives (increased inconvenience/cost for non-eco options (Deikmann and Preisendörfer, 2003)), the evolution of more ‘environmentally aware’ citizens in each society will instigate the adoption of choices based upon more social (environmental) values rather than individual concerns (Espinosa and Harnden, 2007a).

2.3.2.1 Social Organisation through Informal Networking

Hockerts and Wüstenhagen (2009) suggests that sustainable entrepreneurship comes from the combination of ‘Emerging Davids’/niche groups and ‘Greening Goliaths’/established organisations. Tukker and Butter (2007) identifies five main strains of cultural evolution within Cultural Theory governance: fatalist, hierarchic, individualist, egalitarian and hermit. Environmental issues can benefit from each of these areas (with the exception of fatalism and hermit), where some form of intervention is seen as more beneficial than ignorance. Hierarchical methods of change are not viewed as an ideal approach to environmental management, as current approaches to top-down management of EMS overlook valuable knowledge contained within ‘lower’ levels (Section 2.2.1); local environmental knowledge of hands-on employees.

Stapleton et al. (1996) identify that shop floor employee engagement is crucial to successful EMS implementation. The role of the individual within environmental

action is a vital contribution to community engagement and environmental change, with each individual proactively or subconsciously promoting their own beliefs to peers in a manner that maintains social inclusion whilst developing informal networks. It is through the growth of eco-individuals within a community that kin expectations become a key driver to environmental action. The main drawback to individual action occurs when adopted activities are not received positively by the surrounding community, resulting in the individual losing commitment or being prevented to continue the activity.

Egalitarianism is based upon the concept of holistic equality for all individuals, with the assertion that all human life deserves the same standard of living. Fehr et al. (2008) show that egalitarianism is not an instinctual action, but one that is learnt through group interaction and peer behaviour. This approach is hindered by its concept of holistic human equality, as this is quite simply not how the 'real world' operates. For example, CEC (2006) identification of a thematic approach to sustainable development and natural resource management is only applicable to some EU nations. It is suggested that present business accountability of environmental issues within the UK mirrors past social struggles that required adaptation (Hezri and Dovers, 2006): gender, racial and disability equality.

Guibentif (1996) identifies that law is the result of social demand. In the last century, there has been a growing concern in most businesses to recognise and foster employees' needs for individual development and welfare to satisfy social pressure (Hoffman, 2007), as much as the need for business improvement and optimisation. Most of the current laws and regulations, at least in the Western world, defend the right for fair treatment, respect for individual human rights and needs of wellbeing within all type of businesses.

The legal support to equality in the workplace developed from social pressure upon governments to ensure fair treatment for all people e.g. minimum wage, maximum weekly working hours. This social demand came with enough force to overcome the

powerful relationships and influence of business leaders who clearly opposed these new policies (Jerrell, 1997); due to resultant financial losses. Even with these more humanistic business principles in the 21st Century there still remains the need to guarantee individual involvement to enhance businesses' transformation, in regards to environmental issues.

Implementing an environmentally-aware culture and practice is undoubtedly one of the situations where the structure and the culture of the organisation are central for success; Brans (2002) suggests that this will be the Ethical Pole of operational activity. According to Senge and Carstedt (2001, p.28), this new perspective will need to be focused towards viewing organisations as living systems rather than machines; such a view requires a holistic outlook and the concept of "produce, recycle, regenerate".

The successful implementation of an EMS lies within the commitment of all organisational members, with the participatory nature of holistic change greatly aided by social acceptance and shared responsibility (egalitarianism). Understanding the dynamic social connections within an organisation can provide additional avenues for communication, by enabling the utilisation of informal networks in the dissemination of information. Social networking is a complex field of study, with the unpredictability of human action and diverse capacity for change in personal relationships being difficult to monitor.

Kangas et al. (2006) suggests that social choices of action should be supported by participatory approaches to design processes and the power for social players to enact change. Once implemented any business activity that surpasses minimum environmental compliance standards can generate added goodwill (Cano et al., 2008) but has no guarantee of any further reward e.g. increased sales specifically attributed to environmental credentials (Kagan et al., 2003). An individual's choice to support an organisation due to its environmental reputation is a result of a low value-action gap, where personal beliefs directly dictate chosen behaviours.

A value-action gap is the indicator of an individual's behaviour based upon moral beliefs. If a consumer has a strong aversion to using products tested on animals then they are likely to only purchase products that are registered as animal friendly. This individual would be considered to have a low value-action gap in regards to animal friendly product; there is little discrepancy between the person's values and their willingness to act on those beliefs. A high value-action gap could be seen in an individual who holds similar beliefs about animal testing, but does not actively boycott certain products based upon testing procedures.

Such values also influence an individual's choice of social interactions, with personal beliefs and morals defining the informal social networks that one will belong to. This can be analysed via tests of sociometric choice in which an individual will identify the people whom they would choose to interact with in certain scenarios e.g. lunch, work, discussion groups (de Nooy et al., 2005). The identification of these informal relationships within an organisation can provide a broad understanding of the efficiency of formal communications structures (complementing cybernetic methodologies), while also establishing the types of social values held within the system.

Informal networking develops connection of like-minded individuals with similar values and opinions (emergent social interactions (Rank, 2008)), regardless of personal positions within an organisation (e.g. shop floor employee or Chief Executive Officer). Informal networking stems from the social self-organisation of actors within the system, to fulfill a personal need that is not readily available in the formal organisation. The values held within the informal network develop into normative behaviours for the actors within the social group that are then translated consciously or subconsciously to peers (within the formal organisation and other social groups).

One of the basic instincts of both humans and animals is that from a young age actions are replicated from the initial social group, and altered when introduced to

new networks and behaviours. This form of personal learning ('meme') follows the principles of natural selection in cultural evolution, whereby core social behaviours are replicated as a means of survival and acceptance (Marsden, 1999). With regards to EMS the more commonplace it becomes for a business to adopt such systems through memetic evolution, the more of a necessity it will become for other organisations to conform to EMS for survival.

In modern society it is currently impossible to see a consistent social reaction to any activity, as the values and experiences of each person significantly differ from one another. Snowden (2002) suggests that it is not possible to alter an individual's beliefs or ethics, but that it is possible to embed rituals/norms that can encourage a certain standard of behaviour. It is proposed that social engagement through such 'rituals' as advertising (Cialdini, 2003), practical examples and community learning (Laszlo et al., 2009), are the most likely avenues to embed sustainable principles within modern societies.

Many organisations now advertise their environmental policies, as it has proven to be a successful marketing strategy. Unfortunately many environmental policies use confusing terminology (D'Souza et al., 2007; Laufer, 2003; Thornton, 2008), making it impossible for the general public to distinguish between those organisations that are actually conducting worthwhile projects or simply providing a lip-service (CF, 2009; DEFRA, 2010b; Singh and Bernstein, 2006). The development of consistent terminology and organisational reporting of environmental performances, will likely be the result of pressure from social norms with individuals choosing to rebuff those businesses that sideline accountability.

Popular EMS tends to promote the adaptation of business practices to decrease the environmental footprint of an organisation, with broad guidelines for implementation (Section 2.2.1). As highlighted previously one of the main concerns with such EMS is that a significant degree of compliance is judged upon an organisations ability to demonstrate that they are 'trying' to behave

more environmentally-friendly; this leaves many organisations with considerable opportunity to exploit the guidelines.

This illustrates the need to design new methodologies for supporting business transformation towards environmentally responsible businesses, focusing on ways to more effectively engage the organisational culture with environmental actions as a socially responsible and moral activity. The difficulty of attempting such a feat is that the discussion of environmental activities is often viewed as an impingement of individual choice. One purpose of this research project is to address this stigma as a fear of uncertainty, placing environmental activities within the initial ‘defensive’ stage of Schwartz’s Norm Activation Model (Blamey, 1997).

The Norm Activation Model (NAM) contains a core set of individual and social developments that are required to develop a normative behaviour: Awareness of Need, Awareness of Consequence and Awareness of Responsibility. According to Ebreo et al. (2002-2003) the NAM has been used in numerous studies of environmental behaviour, and was shown to demonstrate the tendency for individuals to behave more environmentally when they are faced with social norms rather than just their own personal beliefs. Normative behaviour analysis is used to understand the degree of integration of a specific normative behaviour into a social group by assessing the amount of environmental altruism displayed and the enforcement of punishments for non-compliance (Rastogi, 2010).

In the current state of society it is local communities who are taking on the role of environmental activists, with social distrust of senior managers (Gibson, 2001) and political institutions (Macnaghten and Jacobs, 1997) acting as the critical barriers to a sustainable society. It is proposed that the implementation of EMS could be significantly aided by fostering community norms and developing peer control towards informal networks. It is anticipated that the influence of social values will provide a greater opportunity to more effectively embed an EMS within organisational dynamics and culture.

The field of environmental management contains various interpretations and definitions of related terminology, and it is this form of inconsistent communication that prevents clear understanding of EMS in both business and community settings. The core focus of a business EMS should be to order the complexity of activities within different departments, create a synergy between operational units and internal/external community engagement.

Current EMS tend to focus primarily upon organisational ability to report to external assessors in the terms i.e. Register of Environmental Aspects (Section 2.2.1.1), that they dictate. It is proposed that current EMS provide a consistent structure for business analysis and comparison, but lack the ability to engage the corporate and workforce ethics in a ‘truly holistic’ transition towards an environmentally-responsible system. The following section provides the hypotheses that will guide the research project.

2.4 Research Questions, Aims and Objectives

Popular EMS are designed to be implemented in a top-down approach, with the core drive of the system based upon effective reporting procedures through efficient record-keeping (Section 2.2.1). This research project has been developed upon the notion that such traditional methods of implementing environmental business plans will always be weak, as the problems implicit in any hierarchical structure will naturally limit the possibilities of effective implementation; through the dismissal of knowledge and experience contained within the workforce, or lack of feedback loops to enable innovative strategies.

An approach to EMS that promotes the creation of individual awareness through ‘natural leaders’ and ‘informal networks’ highly committed to an environmental ethos, has better possibilities of embedding concrete and consistent eco-actions (Fraser et al., 2006). It is proposed that EMS should be designed to have the

capacity to clearly motivate people to change their attitudes and responses towards environmental concerns. Such a system would need to be aware of the structure and dynamics of informal social interactions within the organisation (Section 2.3.2), and develop communication and peer control mechanisms to support the learning process (Section 2.3.1).

In this context, an emphasis to develop informal networks will be given, as they are considered to be a natural mechanism for developing strong peer links and commitments (Crona and Bodin, 2006). It is anticipated that by taking this approach, organisations will have a greater opportunity to engrain environmental awareness and produce necessary changes. The main purpose of adopting a systemic perspective is to determine the most productive methods of interaction, with the key goals of holistic coherence and synergy throughout the organisation.

It is suggested that social cohesion and community participation are key variables in effective transformation towards more sustainable communities and businesses; embedding sustainable development as a normative behaviour e.g. defection is punishable (Gintis, 2008). The ability to develop an environmental norm and instigate a memetic eco-evolution (Dawkins, 1976), will be the pinnacle drivers to securing social commitment for a sustainable future. Both the learning context and the structure for participation need to be aligned with the design of an EMS to facilitate successful implementation.

The research questions to be tested by the research are as follows:

1. That a holistic design of EMS requires social commitment and the establishment of environmental action as a normative behaviour.
2. That the design of EMS founded in cybernetic principles of management, will heighten self-awareness and self-regulation and this way it will facilitate community learning.

3. That the use of proper tools to manage the complexity of the learning process for an EMS implementation will facilitate the transformation and smooth the resistance to change.
4. That identifying and fostering natural eco-leaders and informal networks there are better possibilities of breaking through established views and practices.

Aims and Objectives

It is the aim of this research to develop a holistic framework for environmental change for businesses that will accommodate employee experiences and strategic preferences within the design process, whilst using cybernetic methodologies to facilitate the organisational change. The proposed methodology for EMS will place specific focus upon cultural engagement, holistic accountability and development of informal networks, and will focus upon bottom-up approaches to empower employees and promote social cohesion through sustainable practices (Section 2.3).

The objectives of the research project are as follows:

1. To develop a holistic framework for environmental change that will be tested in a case study organisation.
2. To develop a coherent framework of tools supporting individuals and networks prototyping and leading environmental policy, strategy and practice.
3. To use informal networking to determine environmental activity variations across the organisation, and use cybernetic methodologies to facilitate the development of environmental action as a normative behaviour.
4. To provide a participatory platform for organisational members to contribute and self-regulate the change process.

This chapter has explored current social and cultural distinctions in the adoption of environmental activities in national and community settings. The ability to translate environmental ethics into business practices has been discussed and highlighted the need for environmental action to be awarded the status of 'normative behaviour' before true EMS can be implemented. ISO 14001 and EMAS have been analysed to determine their effectiveness to change business operations and engage the organisational workforce. The role of systems thinking as an essential aspect of EMS has been explained, with specific focus upon the use of cybernetics to facilitate the change process. The following chapter discusses the research methodologies that will be used within the research project.

Chapter 3

Research Approaches

In order to develop a valid research project it is necessary to determine the philosophical approach to the project, that suits both the context of the research and the researcher's own skills. This chapter demonstrates the philosophical basis of the thesis, defining the disciplines that will be used to complement the project's socio-environmental focus. In this chapter the research philosophy, approach and design are defined, with the intention of providing a clear perspective of the approaches to be adopted throughout the project. The purpose of the research is narrowed and the validity, reliability and ethical implications related to the choice of data collection methods explored. The chapter is then summarised with the presentation of the multi-methodological approach that will be used for the research.

3.1 Research Philosophy

In order to provide a clear context for the research approach it is necessary to introduce the perspectives of subjectivism and objectivism; both of which underlie different philosophical approaches. The ontological approach of subjectivism focuses upon the core concept that no two individuals will view reality in the same way, as

our perceptions of reality are built upon our personal life experiences. It holds the perspective that analyses are limited to an individual's awareness of their surrounding environment, and that each individual interpretation is valid (Mingers, 1992).

This ontology places significant importance upon the researcher's personal experiences within life as the foundations for their individual interpretation of the nature of reality; a simple example can be seen using the question 'Is the glass half empty or half full?' both are quantitatively correct but result in different qualitative interpretations. Berkley's subjective idealism states that only that which can be directly perceived exists (Berkley, 2007). Stevenson (2005, p.171) presents the riddle "If a tree falls in a forest and no one is around to hear, does it make a sound?" to exemplify Berkley's concepts of perception; Berkley would suggest that the sound occurred and was heard by God.

In modern day use, subjectivism can be summarised as the perspective that research is developed by humans and therefore cannot be free from cognitive interpretation of reality. Objectivism is another ontological approach that views human development and the ability to express knowledge as paramount to social progression (Rand, 1964). Objectivism directly asserts that entities exist regardless of human ability to recognise their presence or not; reality is seen to be something that one ascribes to attain knowledge of through scientific enquiry (Vrasidas, 2000).

Observations of an external phenomenon are seen to be a true reflection of reality, with the perspective that the observer identifies structures and patterns that 'actually' construct reality (Jonassen, 1991); this is the core difference to subjectivism that views structures and patterns as mental constructs of the individual to 'explain' reality. According to Berliner (n.d.) this approach is overtly focused upon anti-environmentalism, with the belief that environmental principles will lead to a stagnated society bereft of technological and industrial innovation; intrinsic value is only awarded to humans. However this extreme viewpoint is not

supported by the breadth of traditional/hard scientific bodies (Bosch et al., 2007; IPPC, 2007; Lancet, 2009), institutions and individuals who are dedicated to the conservation of the natural state of ecosystems.

The choice of the research philosophy determines the context in which the research matter is defined and analysed. Saunders and Thornhill (2009, p.119) describes multiple approaches to business research that include positivism, realism, interpretivism and pragmatism. A brief overview of these approaches is provided below, followed by an expanded summary of the philosophical principles that will dominate the context of the research.

3.1.1 Positivism

Positivism focuses upon the identification of laws of reality, primarily through the scientific understanding of natural phenomena. This perspective views the research matter as an object to be studied that is independent from the researcher's activities, with the belief that this is the only true form of objective analysis. The positivist paradigm was developed in response to social demand to remove 'God, or his will' as an answer for phenomenon that could not be explained; similar to the epistemology of naturalism (Hammersley and Atkinson, 1995; Hume, 1896).

This perspective removed any notion of faith as an explanation for research observations, restricting valid knowledge to that which can be statistically evidenced rather than theoretical conjecture. This dependence of hard approaches upon statistical information focuses most research within the area to a deductive process of enquiry (Saunders and Thornhill, 2009). The research matter is repeatedly narrowed to enable the study of one specific phenomenon and test the validity of developed conclusions within multiple case studies.

Mingers (2006) presents naturalism as a positivist approach to both natural and social sciences, with the focus of establishing objective empirical evidence for all forms of research. Giddens (1976) discusses the development of positivist social science by Emile Durkheim, in an attempt to understand the anomic (lack of social value) concepts of liberalism (individual freedom). Durkheim viewed scientific understanding as a means to personal liberation; “Science is the wellspring of our autonomy” (Durkheim, 2002, p.116).

Parsons and Schutz disagreed with the positivist approach to social research with the assertion that social actors have normative values (Parsons) and are knowledgeable (Schutz), attributes that should be accounted for (Giddens, 1979). Within the literature review (Section 2.3.2) it was identified that social norms are a pivotal aspect of sustainable development and environmental management, which would suggest that the positivist approach to social research is not conducive to this research project.

3.1.2 Realism

Closely linked to positivism is realism, a philosophy that deals with the research perspective that ‘a spade is a spade’, it views the real-world in terms of immediate value. Bhaskar developed the notion of critical realism that maintains the position that reality is independent of human influence (‘is out there’) and should be viewed in terms of empirical (experiences), actual (all events) and causal mechanisms (Houston, 2006). Critical realists adopt the core ontological perspective that reality/events occur regardless of human observation (Mingers, 2006, p.18-20), with focus placed upon the explanation of causal mechanisms (Dobson, 2001).

The approach focuses upon the presence of structures/causes that produce events and holds the perspective that any identified structure belongs to a ‘deeper’ set of structures (Groff, 2000); a reductionist approach. Viskovatoff (2002) presents

transcendental realism as the concept that there are universal natural laws that govern closed system experiments (deductive methods) that should not be applied to open systems i.e. social structures.

According to Mingers (2006) critical realism follows a retroductive perspective of scientific reasoning in which an ‘invisible’ mechanism or structure is hypothesised to explain the occurrence of a specific phenomenon. Houston (2006) uses the example of magnets and metal filings to demonstrate this approach with the presence of a hypothetical magnetic field used to describe the movement of the filings. Bhaskar (2005, p.39) states that “people do not create society”, instead social values (invisible structures) are seen to be absorbed by an individual, reproduced and potentially transformed.

Baert (1996) criticises the use of critical realism within social research as it views knowledge transfer as a one-way process of observation ignoring the influence of social value upon the observer, while also rejecting the notion that society can reflect upon its history and transform past events into new perspectives. This one-way process of observation can be problematic for issues such as environmentalism as anthropomorphising the natural environment (Epley et al., 2007) can create an ‘environmental-being’ that has the same values and worth as a human; a two-way process of observation that accounts for both reality and observer values in research. The deductive method of transcendental realism and ontological perspective of critical realism that reality is independent of human influence, are not appropriate for the social focus of the research (Section 2.3.2).

3.1.3 Interpretivism

Interpretivism introduces the perspective that reality is subjective, taking into account the social dimension of organisational design and activity. Simmel introduced the concept of qualitative study in social systems focusing upon human

emotion (Simmel, 1904) and the presence of social reciprocation to strengthen economies (Simmel, 1898). Drysdale (1996) cites Weber as an early proponent of interpretivist philosophies with the identification that knowledge is the result of conceptualisation and judgement; individual cognitive perceptions of the observer.

Weber viewed economics as a socially subjective system with the belief that organisations are developed through the orientation of multiple social actors to reach a common goal (Swedberg, 1999). According to Fuchs (1989, p.122) “interpretivism emphasises the socialised capacity of individuals for mutual empathy and understanding”. Within organisational analysis interpretivism accounts for the unique cultural values of different social systems and attempts to understand the process of social development, by attributing meaning and sense making analyses to emergent cultural phenomenon (Schultz and Hatch, 1996). Critics of interpretivism purport that a true scientific study should be conducted by an objective observer who is able to remove themselves and their values from influencing data analysis.

Interpretivist researchers will attempt to immerse themselves within the social group they are studying in order to gain an in-depth perspective of the normative values that are held within the community (Guo and Sheffield, 2008). Williams (2000) presents the argument that it is not possible to develop generalised rules of social phenomenon from interpretivist research, and findings should instead focus upon moderatum generalisations: cultural consistencies. Social systems cannot be studied within a laboratory setting like traditional scientific experiments, in which variables can be controlled and altered so as to observe direct causal relationships of interaction.

This leads to the additional argument that interpretive research cannot produce thorough analyses of social patterns of interaction as it is impossible to control social development; it is possible to facilitate and instigate change but social systems are unpredictable and cannot be isolated within a box of experimentation. This results in interpretivism moving from traditional hard scientific analyses to soft

observations of natural social development; ideally suited to the research focus of sustainable development as a form of emerging normative behaviour.

3.1.4 Pragmatism

Pragmatism is highly focused upon the practical implications of the research context, knowledge is gained through practicable actions (Shalin, 1986); it can be used within both positivist and interpretivist studies (Saunders and Thornhill, 2009). Peirce founded the concept of pragmatism as the attainment of knowledge through the efficient definition of the research question and identification of universal habits (Dewey, 1916). Rorty (1961) presents Peirce's view that other research philosophies use nominalist and reductionist perspectives of reality, that discount the complexity of semiotic interactions (forms and meaning of communication) between social actors (Rochberg-Halton, 1987; Ormerod, 2006).

James (2004) used pragmatism to suggest that the value of knowledge lies within its practical usefulness to the person attempting to understand it; however, usefulness is determined by the researcher and as such is an interpretation of values/priorities in the studied social group (Goles and Hirschheim, 1990). Pragmatism asserts that human understanding of reality is limited by our ability to identify what is really occurring in our environment, by trying to define that which we perceive within our own conceptual constructs.

Similar to interpretivism this approach takes account of the dual strengths and limitations of the researcher's mind, in relation to their ability to conceptualise the studied phenomenon in a context that will provide a useful application in the real-world. Ormerod (2006) discusses the use of pragmatism as both a subjective (personal benefit) and objective (impersonal) approach to research; criticised by Durkheim as being highly individualistic ignoring the influence of social action (Rawls, 1997). A criticism of pragmatism comes from its focus upon value within

practicable action, neglecting the value of knowledge that can be found within theoretical research (JoPPSM, 1911); pragmatism has been considered to be anti-intellectual (Gross, 1997).

Conceptualisation and abstract thought are the instigators of innovation, suggesting that pragmatism could stagnate social development as it only pursues research that provides a direct form of action; such action will be inherently limited by the technology and imagination of the present society. Light (2003) suggests that a pragmatic approach is required within environmental projects in order to develop changes in line with public demands (Section 2.2.3). This places pragmatism as a potential philosophical approach to the study, as it will focus the research upon the identification of real-world problems and the development of practical solutions.

3.1.5 Chosen Philosophy

With regards to the role of social behaviour in environmental management practices the ontological perspective chosen for the research will need to reflect the prior assertions that social behaviour and groups are defined by the actors within them. From the above discussions the use of interpretivist approaches to research are most closely allied to understanding the values held within a society. Jackson's (2003, p.18-19) description of subjective approaches to the natural and social sciences links to interpretivism, with the use of a nominalist ontology, anti-positivist epistemology, recognition of human free will, and ideographic research methodologies.

The use of the subjective ontology of nominalism began with Antisthenes and Roscellinus who proposed that universal truths are not possible, only generalised similarities between individual objects/entities are observable (Crockett, 1950; Means, 1879). This supports the previous discussion of normative values and behaviours as a unique development within any given society, with the realisation that whilst a social culture may have similar characteristics to another, its core

value structures are likely to have been constructed differently. Developing away from the perspective of nominalism McLaughlin (2002) suggests that social networks should be considered as ‘phenomenological realities’, that use socially constructed distinctions as a form of analysis i.e. social class.

The narrowed focus of a phenomenological ontology will direct the research into the exploration of social perceptions and understanding of reality, through the eyes of the observer who is in fact a part of the social system of study (Fuenmayor, 1991a). Founded by Husserl phenomenology can be defined as the attempt “to sense reality, and to describe it in words, rather than numbers words that reflect consciousness and perception” (Bernard, 1995, p.14). Paucar-Caceres and Rodriguez-Ulloa (2007) describes the use of phenomenology within soft (social) systems analyses in order to effectively represent the interpretation of complexity and causal rationality of real-world activities.

A phenomenological study is concerned with developing the context and interpretations of a real-world situation in order to develop comprehension and understanding of a specific phenomenon (Fuenmayor, 1991b). The main criticism of phenomenology is that it is highly subjective and it is debatable as to whether or not the observer (who is a part of the system) can produce findings that are sufficiently objective, so as to remove personal feelings from the social analysis. Additionally Mingers (2006) finds highly phenomenological work problematic as it is dependent upon conceptual findings, that are completely subjective to the interpretation of the researcher.

Following on from prior discussions of cybernetics (Section 2.3.1), second-order cybernetics holds the concept that the observer models the studied system based upon their own perceptions (Heylighen and Joslyn, 2001); an interpretivist proposition. It is the individual observer who defines the boundaries of the system to be studied, which places any observations immediately within the observer’s interpretation of what is relevant to the study. Second-order cybernetics accounts

for the exchange of information between the observed system and the observer (Pask, 1996), both of which are seen to be enclosed within an overarching system boundary. It is considered to be the ‘cybernetics of cybernetics’ that views the observing individual as a discrete system of reflexivity within the observed system (Hayles, 1995).

Luhmann and Fuchs (1988, p.24) terms second-order cybernetics as the recognition “that one cannot observe (predict, explain) what is unobservable (unpredictable, unexplainable)”. Wolfe (1995, p.49) identifies von Foersters additional development of second-order cybernetics that “observations affect the observed so as to obliterate the observer’s hope of prediction”.

According to Luhmann (1995) the autopoietic nature of social systems results in the reproduction of self-descriptions that are used to maintain individuality and distinguish different social groups. Communication between two or more actors is seen to self-organise and reproduce within the social system (Arnoldi, 2006), creating a unique set of conscious and subconscious forms of communication. Anthropological studies focus upon understanding social behaviour by studying a specific community/culture for a set period of time (Rowe, 1965).

Bernard (1995) identifies Locke (human behaviour) and Rousseau (social equality) as early proponents of anthropological studies, and directly links this approach to phenomenological approaches to social research. Rousseau concerned his work with the importance of education through experience and the correlation between social inequality and egoism (Rousseau, 2004b,a); paving the way to social analyses that focus upon the evolution of both group and individual behaviour.

According to Johnson (1978) anthropologists seek the distinction between social norms and behaviour held within different cultures. Anthropological approaches to address community-based environmental projects have previously been pursued by researchers (Babcock, 1997; Wamsley, 1999). Leopold (1977) developed an ethical-

aesthetic view of the environment, in which environmental restoration was seen to be an ethical responsibility of humans; linking anthropocentric (Rachel Carson in Section 2.1) and biocentric (Arne Naess in Section 2.1.2) concepts of environmental action (Leopold, 2004).

Nelson et al. (2006) present the use of anthropogenic approaches to environmental issues in order to understand the direct and indirect influences of human activity upon ecosystems. Similarly Kortenkamp and Moore (2000) detail a study of anthropocentric and ecocentric value attribution and identify that scenarios of environmental damage, that have direct implications to social well-being, are awarded a larger degree of moral debate. Lewis (1998) criticises modern anthropology as being dominated by Nietzschean principles of human action to demonstrate ‘power’, rather than the traditional anthropological focus of socialism and Marxist theory where human action is a ‘survival’ mechanism.

The anthropologist Frazer (2003) viewed scientific observation as the most rigorous form of social analysis but also identified that scientific laws are merely names to define specific ‘phantasmagoria’ (images of reality). Using Kantian principles, scientific observation can develop the *a posteriori* knowledge (experience) of a specific situation (Kant, 2003); the use of a phenomenological approach accounts for the influence of a researcher’s *a priori* (intuitive) knowledge upon the interpretation of external realities (Kant, 2005). Hartley (2003) suggests that environmental legislation is typically based upon Kantian principles where social rights are developed upon the morals of the present community.

With the underlying principle of cultural responsibility and social values an involved axiology will be adopted: the researchers values of environmental significance in modern organisational strategies and existing involvement in the case study organisation, will affect the interpretation of research findings (Hill, 1999). An involved axiology acknowledges that the researcher is a part of the research and their presence (values and physical) will affect the system being studied, and in

turn being embedded within the system will affect the researchers findings (lack of objectivism). From an interpretivists perspective the researcher intends to develop the understanding of the current reality of environmental priority within cultural behaviour, viewing the values of the studied community and organisation as central aspects of the research analysis.

The research will then focus upon developing methods to engage the basic social drivers that determine normative behaviour, and produce processes by which to facilitate the amplification of those environmental values that are emerging as a priority to the embedded community. The additional use of pragmatic principles to support the dominant interpretivist philosophy of study will complement the use of an involved axiology, to steer the focus of the research towards practical solutions for environmental management in a context that supports the local communities' values.

Within Section 2.2 it was identified that current approaches to environmental management lack an understanding of social structures and are therefore often met with resistance and confusion. Forms of communication within social structures can be both an amplifier and barrier to knowledge and persuasion; an epistemic rhetoric. Ashby (n.d.) identified the link between effective discourse and the ability to produce a persuasive (rhetorical) argument to one's opinions.

Rhetorical propositions do not place value within a specific answer and instead see worth within the process of self-reflection and personal identification that is generated when such questions are posed. It can be argued that civilisation is built upon discourse and that social organisation is based upon the ability for individuals to attribute universal names and meaning to specific phenomenon; Maturana and Varela (1987) suggest that even consciousness itself is dependent upon language.

To complement the proposed dependence of environmental issues upon social morals and the development of practical activities of business change, a core focus of

interpretivism has been chosen for the project; with pragmatist principles acting as a secondary focus. The following section narrows the philosophical approaches further using the concepts of interpretivism, phenomenologism, anthropology, involved axiology and epistemic rhetoric as underlying principles of research.

3.2 Research Approach

The research approaches of social constructionism, functionalism, radical structuralism and radical humanist are reviewed below. Each of these research approaches hold a different view about the role of individuals within society, ranging from the perspective that society is built by social actors to the concept that social actors are merely cogs within a machine. A brief overview of these approaches is provided below, followed by a more in-depth study of the research approach that will dominate the context of the research.

3.2.1 Social Constructionism

Berger and Luckmann (2002) founded the concept of social constructionism to suggest that knowledge comes from some form of social interaction. Social constructionism is a research approach that views society as both determinist and subjective with the “notion that social reality, identities and knowledge, are culturally, socially, historically and linguistically influenced” (Cunliffe, 2008, p.125). Hobbes (2002) developed the concept of social contract theory, in which a civilised society constructs and submits to a central authority (typically a government), in order to maintain social stability.

‘Lockean nominality’ identifies philosophical problems as constructs of the human mind (Kim, 2008, p.440), with the underlying assumption that human perspective and interpretation does not reflect reality. Locke (2004) believed that knowledge is

developed through the perception of external objects where primary qualities are objective (reality) and secondary qualities subjective (nominal/named); this can be interpreted as an early form of social constructivism (individual sensemaking). Creppell (1996, p.215-223) description of Locke's work on social interaction provides a context in which normative behaviour is a form of 'toleration', that is deemed to be essential in order to accommodate both individual choice and socially-constructed constraints.

This research approach supports the adoption of interpretivism and an involved axiology by focusing upon the social values held within a community and understanding how structure is developed from social perspectives. McLaughlin (2002) discusses essentialism as a reductionist approach that has dominated philosophy since Aristotle's teachings (such as the Natural State Model), that impaired the ability to understand the interrelations of social structure, agency and environment; preventing social constructionist thinking.

The greatest criticism of social constructionism stems from the concept that knowledge comes from social interaction, instead of the focus that knowledge is attained through scientific rigour. For example social constructivists would view physics as a social 'explanation' of observed events, rather than the social 'identification' of a specific phenomenon. This criticism can be viewed as the perspective that reality is what it is, and would continue to exist regardless of human interpretation.

3.2.2 Functionalism

The functionalist research approach is both determinist and objectivist and holds the perspective that society is independent of social actors. Functionalism is "the anthropological theory that all the various aspects of a culture serve a social purpose" (Stevenson, 2005, p.219); influenced by Darwin's work into the role

of biological function and processes within evolutionary theory (Capra, 1983). Malinowski (1932) states that studying just one aspect of a culture does not provide a sufficient social analysis, and therefore an anthropological study must become fully immersed within a culture to study social functioning as a whole.

This approach focuses upon the purposeful actions of a culture within the present time (study period), generally ignoring the past activities of the society (Lesser, 1935); with the perspective that the current society is embedded with its social history. Functionalism is primarily concerned with the cause and persistence of observed behaviours (Bredemeier, 1955) and the development of universal truths based upon multiple observations/instances of similar events (Lafleur, 1941); typically presentable within quantified statistics of generalised validity e.g. Durkheim's suicide research.

Functionalist research aims to understand phenomenon in order to be able to predict and identify the causes of behaviour patterns, and in turn establish a form of regulation/control over the system. According to Jackson (1991) functionalism is dominant within hard (machine) systems analyses, where all components within a system (including humans) are considered to be subject to regulation. Functionalists take the stance that experts are required to control the regulation of a system, so as to design and maintain efficient procedures of action (Jackson, 2003).

Jackson (2000, p.207) finds functionalism to place little value in the pursuit of general "conscious meaning, to achieve and sustain shared understanding and purposes". The functionalist is not concerned with how social actors choose to interact within their social roles, but instead focuses upon the normative processes that define a social role (Mouzelis, 2000). That is to suggest that social actors behave in the way that their social role defines them, so as to be a useful member of society (Capra, 2003), placing this research approach in conflict with prior discussions of normative behaviour development through bottom-up social innovations.

3.2.3 Radical Structuralism

Radical structuralism is a research approach that uses a radical and objectivist perspective, that focuses upon the identification of group conflicts and contradictions within a system (Jackson, 1991). The anthropologist Levi-Strauss used initial structuralist principles within his studies of the human mind, specifically focusing upon the influence of language and naming upon an individual's conceptualisation of objects (Luhmann, 1990). The poststructuralist Derrida used the concept of deconstruction as a form of minimalist realism, in which analysis of the discursive foundations/structure upon which knowledge has been formed, results in the breakdown of logical argument (Fuchs and Ward, 1994).

As a postmodernist (radical structuralist) Foucault focused upon micro-social conflict and power to understand the power relations held within knowledge (Jackson, 2000; Fox, 2003), and the historical contexts upon which discourse is structured Flyvbjerg (1998). Agger (1991) views postmodernism as providing a critique of positivist approaches to science that discount the influence of '*a priori*' assumptions within research practices and refute the ability to develop universal truths. Rossi (1973) identifies phenomenologism and existentialism as opponents of structuralism. The greatest criticisms of radical structuralism come from Habermas who viewed human emancipation (political equality) as a social goal (Maru and Woodford, 2001) based upon the development of rational communication within society.

This was in opposition to the postmodernism of Foucault who did not believe that communication existed between social power hierarchies (McIntyre, 2004). Habermas viewed "...rationality as dialogical..." (Midgley, 2000, p.236) with the belief that effective communication could be achieved through an ideal speech situation of "...intelligibility, truth, rightfulness and truthfulness" (Muller et al., 2005, p.198). For postmodernists 'truth' has never existed (Grange, 1996), as deconstruction has demonstrated the lack of meaning in language.

Habermas supported democratic communications in which all individual actors are encouraged to vocalise their opinions and participate within debates (Warren, 2003), with the view that conflict (post-structuralism) leads to social disorder (Jackson, 2000). With regards to the research project poststructuralist principles have the potential to provide an insight into social language and bottom-up conflicts for environmental management, but the removal of intention within discursive contexts prevents the adoption of a democratic process to change.

3.2.4 Radical Humanism

Radical humanism is a research approach that has foundations within both Western (Erasmus (Mansfield, 1968)) and Eastern (Confucius (Danton, 1943)) philosophy of education through practical displays of moral action and free will. Gioia and Pitre (2000) identify radical humanism (emancipatory systems approach) as a research approach that focuses upon the political aspects of social interaction from a pragmatic perspective (closely linked to interpretivism). Humanists place value within social liberty (Dewey, 1935; Keohane, 1977), pragmatic world-views (James, 1905), discourse (Habermas, 1976), duality of constitutionalism and democracy (Habermas and Rehg, 2001), and structuration (Livesay, 1985).

Morgan (1980) places radical humanism in direct opposition to functionalism with the concept that social roles form a psychic prison upon an individual in order to dominate and alienate/constrict their potential. Jackson (2003, p.36) uses the concept of a psychic prison within his framework for Total Systems Intervention, as a metaphor for 'negative' social domination that prevents individualism within an organisation. The ability to think outside of one's defined social role has been the foundation to the greatest stages of human development including evolutionary (ape to man), technological (Leonardo Da Vinci, James Watt), scientific (Galileo Galilei, Gotfried Leibniz) and creative (Filippo Brunelleschi, Ludwig van Beethoven) advancement; individual liberty is the cornerstone of innovation.

Radical humanism is criticised from the functionalist perspective that individual liberty is not conducive to efficient regulation within a system. From this viewpoint it is necessary to define social actors within different roles and for those roles to be maintained to ensure that the fundamental needs of society are fulfilled. Functionalism would dictate that society should be viewed as a ‘machine’ where all of its components must perform their set role to maintain efficient performance; for example a computer operating system will become corrupt if one of its protocols changes its mode of operation.

This presents the assumption that individual autonomy leads to social radicals and anarchy that cause deliberate friction to system performance. However it could also be argued that radicals and anarchists are the instigators of social change and the negative connotations of these two terms are historically subjective interpretations from those who benefited from revolutionary action. Further suggesting that negative perspectives of individual autonomy stem from social action that has not been beneficial to society as a whole; emergent behaviour not accepted as a societal norm. With regards to the research project it has been argued that environmental action is dependent upon social action and innovation (Section 2.3) that can be linked to radical humanism, which results in this approach having potential use for the study.

3.2.5 Chosen Approach

The researcher identifies with the principles of social constructionism viewing any form of human collective (business, government, communities, etc) as a response to specific social needs; in line with the ontological perspective of subjectivism. Dominated with interpretivist philosophies, this project will focus upon the construction and adaptation of cultural beliefs with the premise of promoting environmental management as a typical workplace activity (Gregor, 2006).

In relation to human societies it is the researchers' belief that all organisations and groups are developed upon a specific social need i.e. governments in response to resource distribution, charities in response to exploitation of vulnerable citizens, and businesses in response to customer demands. Such groups and networks emerge to fulfil a specific purpose and remain a part of the system whilst they continue to perform a productive role. This research will also build upon the concept that whilst businesses serve a specific social need, the manner in which it does this is dependent upon the ideals and principles of the social actors who constructed it.

It has been identified that social environmental development is often dependent upon the voluntary actions of communities and businesses (Section 2.2), which may progress to the establishment of socially normative behaviours. This form of social development is also supported by the radical humanist perspective of society as an emancipatory system, where individual freedom (choices of action) leads to social innovation. It is suggested that businesses within the UK that choose to voluntarily adopt an environmental management system (Section 2.2.1), do so because of their social construction; moral and ethical beliefs of their internal and target social communities (Section 2.1.3).

With regards to functionalist criticisms of social constructionism, it is proposed that social systems are able to support an individual actor's autonomy (liberal citizen) as long as there are sufficient mechanisms for self-regulation (metanormative constraints) within the system. Within business this form of individual autonomy can lead to innovations that can produce economic benefits in line with the organisation's mission statement; such as the employee within the Lush company, who identified popcorn as a viable biodegradable alternative to plastic packaging (Lush, n.d.).

The anthropologist Bateson (1972) introduced the term 'schismogenesis' to define the symmetrical (mirrored behaviour) and complimentary (dominance-submission) differentiation of social interaction (Section 2.2.4); with reciprocity viewed as an

asymmetrical merger of the two. It is proposed that an ‘asymmetrical environmental action’ (socially reciprocated) is dependent upon the normative behaviour of a society; the social characteristics identified by ethnographic research. The use of an ethnographic approach to the research will focus the study of environmental action upon the inductive analysis of a specific social system for a set period of time (Saunders and Thornhill, 2009); complementing the adoption of phenomenologism alongside symbolic interactionism (Crang and Cook, 2007).

Malinowski (1932, p.516) states that ethnographic research “...studies the influence of cultures by contact, infiltration and transmission”, in which the researcher attempts to develop a clear description of cultural behaviour; in use with phenomenologist principles such descriptions should be qualitative/interpretive and not quantifiable (Bernard, 1995). Ethnographic research is focused upon the development of a cultural understanding through the ‘microscopic/thick description’ of social behaviour and the causal relationships that define such actions (Martin, 1993). As a study of human behaviour, the researcher will need to become familiar with the vernacular/local knowledge held by social actors and ‘environmental language’ used within the chosen community, so as to instigate a two-way process of communication.

Johannisson (2007) suggests that the combined development of local stakeholder and researcher knowledge bases, can lead to a stronger capacity to affect worthwhile change. Ethnographic approaches to environmental change have previously been conducted in regards to water management (Stone, 2000), discourse (Milton, 1996), social networking (Gillooly and Pinsker, 2000; Jack, 2005), rural development (Maloney, 1998), policy development (Malpass et al., 2007), environmental partnerships (Poncelet, 2001) and operational research (Midgley and Reynolds, 2001). These studies were conducted via the ethnographic approach due to the belief that understanding the values and behaviours of the present social system is essential to implementing effective environmental projects.

Using Daily and Ehrlich's (1972) perspective of cultural analysis, a focus upon social behaviour is linked to both affective and sociological unity; the emotions that dictate behaviour choice and processes of solidarity within a group. From an environmentalist perspective an anthropocentric approach is a form of shallow ecology (Fox, 2003), that places focus upon human interests rather than environmental needs. It is proposed that as humans and the natural environment have a mutual impact upon each other, both of them require equal representation and value within sustainable development practices.

An ethnographic research approach places an immediate focus upon the observation of human behaviour, and it is the environmental context upon which this research is directed that will unite the two within a socio-environmental project. The further adoption of radical humanist principles mirrors the need for social analysis, with the added aspect of understanding drivers to change within the studied community and the processes needed to alter 'normal' operations (Saunders and Thornhill, 2009). This concept provides focus upon the processes of control that are present within a society, specifically analysing the development of group consensus of normative behaviour that leads to the establishment of metanorms.

Emancipatory systems advocate individual autonomy that can lead to the voluntary choice of environmental action as a result of some form of affective connection between one's moral beliefs and the protection of the natural environment. The research will not focus strongly upon radical humanism (extreme environmentalists) as this will not be politically acceptable within a business organisation, but studying the development of such deep personal beliefs will provide an added dimension to the analysis of social norm creation.

Based upon the theory of social constructionism the research is governed by phenomenologism, specifically the development and replication of individual and group psyches/behavioural patterns (Sheard, 2006; Saunders and Thornhill, 2009). The use of ethnographic approaches to social analysis will immerse the researcher

into a specific social community, to observe and record their behaviour toward environmental action and identify social drivers to change. The concept of individual autonomy and systemic self-regulation will be analysed as a means for environmental innovation in line with social norms. The following section analyses the different data collection methods available to the researcher and defines the choice of data analysis that will be performed.

3.3 Research Methods

The choice of research methods will determine the type of data analysis techniques that will be used to support the social constructionist and ethnographic approach of the project. The following section explores the research logic that will dominate the research, the use of descriptive and exploratory data collection techniques and the practical methods that are used to attain such information. The section closes with the identification of validity, reliability and ethical considerations that need to be addressed before and during the research process.

The concept of induction focuses upon developing generalised statements of reality from specific observations; for example, Hempel's Raven paradox where it is induced that all ravens are black because one has only observed ravens of that colour (Gardner, 1998). Spinoza (2003) developed his philosophies of ethics upon the principle that everything in the world is part of one whole 'substance' (an inductive principle); even though it is not clearly stated as such, this provides an early form of recognition in the holistic interrelations of humans and the natural world. Spinoza's work is closely allied with social constructionism in the sense that society is built upon the entities that preside within it; however Spinoza views God as both the substance of the universe and sole possessor of free will (Brown and Kasser, 2005).

Naess (1977) was influenced by this work to develop the concept of deep ecology, and views Spinoza's philosophies as providing useful insights into social symbiosis

with nature. From this perspective organisations are faced with the reality that the activities of its component parts (including humans) will determine the efficiency of the whole. Conversely, Aristotle's teachings focused upon the process of deductive thinking, in which a logical statement (syllogism) is created from two premises (arguments) that reach a logical conclusion (Smith, 2007); his work has had a strong influence within Western societies.

Descartes (2003) mind-body dichotomy further established the concept of deduction as a typical perspective in the West, with the reductionist view that the mind is the true self (divine being) and the human body is merely an earthly vessel; essentially dividing an individual into two distinct parts. Descartes work was focused upon the separation of sense and intellect, with the perspective that true understanding of the world requires the removal of bodily senses (irrational) from intellectual reasoning (rational mind) (Buckle, 2007). Hume (2006) supported the concept of deduction as he viewed inductive thinking as an unjustified belief in circular causality that could not be logically evidenced.

This led to the adoption of quantitative data analysis as the primary evidence of rational scientific thinking; primary worth being awarded to *a posteriori deductions*. Quantitative data focuses upon the development of statistical evidence to prove or disprove hypotheses, developing universal rules that could be replicated by any other researcher performing the same study. When used within social systems Zikmund (2002, p.55) describes such data as being used for descriptive analyses, where statistical data is used to explain the "...who, what, when, where and how questions".

The types of questions used within this descriptive form of analysis are generic and can be applied to multiple social groups in order to develop clear cross-population analyses; participants are usually provided with specific multiple choice answers to make analysis easier e.g. yes/no, male/female, age group, etc. As discussed in Section 2.1 quantitative data is still reliant upon human interpretation as the

context in which the analyses are performed is subject to the researchers chosen contexts.

In contrast qualitative analyses access the social drivers ('whys') that influence human behaviour; both *a priori* and *a posteriori knowledge* are acceptable. Qualitative data aims to understand the reasons as to why certain social patterns of interaction develop, and attempts to understand the cause of deviations in such behaviour across social groups; leading towards a psychological analysis of group and individual behaviour. Zikmund (2002) refers to this form of analysis as exploratory research in which the researcher works with social actors to identify and structure the causes of social problems, and determine the present and future needs of the society.

Within this form of analysis researchers are focused upon explaining social behaviour and gathering as much rich data as possible; for example, Vince and Broussine (1996) detail the use of rich picture analysis (participant drawings) to identify both the conscious and subconscious perceptions of reality. Their use of rich pictures is based upon concepts of Collaborative Inquiry (Reason, 1988), in which research is a process conducted with people not on them (Vince and Broussine, 1996, p.9). However it can be argued that qualitative data is so focused upon behaviour and meaning within one social system, that any research findings will only be applicable to that one observed society.

3.3.1 Data collection methods

Experiments are used to test the alteration of a specific behaviour within an observed system to identify the processes by which a system adapts to change, and the resultant system properties (causal links of tested variables (Saunders and Thornhill, 2009)). Experiments are often designed within a laboratory setting to remove the influence of unexpected or uncontrollable variables (producing a

closed systems analysis). The goal of this research method is to conduct multiple perturbations of the experiment to establish either consistent or sporadic system responses to the same stimuli.

Researchers who conduct experiments use a duplicate system as a control sample, to demonstrate the result of changing a variable within an unaffected (control) and affected (experiment) system; producing objective analyses. Meadows and Robinson (2002) discuss the use of computer modelling simulations to forecast the sustainability of social systems using different growth parameters to conduct global-scale experiments; however these authors suggest that such models cannot be truly objective as they are created by humans.

Surveys are used to access a broad range of the target population, most typically through the use of questionnaires conducted via the internet, phone and postal mail services (Rubin and Babbie, 2010). The survey method is a deductive approach to social analysis that aims to develop understanding of a specific social group; government elections can be seen as a form of survey to establish the political tendencies of a society. A social research survey accesses a target study group through the use of random, representative, systematic, stratified, multistage cluster and non-probability sampling techniques (de Vaus, 2002).

Surveys are used to access precise social data usually via multiple choice answers, reducing the ability for respondents to provide rich data that would be unnecessary for statistical analyses. This lack of rich data is a core disadvantage of surveys that leads to the production of a brief overview of social opinion. Surveys are also highly problematic as they usually rely upon the respondent to return the completed questionnaire to the researcher, which often results in very low response rates (Krosnick, 1999).

Case studies can be used to gain an in-depth social analysis of either a single or multiple social communities through rigorous observation and researcher

engagement; Bacon (2006) views observation as the precursor to knowledge. Saunders and Thornhill (2009) refer to case study analyses as either being holistic (whole organisation) or embedded (whole organisation and sub-units), in which a triangulation of data collection techniques will be required to conduct thorough research. Eisenhardt (1989) suggests that case study approaches can be used to build social theory, when performed in a staged process of research.

This involves the definition of the research question, case study selection, triangulation of quantitative and qualitative data collection techniques, field work, data analysis, development of hypotheses, comparisons with literature, ending with theoretical interpretations of the research. It can be argued that the study of an open system (non-laboratory setting) is exposed to external stimuli that have an unpredictable influence upon social analysis; thus preventing the development of generalised theories across social systems which are all subject to different external influences.

Grounded theory focuses upon attaining research data before defining a clear research hypothesis and using the collected data to direct the formation of theory; opposite process to traditional scientific methodologies. Glaser and Strauss (1967) developed grounded theory as a way to produce theoretical explanations based upon actual system data, rather than the usual research process of developing theory and then seeking out data to support the research assumptions. Dobson (2001) refers to grounded theory as an approach that holds no theoretical assumptions at the beginning of the research, to prevent the researcher guiding the research and instead allowing the data to lead the researcher.

Within grounded theory data analysis and collection begin simultaneously and are constantly evaluated for patterns, social activities are coded and categorised, incident sampling is conducted, and the researcher makes continuous updates to theoretical memos and hypotheses (Corbin and Strauss, 1990). Grounded theory has the disadvantage that starting a research project based solely upon 'random'

data without a theoretical focus, could be difficult for a researcher to culminate into a set of hypotheses.

Action research focuses upon the researcher working alongside community members to address specific social problems and facilitate change processes. Kurt Lewin founded the concept of action research in a response to the emergence of cultural anthropology, sociology and psychology as complementary disciplines, and the identification that studying social actors within their natural environment produces a stronger analysis (Lewin, 1944, 1945). Barton et al. (2009) suggests that action research and positivism produce thorough scientific findings as they address both open and closed systems thinking, respectively.

Swann (2002) identifies action research as a cyclical process of critical collaborative enquiry, reflective, accountable, self-evaluation and participation (CRASP). Helmfrid et al. (2008) discuss the use of action research within the analysis of sustainable development farming practices in the Baltic region, that established the need for normative goal setting and facilitation in change processes. The main concern of using this technique is that the researcher must refrain from becoming too involved in the transition process, and allow the organisation to maintain control of bespoke strategies for change.

3.3.2 Chosen Data Collection Methods and Analysis

The choice of data collection methods is pivotal in the development of a successful research project, as they define how the researcher will engage with the employee community and the types of analysis that can be conducted. A triangulation of methods is used in the research, to support both the dominant (interpretivist/social constructionist) and dependent (pragmatic/radical humanist) philosophical approaches. The ethnographic and pragmatic approaches to the research leads to the development of an action research project that focuses upon

providing specific practical benefit to the studied social system. This is achieved through the combination of established theories, researcher design of a framework for change and the application of said framework in an action research study (Figure 3.1).

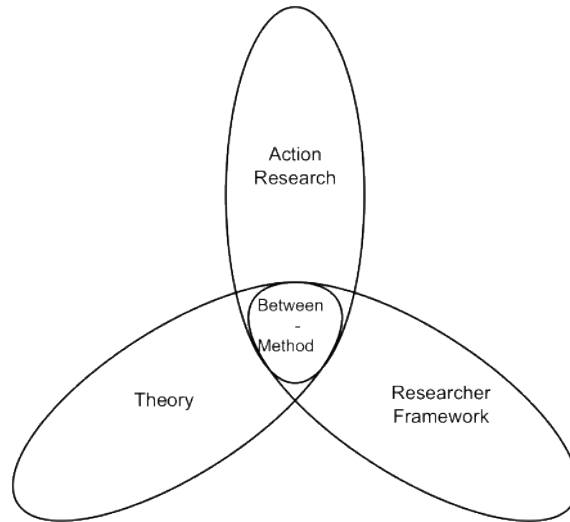


Figure 3.1: The Triangulation of Research Methods.

Methodological and data triangulation will be used to improve the breadth of information gathered from the organisation and the reliability of the interpreted research findings. Methodological triangulation will be conducted by using multiple research models that have core strengths in different aspects of organisational performance and structure, and chosen specifically to compliment one another (discussed further in 3.4). Ammenwerth et al. (2003) describes triangulation as the use of multiple approaches to observe and analyse a particular phenomenon in order to improve the validity and completeness of the research.

Validity is improved if the same research findings are developed from the different research methods used. Completeness is achieved by being able to gather a greater range of data from observations, leading to a more thorough understanding of the phenomenon being studied. This research will use between-method triangulation in which research models from different traditions are used to study the same phenomenon from multiple perspectives Ammenwerth et al. (2003). A clear advantage of using between-method triangulation is that the researcher can choose

multiple research methods that support the strengths and weaknesses of the others used (Mangen, 2004).

The researcher intends to develop a framework for organisational engagement that will be used to facilitate social development in regards to environmental action. As this will be a unique approach to social and environmental engagement the researcher will use previous case studies and theoretical research to compare their work to. Babcock (1997) details the use of interviews within an eco-anthropological project, to diagnose the social history and environmental needs of a specific community.

Similarly Gillogly and Pinsker (2000) discuss the use of observation, snowball sampling and open-ended interviews within anthropological approaches to environmental research. Therefore both interviews and observational techniques will form a part of the action research design. The choice of action research as a leading technique in the project, is due to the capacity for reflection and team participation that is inherent in this approach (Prybutok and Ramasesh, 2005). The use of action research enables organisational members to be directly involved throughout the research process, leading to stronger understanding of transitional requirements.

As stated previously, the development of the intended environmental framework will require, in part, strong focus upon structural and cultural transformation (Section 2.3). In order to successfully analyse the culture of an organisation, the researcher would need to become embedded within the community so that research subjects felt comfortable about discussing their opinions/views of current management decisions. Furthermore, the structural needs of the framework will require in-depth social network analysis, to inform the current formal and informal networks within the organisation, and in turn provide the base strategy for new policy integration i.e. improved communication channels.

In order to analyse the whole organisation, its social networks and norms, an embedded case study approach will be used. In order to gain an in-depth insight into strategic, operational and cultural/interactive perceptions a case study organisation will be chosen (OrgX), within which a framework for environmental change will be applied. Berkes and Davidson-Hunt (2007) refers to Ostrom's perspective that study of a case study organisation enables in-depth analysis of self-organisation and self-governance. The researcher has been associated (not as an employee) with the OrgX community for three years prior to the research project inception.

Prior familiarity with a range of OrgX employees has potential to improve access to the organisation, leading to an ideal study for inductive action research. This also leads to the main concern of using action research, in that the researcher cannot remain objective whilst conducting analyses and may find that past relationships affect their interpretation of events. With the practical application of action research, it is inevitable that the researcher will have an impact within the organisation and the thought processes of its members.

This is due to the nature of cultural analyses and the inherent interactions between both parties through collaborative participation (Swann, 2002). In order to derive accurate information regarding company policies and ethics the researcher will use a combination of qualitative and quantitative data collection methods, to produce rich analyses that are supported by statistical findings. By using action research the researcher must be cautious throughout the project as their role should remain as one of an observer and facilitator.

It would be easy for the case study organisation to rely heavily upon the skills of the researcher rather than develop their own knowledge of environmental management. The progression of a business to environmental-orientation will be a mutual learning experience for both the researcher and organisation, with both parties responsible for discussing perceived problems within the practical application of the project. Full disclosure of concerns by the organisation will enable the researcher to provide

relevant supportive data or modify intended activities, making the integration of the developed framework more feasible.

The combination of ethnographic and action research principles places this study as an exploratory research project (Zikmund, 2002), in which the researcher will engage with social actors to cooperatively address social problems. The research will follow the inductive theories of pluralism and constructionism (Howlett and Ramesh, 2003; De Lange and Linders, 2006), to engage and support the diverse knowledge and opinions held within OrgX. It is intended that the research will then lead to the broader focus of innovation and complexity management (Howlett and Ramesh, 2003), brought by the implementation of environmental strategies, organisational behaviour analysis and cultural modification.

As the concept of sustainable development depends upon holistic organisational development (Triple Bottom Line), an inductive approach is essential for any proposed case study transformations; cyclical learning and continued adaptation of economic, social and environmental variables. This will enable the researcher to alter the research emphasis as the project progresses, in response to social values (Saunders and Thornhill, 2009). The use of action research within an ethnographic research approach will enable the researcher to become actively involved within social transformations as an ‘observing participant’ (Bernard, 1995).

The use of observation allows the researcher to view social actors within their natural setting, enabling the combination of both researcher and community perspectives of social problems. Observations provide valuable access to the practical behaviours of a social system, moving away from the theoretical assumptions of how the system should work to the more thorough understanding of what the system actually does. It is proposed that acting as a facilitator of change (observing participant) the researcher should be conscious to remain in a supportive role of social development i.e. administrative help.

Data collection will start with the distribution of a questionnaire to all OrgX employees, to gain a clear snapshot of the community ethic, social networks and future goals in relation to environmental activities (Appendix B). Questionnaires must be highly concise to ensure that answers can be transformed into valuable statistics, and make sure that respondents do not become irritated by a barrage of unnecessary questions. The disadvantage of using questionnaires is that they typically receive a low response rate and provide little opportunity for respondents to provide in-depth answers.

To avoid this, the research questionnaire will use both multiple choice questions for generic data collection (age, gender, etc) and also use open-ended questions to allow respondents to provide rich data e.g. “Who would you contact for environmental information?”. The researcher will also make themselves personally available to collect the questionnaires from OrgX employees, with the assurance that each questionnaire will be randomly assigned a unique code to prevent employee identification (Bernard, 2009).

As the research will use social network analysis to analyse the formal and informal communications structures it is essential that the researcher can personally link questionnaires to specific respondents (to establish reciprocal interactions), before assigning the unique identification code. Additional data will be gathered via both internal and external interviews, providing in-depth practical views of organisational strategic planning, corporate culture and resource networks. A semi-structured interview technique will be adopted throughout the interview process, as this will allow the researcher to ask generic questions and also tailor additional topics for discussion to the knowledge and experiences that the interviewee is familiar with (Longhurst, 2003).

The main drawback of using a semi-structured interview technique is related to the amount of time that is required to analyse the rich data into a coherent account of social behaviour. However, it is the researcher’s perspective that the value of

the qualitative data gathered from such interviews, will outweigh the amount of time required to perform the activity. In conjunction with interviews, regular group meetings with environmentally-conscious individuals will be designed to facilitate active learning and planning strategies, within a participative environment.

The additional use of rich picture analysis within interviews will provide the researcher with a range of qualitative data (Waring, 1996), that can be used to identify subconscious relationships/interactions within the interviewee-drawings that would not necessarily be vocalised by participants. This will aid the researcher in defining patterns of social perspectives towards environmental issues within OrgX, in relation to the interviewees' position and responsibility within the business structure. However this technique is highly dependent upon the researchers' ability to interpret the drawings, it will be necessary to ensure that only those interpretations that are supported by interview responses are viewed as valid analyses.

3.3.3 Validity

The validity of the research will be tested by the ability of the researcher to engage with the chosen business and facilitate the design and implementation of environmental activities within the organisation. Reason (2006) identifies the validity of qualitative data as the practical, political and moral aspects of research development. The researcher was awarded initial personal funding from OrgX to conduct the research for one year; the attainment of any additional resources to the study will be the result of the organisation deciding that the study is worthwhile/valid and should continue.

Any environmental development that takes place within the organisation will be as a direct result of voluntary action on OrgX's part, demonstrating successful engagement with cultural drivers to change. The research methods used will need

to encourage and maintain commitment from OrgX to continue active involvement in the project for three-years. As both the researcher and OrgX will be pursuing the project without any form of external funding, any activities that are adopted by OrgX due to the research will need to be funded from the organisations usual monetary resources.

It is proposed that if new strategies are in fact implemented it will indicate that the organisation has found the research findings useful to their needs. This will demonstrate the real-world validity of the chosen research methods and developed framework for environmental change; Socio-Environmental Cohesion for Sustainability (Chapter 4). Validity is usually determined through the statistical analysis of hypothesis testing, in regards to a specific logical argument: X always produces Y, or X does not always produce Y.

This research focuses primarily upon qualitative data analysis that is highly interpretive and is often questioned for its validity as a rigorous scientific approach (Maxwell, 2002). A core consideration for validity is the use of action research and position of the researcher as an observing participant within a case study organisation. This means that the researcher will be a part of any change processes and can therefore not provide a truly objective analysis of the organisation (Smyth and Holian, 2008).

Much of the collected data will be qualitative and require an interpretive analysis that will necessitate the need for the researcher to be self-aware and develop critical subjectivity of their findings (Heron, 1996). To minimise any compromise of analytical interpretations, quantitative data will be used to support or disprove the researcher's interpretations of qualitative data analyses where possible.

The triangulation of both qualitative and quantitative analyses provides the researcher with both rich social data and traditional statistical data; the later still being considered by many as a stronger form of evidence in research validity. The

successful combination of qualitative and quantitative research methods will provide the academic validity of the project.

3.3.4 Reliability

As with research validity, reliability is often most easily evidenced within positivist studies (Heron and Reason, 1997). With focus upon how individual actors and social groups coordinate within an organisation this research could arguably be dependent upon ‘synchronic reliability’ Kirk and Miller (1986). This form of reliability is concerned with how the same phenomenon and behaviours/processes leading to it (environmental action and informal environmental networking), are created by different entities (multiple social groups). However the application of the developed framework for change (SECS) within multiple organisations by one researcher with limited financial support in a three year timeframe, is unrealistic.

Therefore the SECS framework will only be tested within one case study organisation. This will prevent the researcher from producing a statistical analysis of the reliability/quality of the approach within other social organisations; synchronic reliability testing will be possible with future applications of the framework. Golafshani (2003) identify the argument that reliability within qualitative studies is based upon the trustworthiness of the researcher and is ultimately proven by validity testing. This would suggest that reliability will be tested by the ability of the developed framework for change to address the research questions (Section 2.4).

The limitation of the research to one organisation could present a difficulty for the researcher, as the project becomes reliant upon the case study’s continued support of the work. The researcher requires access to the organisation throughout the entire project timeframe, in order to perform the periodic analysis of change processes. If OrgX were to revoke its commitment to the research the quality of the research

would automatically be in question, as it would demonstrate that the organisational engagement methods used within the framework for change were not useful.

An advantage of using one case study organisation is that the research becomes narrowed to the specific needs of one community, ensuring that the project is not affected by differences in demographics and structural variations. The ethnographic study of OrgX for three years holds the potential to produce in-depth social analyses (Elliot and Jankel-Elliot, 2003), of how the SECS framework actually works within the real-world. By focusing upon one organisation the researcher can devote their attention to gather a breadth of rich data and provide specific and continued aid to the facilitation of environmental activity development within OrgX.

An additional consideration for reliability stems from the inability of another researcher to replicate the exact analyses and results of the case study engagement. It is not possible for a different researcher to access the same economic, social and environmental considerations that were present within OrgX at the start of the project. The internal and external conditions of OrgX within the time period 2006 to 2009 will never be present again. Further to this a different researcher could analyse the collected data and produce alternative (but similar) interpretations of the research findings. The use of quantitative data to either support or disprove qualitative data analyses will reduce the ability to make unjustified interpretations.

3.3.5 Generalisability

The research is being conducted within one case study organisation, which inherently limits the ability to understand the generalisability of the work in other organisations. The case study organisation is actively willing to develop its environmental activities and is very supportive of the proposed research. Whilst this is very fortunate for the research, it does not provide the researcher with the challenge of addressing environmental issues within an organisation that does not

want to be involved in this type of research. The type of management system within an organisation may affect the ability for the researcher to use the SECS model within future applications.

An autocratic management system could present difficulties for the SECS framework if higher management figures do not value environmental issues; the chosen case study organisation appears to have an autocratic structure, however higher management do see worth in environmental research. A democratic organisation could be an ideal management structure in which to apply the SECS framework, due to the embedded culture of discussion and employee cooperation within the system (Stringer et al., 2006). However, if the majority of employees do not see worth in environmental issues, the SECS framework will not likely receive sufficient “votes” to be used.

Similarly within a Laissez-Faire management structure if there is an insufficient drive within the employee group to address environmental issues, there is no specific management structure in place to help direct implementation and commitment to SECS; employees have free-rein to behave as they wish to as long as they do not compromise the whole (Madura, 2007). Within each of the types of management structure discussed it is the underlying culture of the employee group that will determine commitment to the SECS framework. The SECS framework may prove to be more beneficial within countries outside of the UK who already have a heightened sense of responsibility than the present political and business mindsets within the UK.

The SECS framework has the potential to be used within a different context than environmental issues. The framework is based upon cultural and social analysis and employing these two approaches alongside cybernetic principles, to better structure the communication and viability of an organisation. It would be possible for another researcher to use the framework to address a multitude of organisational systems such as human resource management, CSR, and health and safety management

by simply substituting the environmental context of the framework for the one so desired by the researcher. Whilst there is a potential for this alternative use of the multiple methodologies used within the SECS framework, there is insufficient time within the research timeframe to test a different approach.

Additionally the SECS framework is designed to create a bespoke environmental management system for the case study organisation, based upon its social values and structural needs. Therefore the environmental strategies and achievements developed from the framework are specific to this one organisation and may not be replicable within another; a limit of inference transferability (Onwuegbuzie and Johnson, 2006). Whilst the process of the application of SECS would be the same in another organisation, ‘how’ and ‘what’ the employees in a different organisation choose to pursue is likely to be different.

3.3.6 Ethical Implications

The main ethical implication produced by the project concerns the anonymity of participating employees within OrgX (Haggerty, 2004), which will be difficult to maintain internally within the organisation as it is a relatively small community-based organisation and job titles/responsibilities will be easily identifiable. Employees will be informed that whilst the researcher will be aware of individual contributions within the raw data, anonymity within research findings will be maintained to conceal participant identity; the thesis itself and related publications (Knowles, 2010; Knowles and Espinosa, 2009) will be fully anonymous. OrgX personnel and departments will be assigned unique identity codes, known only to the researcher, to remove the possibility of direct individual identification.

Interviews conducted with external organisations will be discussed with OrgX employees by name, but recorded as anonymous within the thesis document. As the researcher has been involved with OrgX for three years prior to the project, personal

loyalties to the present community must be tempered throughout the analytical stages of the project. It is impossible to state that emotional ties between the researcher and studied community will not impact upon the research. Therefore the researcher must actively refrain from allowing personal bias to affect critical analyses (Onwuegbuzie and Johnson, 2006).

The researcher must ensure that they do input their own judgments of how environmental activities should develop within OrgX (Barnes, 1984), instead focusing upon the emergence of environmental strategies from the social group. It will also be necessary to develop amicable discussions between environmental and non-environmental extremists, who are unlikely to respond positively to activities that are polar opposite to their beliefs. This will require a middle-ground debating forum to be maintained to placate opposing views and it will be the role of the researcher to ensure stability within these discussions.

3.4 Multimethodology Design

The purpose of this research is to develop a framework for environmental change within a case study organisation; Socio-Environmental Cohesion for Sustainability (SECS). The ontology of the project will be based upon an exploratory approach: through action research the researcher will be a part of the organisation's transformation, allowing the modification and development of environmental strategies in response to continued/emerging organisational requirements. It is anticipated that the development of such a framework could be implemented within similar organisations to that of the case study, providing a suitable model for other organisations to tailor suggested activities into bespoke cultural strategies.

With the view of sustainable development as the pivotal knowledge base of the project, the aim of the research is to produce a generic framework for organisational change to environmental-practices, through adaptive/responsive management (Lee,

2005b). A core focus of the research is to demonstrate that environmental strategies are more likely to be implemented when they are designed by the community that will be affected by them. This project will focus upon the emergence of social values, informal networking and capacity to learn as contributors to organisational change; cultural (dominant) and brain (dependent) metaphors from Total Systems Intervention (Flood and Jackson, 1991; Torlak, 2001a).

Due to the underlying cultural orientation of the research qualitative data (cultural analysis, Social Network Analysis (SNA), rich picture analysis, Team Syntegrity (TS), Viable Systems Model (VSM)) will be regarded as the primary source of data collection, with quantitative analyses (cultural analysis, SNA) providing support to the interpretations of gathered information (Milton, 1996); the methodologies mentioned will be discussed further in the following chapter. The identified techniques come from a range of academic disciplines including organisational cybernetics, cultural psychology, sociology, and anthropology. It is the combination of these diverse methods to address environmental management issues that provides the unique basis of this research.

Blaikie (1991) criticises the triangulation of research methods from different disciplines as the ontological basis of the methods may significantly differ. Ulrich (2001) suggests that the concept of methodological pluralism (complementarism) can only be used once the establishment of boundary critiques (facts and norms to be analysed) has been conducted. The literature review can be summarised as defining the boundary critique: organisational observation, informal networking, practical environmental action and social normative behaviour. This leads to the choice of multiple methodologies for social engagement and analysis, as defined in the above paragraph. The multimethodology design focuses upon the efficient reflection and design of organisational engagement, alongside the identification of problems and practical intervention within the studied system (Mingers, 2006).

It is clear within Table 3.1 that the chosen methods of organisational engagement each contribute to at least two aspects of social (group), personal (individual) and material (causal structures) methodological mapping. Each of the research methodologies that have been chosen for this study are able to provide a unique analysis of the unstructured problems of an organisation: “multiple actors, multiple perspectives, incommensurable and/or conflicting interests, important intangibles and key uncertainties” (Mingers and Rosenhead, 2004, p.531). The chosen methods of analysis have been included within Table 3.1 that is based upon Mingers categories of a multimethodology design.

-	Appreciation of	Analysis of	Assessment of	Action to
Social	SNA and Cultural Analysis (NAM)	SNA and Cultural Analysis (NAM)	SNA and VSM	TS
Personal World	Cultural Analysis (NAM), TS and Rich Pictures	Cultural Analysis (NAM) and Rich Pictures	Cultural Analysis (NAM), SNA and Rich Pictures	TS
Material World	TS and Rich Pictures	TS and VSM	TS, Rich Pictures, SNA and VSM	TS, SNA and VSM

Table 3.1: Multimethodology Design adapted from
Mingers (2006, p.234)

Mingers and White (2010) explain that the multimethodology approach is intended to support the combination of both hard and soft systems methods, providing an ideal opportunity to merge quantitative and qualitative data. The multimethodological approach holds the capacity to join research methods from different philosophical approaches, so as to challenge and develop mutual learning across multiple paradigms (Zhu, 1998). For example, SNA produces quantitative data analysis which will be coupled with the qualitative findings of TS and rich picture analysis. Despite the philosophical discrepancies it is proposed that the strengths of each research model serve to fill the weakness in another, producing a more thorough social and organisational analysis.

Each of the research models are discussed in length in the following chapter, the remainder of this chapter will provide brief summaries of the research models to be used. It is worthwhile to consider the disadvantages of the models being used for academic rigour therefore these are also presented here alongside proposals as to how the researcher can overcome potential issues.

Systems Thinking

Systems thinking is based upon the understanding that a system is made up of a group of interrelated subsystems that work independently towards a common goal; this has already been introduced briefly within Section 2.3. This is an inductive approach that focuses upon understanding a system by studying the holistic communication and adaptation of all of its constituent parts. Within systems thinking any change within a component part is seen to have ramifications to the entire system (von Bertalanffy, 1950a); for example if the human liver malfunctions the entire body suffers not just the one organ. This approach can be applied to social (bee colonies), biological (human body) and organisational (businesses) systems. Primary focus is placed upon the efficacy of communication networks and relationships displayed between the component parts of the system.

Disadvantages of Systems Thinking within EMS design

1. Systems thinking uses the concept of open systems and requires the perspective that subsystems cannot be studied in isolation. Organisations are seen to be in a constant process of adaptation to maintain their identity within multiple external environments. *The researcher will need to successfully demonstrate that environmental practices are relevant to all departments within OrgX (social, economic, environmental), and not just a subsystem of the Facilities department.*
2. Soft systems approaches are based upon interpretive analyses that produce a conceptual understanding of a situation and cyclical learning processes.

Interpretive analyses may encounter some resistance from individuals who prefer more definitive (quantifiable) forms of analysis. The researcher will conduct statistical analysis to support interpretive observations of the organisation.

A systems thinking approach will help to design an EMS that has a holistic outreach throughout the case study organisation. Organisations are seen to be built upon economic, social and environmental variables, that each need to be equally considered within activity developments. Systems thinking focuses upon understanding the interactions and characteristics of multiple groups that form an organisation; the whole system is understood by the interrelated functions of its parts (Mulej et al., 2004).

An alternative approach to systems thinking is reductionism that works to understand the whole organisation by reducing the system to its component parts and treating each as an isolated entity. This approach has proven to be beneficial to many traditional scientific studies that remove external influences upon a specific system, to monitor how it works without the interaction of random variables. The reductionist perspective is not seen to be useful to this approach as the research will be conducted within a real-world business, not a laboratory.

Viable Systems Model

The Viable Systems Model forms the basis of the SECS framework and the research process as a whole. The VSM is based upon the human neural network as an optimal design for self-organisation and systemic viability through the understanding of five specific system features: 1. Primary Activities, 2. Coordination, 3. Internal Cohesion, 4. External Influences and Capacity for Adaptation, 5. System Identity (Beer, 1979, 1981). When used correctly the VSM is able to identify strengths and weaknesses within the communication and feedback structure; a VSM diagnosis looks at every system and subsystem to understand the holistic network or relations

within the whole system. The VSM can be used to diagnose, and therefore ‘treat’, a systems capacity to integrate and adapt to both internal and external fluctuations that compromise system stability.

Disadvantages of the Viable Systems Model

1. The VSM diagnosis will need to be performed by the researcher, with no employees besides the primary supervisor having knowledge of the model. Whilst employees will provide the necessary information regarding OrgX’s structure and functioning, it will be the researcher who will construct and analyse the VSM diagnosis. *The VSM diagnosis will be built upon information gained from employee interviews and general observations of the researcher. Therefore the VSM models that are produced will merge both employee interpretations of OrgX, and the researcher’s ‘external’ perspective of the organisation’s structure. This will enable the comparison of how the organisation is meant to work (observation) and what it actually does (observation and employees).*
2. Jackson (2003, p.107) identifies the VSM as a functionalist model that pays little attention as to “how individuals can be motivated to perform and how participation and democracy can be arranged” within an organisation. *The researcher adopts the perspective of the VSM as a constructionist model in line with the work of (Espejo et al., 1999; Espinosa et al., 2008; Harnden, 1990), which complements the chosen research approach.*

There are no clear alternatives to the VSM within operational research, as this model provides a holistic understanding of an organisation that is not achieved by others. Different approaches to operational research provide a more narrowed analysis, that satisfy specific areas of the VSM: Supply Chain Management primary activities (System 1), Soft Systems approaches administration and internal coordination (Systems 2 and 3), Critical Systems Heuristics internal coordination and identity

(Systems 3 and 5), Total Quality Management primary activities and external influences (Systems 1 and 4) (Maloni and Benton, 1997; Mingers, 2000; Midgley, 1997; Leonard, 1992). The VSM diagnosis encapsulates the whole organisation, producing an analysis that clearly identifies the interrelations of Systems 1 through 5.

Despite the potential disadvantages of the VSM, its focus upon normative, strategic and operational aspects of organisational performance (Schwaninger, 2000) make it the most appropriate method for the holistic diagnosis of organisational viability. This project focuses upon the emergence of social networking as a precursor of voluntary environmental action (Section 2.3.2), and the continued observation of how such developments can gain prominence within an organisation. According to Jackson (2003) operational research uses customer/client-led interpretations of problem structuring, which in the case study organization will be determined by the employee group.

The diagnosis and design capacity of the VSM make it possible to understand how an organisation is currently performing, whilst also identifying its potential for increased efficiency. Leonard (2008) details the use of the VSM as a template for community designs for social and environmental sustainability; providing a logical link between the VSM and EMS, in line with the project's focus (Espinosa et al., 2008).

Cultural Analysis

Cultural analysis can take many forms but the focus of this research will be based upon Schwartz's Norm Activation Model (NAM) (Blamey, 1998). The NAM aims to understand a culture by addressing the Acceptance of Needs, Awareness of Consequences and Acceptance of Responsibilities; Blamey (1998) added the additional Acceptance of Policy to the model. These three aspects of cultural behaviour are seen to predicate the development of normative behaviour within

a society. Once the majority of individuals within society conform to a certain set of beliefs and actions, a metanorm is then produced. The NAM can be used to classify the culture within a system in a specific context; for example within this research the case study organization will be initially analysed as to its ‘Acceptance of Needs’ of environmental activities.

Disadvantages of Cultural Analysis

1. Cultural analysis requires an objective analysis of a studied community, without pre-determined assumptions or expectations of potential behaviours. *The researcher is aware that their own perspective of environmental values cannot be forced upon the studied community. It is essential that the observed community is provided aid with the facilitation of projects that ‘they’ would like to pursue, and not those activities that the researcher would personally choose.*
2. The case study community may not positively respond to the researchers presence. *The researcher has been a member of the case study organisation for three years prior to the projects inception. It is anticipated that this past involvement will reduce employee resistance to the research.*

Instead of conducting a cultural analysis it would be possible to focus solely upon the operational activities, with the perspective that the organisation is a machine; a reductionist principle (Ackoff, 2000). A mechanistic approach would ignore the human dimension of an organisation, instead seeing social actors as cogs within a machine that must conform to the set rules of their position within the system (Morgan, 2006). This would directly contradict prior discussions of the interdependence of environmental issues upon social norms (Section 2.3), and the adoption of an ethnographic research approach (Section 3.2.5).

An alternative approach to normative behaviour analysis is that of the New Environmental Paradigm Scale, a measure used to determine an individual’s

environmental priorities and pro-environmental behaviour (Milfont et al., 2006). Individuals are asked to determine whether they agree or disagree with broad environmental claims such as “Humans are severely abusing the environment” (Dunlap et al., 2000, p.433). The use of the scale can generate consistent environmental valuation statistics across social groupings, but it is proposed that this approach is focused upon quantitative research findings that ignore rich data collection.

The questions used in this scale are deemed to be inappropriate (too generic) for the selected case study organisation; questions are to be tailored to specific activities that employees will be able to relate to. The task at hand is to not only understand the development of environmental metanorms, but also to create a framework for change that can accommodate the diverse set of real-world social values. For the outlined project the base principles of social awareness, consequence, need and responsibility with regards to normative environmental action will be analysed and reviewed throughout the fieldwork timeframe.

Social Network Analysis

Social Network Analysis is used to understand the strength of informal communications within a specific system. Social networks form when individuals choose to cooperate and actively be connected to other individuals with similar beliefs; often spanning multiple networks. SNA can be used to identify emergent values (norms) of social actors within the system of study, which can then be engaged to either support or dispel new developments in line with the overarching social metanorms (Pelling and High, 2005). The identification of weak-ties within an organisation (informal networks of colleagues who do not have official communication channels to one another) can be developed as sources of innovation.

Disadvantages of Social Network Analysis

1. SNA is primarily used to determine social behaviour, with Wellman (1983) suggesting that beliefs and norms are psychological rather than sociological characteristics of action. *SNA will be focused upon identifying individuals within the case study organisation who are perceived as sources of environmental information (sociological). The ensuing analysis will then determine if an individual has gained an 'environmental status' due to their normative behaviours (psychological beliefs) or work-based role.*
2. Urry (2003) suggests that SNA can be affected by the types of communication medium available to the social group e.g. person-to-person, video-conferencing, telephone, email. The core disadvantage is seen to be the respondent's individual interpretation as to definition of social contact: physical meeting vs. electronic communication.
3. Popular SNA software programs, such as Pajek, do not have a user-friendly interface; base-code writing, menu format and base-file data analyses. *The researcher has spent an extended period of time learning how to use the software. It is suggested that within future applications of SNA alternative software programs be tested to build the SNA diagrams, to reduce the amount of time needed for manual coding. However, there is insufficient time within this project to learn a new programming software. The researcher will not ask participants to restrict their choice of contacts to those met face-to-face as the organisation has a strong technological infrastructure, with many communications conducted via email. Similarly the case study organisation has a sister site at a different geographical location and restricting communications to only those conducted face-to-face could affect the inter-site network.*
4. SNA requires participants to feel comfortable in discussing their network of chosen acquaintances. This can cause anxiety due to the 'Big Brother' debate where personal choices become open for scrutiny and apprehension as to what an analysis of these choices could reveal about an individual. *Face-to-face*

discussion with employees will be conducted to clarify the research purpose of naming within the analysis.

5. The networks produced from the SNA will provide a clear depiction of the informal interactions of OrgX community, but it can only be used as a guide to the present social relationships as it is not possible to ensure a one hundred percent return rate. *The researcher intends to use the results of the SNA as an indicator of key actors and subgroups within OrgX, it will not be viewed as an absolute representation of the community network.*

An alternative to sociometric research is the use of other anthropocentric methods such as religious and symbolic interaction theories (Frazer, 2003; Tylor, 2004), and linguistic/cognitive/discourse analysis (Maturana and Varela, 1987). These approaches are focused upon identifying a range of human characteristics/behaviours that define social interaction. By understanding those characteristics/behaviours that encourage environmental action it is possible to develop broad social stereotypes, allowing researchers or activists to construct projects using methodologies that suit target groups.

Whilst such symbolic interactions and discourse patterns contribute to the emergence of an environmentally-focused social group within the case study organisation, research emphasis is placed upon the processes that such groups use to influence the broader system to which it belongs. SNA will be used to identify the presence of environmentally-aware individuals within the case-study organisation, and determine whether such values have instigated the development of an informal environmental network.

The analysis will establish the communicative outreach of environmental individuals within the whole organisation. The strength and capacity for innovation (weak-ties) contained within the environmental network will be analysed and compared to the formal work-based communications network. An informal environmental network will already contain a set of normative behaviours that have been accepted by social

actors within the group, and it is these norms that will form the starting point of organisational change.

Team Syntegrity

Team Syntegrity is a non-hierarchical discursive platform in which employees from all departments and managerial positions are invited to develop a future strategic plan for an organisation (Beer, 1994a). TS uses a logistical arrangement of employee meetings so that all employees meet and discuss the topics of focus with all other members of the event at some stage. Participants are asked to take part in both positive (Pro-Idea) and negative (Devils' Advocate) contexts within specific schedules over a three day period, in order to develop a future strategy that has been thoroughly debated. A core feature of the TS event is that each topic of discussion is revisited three times, which produces a reverberation of practical ideas for implementation that gradually permeates and links each topic.

Disadvantages of Team Syntegrity

1. The TS protocol is a highly unique and innovative methodology of business engagement and it is unlikely that participants will have been involved in a Syntegration before. Therefore a significant degree of trust is needed between participants and the event facilitators to ensure that the Infoset continue to follow the protocol. *The researcher has been a member of OrgX for three years prior to the project, and has developed strong links within the organisations community.*
2. TS is highly dependent upon participant knowledge and the vigilance of facilitators to ensure the protocol is maintained (Jackson, 2003). *The researcher will invite environmentally-aware employees to the event, and invite additional employees to ensure fair representation of all departments. The researcher and a research peer will act as facilitators to ensure that the protocol is strictly maintained.*

3. There is no guarantee that the Final Statements of Importance will become practical activities within OrgX. *The approach of action research adopted for the project will enable the researcher to aid the facilitation of the FSI into practical activities.*

An alternative to the TS technique for environmental strategy development is that of traditional top-down management planning in conjunction with specialist external consultancy. It is possible to employ environmental consultants to diagnose and develop an eco-strategy for the organisation; ISO 14000 and EMAS specialists could be used to conduct this form of analysis (Section 2.2.1). The use of environmental specialists can be beneficial as the knowledge and expertise of these individuals is attuned to the different methods of EMS implementation, they are highly aware of relevant legislation in the field and are likely to conduct the analysis in a concise timeframe.

The disadvantage of using external consultants is that they are not familiar with the organisational culture and will restrict the choices of environmental change to those methodologies that they are familiar with. This could result in the organisation pursuing activities in a manner that does not suit employee culture, with the potential of increased resistance to change. Further to this environmental consultants will develop strategies based upon management goals, whereas the TS technique compiles a set of employee needs. The TS approach can provide a beneficial merger of policies (top-down) and hands-on (bottom-up) knowledge, if the participant set equally represents organizational employees.

Cortés-Aldana et al. (2009) detail the use of Multi-Criteria Decision Analysis (Analytic Hierarchy Process and Analytic Network Process) to study the technology transfer mechanisms of a HE with its socioeconomic environment. Analytic Hierarchy Process (AHP) places business activities within a hierarchical analysis of problem identification, goal, criteria and sub-criteria (Vaidya and Kumar, 2006). The AHP scales the priority of two business activities against specific criteria,

and establishes which of the two has strongest influence upon a third activity (Saaty, 2004). Analytic Network Process (ANP) develops an understanding of the interdependence of local priorities that span system activities (Wu and Lee, 2007), removing the hierarchical structure of analysis. While the ANP could be useful for OrgX to ‘prioritise’ environmental strategy implementation, the TS will provide employees with the means to ‘create’ the strategies.

Despite the possible disadvantages of using these research models the researcher believes that the benefits of their combination will outweigh any potential issues. As shown in Table 3.1 the chosen research models are able to engage the social, personal and material world. Figure 3.2 shows the core strengths of the Multi-Methodologies that have been chosen for the research. For example, understanding the internal cohesion aspect of the VSM will be aided by studying the normative behaviours of the organisation (CA), the identification of any structural holes (SNA), use of tacit knowledge in future strategy designs (TS) and the realisation of how the organisation actually works rather than how it is supposed to work (RP).

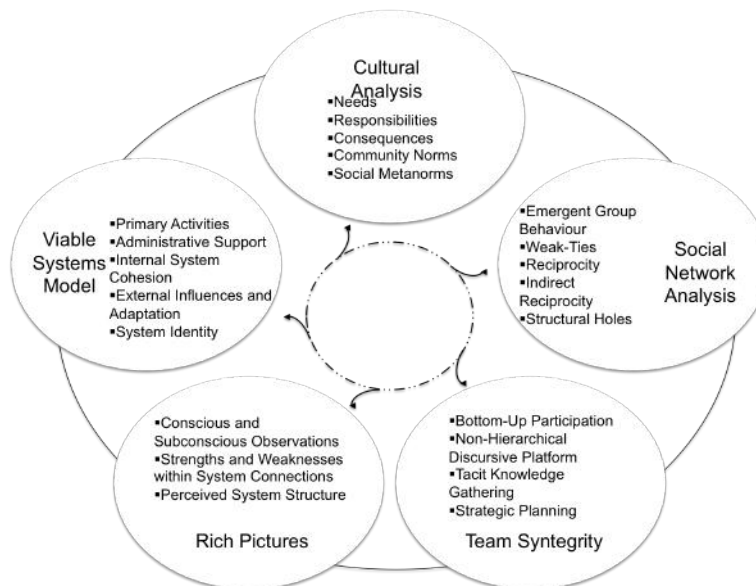


Figure 3.2: Multi-Methodology Complementarities.

Using arrows in the diagram to depict the complementarities of the research models would result in a highly confusing and messy picture, with each of the sub-categories feeding into and being supported by at least three of the other models. The

interrelations of the research models will be explained further within the next two chapters.

In conclusion the research will pursue an interpretivist perspective of social constructionism, in which real-world societies are viewed to be designed, maintained and evolved by the actors within them. A phenomenological philosophy focuses the research upon the values held within a society that is further coupled with an ethnographic approach to social engagement. The use of action research within a case study organisation will allow the researcher to gain direct access to the normative behaviour held within a particular social group (McIntyre, 2002), and observe the process and drivers to adding environmental activities into regular social norms. The following chapter develops the conceptual background to the choice of research methodologies that will be used within the developed framework for change.

Chapter 4

A Holistic Framework for Environmental Change: Socio-Environmental Cohesion for Sustainability (SECS)

This chapter demonstrates the theoretical basis of the thesis and defines the stages by which action research will be used to develop environmental activities within OrgX. The initial sections of this chapter provide in-depth analyses of the chosen research models, establishing the reasons for their choice whilst also identifying potential problems with their use. The methodological framework developed for the project is presented at the end of the chapter defining a coherent framework for community engagement within organisational change; Socio-Environmental Cohesion for Sustainability (SECS).

4.1 Holistic Environmental Management System

This chapter defines the use of systems thinking in the development of an holistic environmental management system to increase the capacity for change within an organisation. Stafford Beer's Viable Systems Model (VSM) forms the basis of the conceptual framework providing a context of viability through self-organisation and effective communication, based upon the human neural network as a guide to optimal capacity; discussed in more depth in Section 4.2. The VSM has been the inspiration to the design of autonomy between social networking and environmental monitoring within the SECS framework.

Systems thinking is itself focused upon the recognition of patterns of interaction between system components/actors, that can generate a 'whole' system map (Moberg, 2001). Businesses are developed to facilitate the exchange of goods to meet human needs, governments are created to maintain inter-group and internal stability, and social networks are developed as an expression of our identity. The internal dynamics of a social organisation consist of multiple interdependent units (Gharajedaghi and Ackoff, 1984), each operating towards the generic goal/purpose of the whole system to provide a certain service/product.

An organisation or system cannot function effectively if its subsystems do not work cohesively towards the specified purpose of the whole (autonomous self-regulation (Espejo, 2003a)). For example, a nation (organisation) cannot be sustainable if the diversity of the present cultures is in conflict e.g. ethnic cleansing in USSR, East-West divide in Germany, religious violence in Northern Ireland. Mingers (1991, p.320) identifies Maturana and Varela's concept of organisation as "the central relations which constitute a system as a whole and which determine its type".

Organisation is a basic concept that is experienced by most individuals during the early formative years, often through language classification of first and second person narrative, family identity, colours and shapes (Maturana and Varela, 1987).

Within businesses such organisation depends upon the effective coordination and regulation of its subsystems, which is specifically reliant upon the communication structure available to the whole system (Beer, 1994a,b).

The business-focused Environmental Management Systems (EMS) discussed within Section 2.2.1 appear to prioritise economic variables, closely followed by environmental needs and lastly by social factors that drive change. Such EMS audit an organisation based upon the efficiency of their reporting systems and top-down management procedures (BSI, 2004a; EC, 2003). While these EMS provide a valuable account of activity integration within organisational procedures, they do not focus upon the range and degree at which environmental activities are pursued; placing priority within management and record-keeping capabilities rather than practical environmental benefits.

Traditional EMS do not adopt an open systems perspective of organisational performance. It is proposed that systems thinking provides the necessary holistic perspective of organisational activity to develop efficient environmental practices (Porter, 2008; Sterling, 2003). Systems thinking perspectives view an organisation as consisting of multiple interdependent units that interact and affect one another (Ackoff, 1971); a change within one unit is viewed to have ramifications across the whole system (von Bertalanffy, 1950a). Flood (2001) identify socio-ecological perspectives of system activity as being based within open systems thinking, which led to the development of action research as a more reliable method of capturing vital social and environmental information.

Stewart and Ayres (2001) proposes that for systems thinkers an identified problem is not seen to be the result of one 'cause', but is in fact the product of multiple causes within the system. This research proposes that environmental management practices need to place equal priority to social (all employees and surrounding community), environmental and economic aspects of organisations activities; whole system perspective. The following sections provide the argument for combining

systems thinking within EMS design, as a method to effectively embed all aspects of the triple bottom line into management strategies and social normative behavior.

4.1.1 Open System

Businesses operate by receiving an influx of resources/demands (environmental), transforming said resources (operational) into their own unique product/services and then delivering the resultant products/services to external consumers (social and environmental). Within systems terms an open system is defined by its ability to maintain its own identity (Midgley, 2000) and structure, whilst being subject to resource flows and environmental fluctuations (von Bertalanffy, 1950b, 1972). For example, a University retains its name and operational activities regardless of an ever changing student group and funding awards.

This concept is relevant to EMS designs as it indicates that organisations cannot be viewed as static entities with a consistent flow of resources, they are instead subject to a variety of external and internal fluctuations. Such variety will be evident within internal and external social values, technological development, political agendas and economic stability. This process is supported by double-loop learning in which an organisation analyses the values that drive its operations, corrects and then adapts its internal behaviour to optimise activities (Senge and Fulmer, 1993).

While an organisation is considered to be an open system it can also be considered to be operationally-closed. Operational-closure occurs when a systems “identity is specified by a network of dynamic processes whose effects do not leave the network” (Maturana and Varela, 1987, p.89). Open and closed systems perspectives are an important consideration for business EMS as they recognise the need for autonomous design (closed) to handle changing values and resource flows (open). In order to maintain an individual identity (niche competitive advantage) an

organisation must be able to self-regulate its internal environment to adapt to external fluctuations.

Homeostats are the mechanisms by which internal regulation occurs through positive (growth) and negative (constraints/regulation) feedback loops (Capra, 1997; Meadows et al., 2005). Based upon the concept of circular causality, these feedback loops work to establish a stability between system components. Pickering (2002) identifies Ashby's development of the homeostat as a cycle of learning and adaptation to maintain internal stability with the external environment. Traditional EMS use feedback loops to monitor and audit operational activities in relation to the social and environmental impacts they cause, but lack sufficient mechanisms to encourage holistic social learning (Section 2.2.1).

Following the perspective of social constructionism (Section 3.2.5) it is suggested that social needs should be considered as a primary influence of operational impacts, as business operations are built upon satisfying specific social demands. Similarly environmental resources tend to determine social needs (food and shelter) and the range of operational activities possible within a certain geographic region (wind turbines (Chen and Blaabjerg, 2009), carbon sequestration (IPPC, 2005), desalination plants (Einav et al., 2002) and solar energy (Trieb et al., 2002)). Each of these activities has environmental benefits that are experienced within internal business operations and external social groups (Lozano and Vallés, 2007); an open systems perspective.

Essentially this suggests that operational, social and environmental aspects of sustainable development each have an impact upon, and are impacted upon by one another. As an organisation is seen to be an open system it is necessary for an EMS to have the capacity to adapt to an ever changing flow of resources, information and social values (Midgley, 2000). An EMS must be sufficiently flexible to maintain its own identity and function within an organisation that is itself constantly reacting to an unstable business environment (Clemens, 2009).

Traditional EMS account for this open systems perspective in terms of market demands (economic) and environmental impacts caused by operational activities (environmental), but fail to recognise the importance of social norms. Internal and external social values provide the ‘invisible’ constructs that dictate the degree at which an EMS is directed and supported. It is proposed that the economic, social and environmental drivers that influence an EMS can be equally engaged if there are sufficient communication channels in place to gather, utilise and feedback relevant information.

4.1.2 Communication

Communication is essential for adaptation as it is only with a full understanding of internal and external realities that an organisation can develop transition strategies that will be worthwhile (Beer, 1970b). Communication within an EMS serves to advertise environmental activities to employees, the general public and other organisations; with the potential to improve perceptions of Corporate Social Responsibility. By communicating with these social groups the EMS can also be used to identify the social connotations of the environmental impacts caused from business operations.

As such it is suggested that a holistic EMS must contain sufficient communication channels to amplify environmental values and activities within internal/external social groups, whilst also having the capacity to gather feedback on the efficacy of EMS procedures. With regards to communication flows information is considered to be a positive feedback of negative entropy, with pure entropy (uncertainty/probability) acting as a negative feedback to balance the system (Beer, 1994a). According to Axel (2006) entropy is the natural tendency for human organisations to become disorganised, which Beer (1981) considers to be death to a viable system.

Beer (1994a, 1974) refers to negentropy as the presence of information within a system that can become the instigator of revolution. Kelley (1969) discusses the transfer of information within communication channels, with entropy/disorder as the probability that the embedded content has a particular structure. To access ‘relevant’ information contained within communications it is necessary to have sufficient attenuation and amplification filters to remove such disorder/‘noise’; reducing the variety of external inputs and amplifying variety in output communications (Espejo, 2000).

Espejo and Howard (1982, p.16) identify attenuation filters as the barriers by which to segregate external “...disturbances so as to pass on only those that require a differential response”; Beer (1979) recognises such variety filters as sources of innovation. An attenuation filter of external environments takes the form of market research (e.g. technology developments, competitor analyses (Devine, 2005)) that can then be transformed by the organisation into future strategic goals; this enables an organisation to adapt its strategies to complement external demands.

Internal attenuation filters should frequently occur within staff meetings and reporting mechanisms (e.g. project updates, summary reports (Espejo, 2008)), in which an organisation’s sub-groups summarise/attenuate their activities into a relatable format (generalised terminology) to share with colleagues. An amplification filter of system activity to the external environment involves any form of marketing (e.g. product or service delivery, one-to-many communications (Espejo, 2008)) that enables the organisation to remain a competitor within its niche. Espejo and Howard (1982, p.16) view amplification filters as having the potential to improve system efficiency by “...developing more absorptive responses” within internal variety management.

Internal amplification filters involve staff meetings (e.g. delivery and discussion of sub-group reports) and alarm systems that notify relevant personnel if operational activities are underperforming (e.g. emails, energy meters). While many of these

examples may seem to be standard activities for regular work discussions, it is suggested that environmental communications can be enhanced if such filters are deliberately designed and maintained. Communication with employees accesses the social values within the system and aids the identification of any problems within the system from those with hands-on knowledge of practical activities; tacit knowledge (Leonard, 2000).

Henriques and Sadorsky (1999) identify that proactive EMS are linked to organisations that place value within stakeholder groups. Using techniques such as the Soft Systems Methodology (SSM) provides a stakeholder perspective of the organisation's activities, with focus upon the content of the problem and process by which to address identified issues (Checkland, 2000; Checkland and Winter, 2006). This approach depends upon the interpretations of system actors to effectively model the problem situation, by combining multiple values and perspectives of organisational activity; complementing the social constructionist approach of the research (Section 3.2.1).

The purpose of the SSM is to understand the complexity of dynamic systems, by defining a conceptual framework of specified aspects of procedural activities (Jackson, 1991). SSM is used to handle the complexity of human activity systems (Jacobs, 2004) that cannot be modelled within traditional mechanistic approaches (Hutchings and Casaar, 2006; Spruill et al., 2001); this approach is most popular within the UK (Paucar-Caceres, 2010). System activities are then reviewed in regards to effectiveness, efficacy, efficiency, ethicality and elegance (Checkland and Tsouvalis, 1997). SSM is designed as a participative study with the analysis performed by organisational members in an iterative process of learning, based upon real-world situations (Checkland, 1994).

SSM uses a seven stage process of system analysis: 1. Defining the problem situation, 2. Expressing the situation, 3. Establishing root definitions, 4. Development of conceptual models, 5. Comparison of real world situation and

conceptual ideal, 6. Definition of potential changes, 7. Action (Nidumolu et al., 2006). A significant aspect of this approach is the use of rich pictures as a method to identify cultural and logical analyses of the problem situation, that can then be used to formulate a future strategy (Lane and Oliva, 1998). The use of rich pictures are used to fulfil Checkland's Law of Conceptualisation that states "that if a system needs to be modelled then the system it serves must first be modelled" (Davies, 1989). Therefore if the purpose of this research is to design an environmental management system for OrgX, it is necessary to first understand how OrgX itself is structured.

As a heuristic methodology SSM focuses upon social behavior and multiple interpretations of real-world issues (Schwaninger, 1997a). Within the context of environmental management integration, conceptual modelling can aid organisational members to divide the implementation strategy into specific tasks, making the project seem less daunting. The SSM provides the further advantage of developing short-term through to long-term visions of each purposeful activity defined by the participants. Significantly, it is the social values contained within the system that will determine if environmental activities are viewed as purposeful.

4.1.3 Environment

As discussed in Section 2.1.1 the Tragedy of the Commons is based upon the concept that the Earth has a finite set of resources for humans to utilise, and misuse of the allocation of such resources results in a poorer quality of life for all within the system (Rankin et al., 2007). It is an inevitable real-world situation that is evidenced by dwindling raw materials, third-world exploitation and the global economic recession, amongst others. Initial solutions to the tragedy focused upon the control of resource consumption by a single governance system (Ostrom et al., 2007).

Ostrom (2007) suggests that such systems are too generalised, producing panaceas for governance that are unable to handle the unique requirements of complex adaptive systems. Due to the complex interconnectivity of both natural and man-made systems any disturbances within their stability is communicated and impacted upon the other, developing into a new structure of interdependent variables. Survival requires the ability to quickly adapt/attune to the structure of the newly formed environment (Kawalek and Wastell, 2002).

Communication channels are responsible for the ability of each system to analyse and respond to internal and external stimuli. Midgley and Reynolds (2001) used a modified SSM alongside other systems methods to develop an Operations Research approach to environmental planning, that could access the bottom-up social values and knowledge present within stakeholder groups. A social system is likely to contain a vast amount of local environmental knowledge (Marshall, 2008), both useful and not, that should be filtered for relevance when designing an EMS for a particular organisation.

The biodiversity of the surrounding natural environment will be different for most organisations and will likely differ between different geographic sites of operation; similar to variations in social values. It is necessary for an organisation to understand the different economic, social and environmental systems that are encountered by its internal subsystems (Beer, 1989). This will result in an EMS design that accounts for all external influences upon the organisation. Within businesses environmental activities often require a long-term perspective of project payback periods (Lee, 2005a) that can be difficult to gain management commitment, especially within an economic recession.

The choice of an organisation to pursue activities with long payback periods relates directly to perceptions of future competitive advantages (social and/or economic); this can be linked to Kantian concepts of action based upon moral obligation (Hartley, 2003) rather than immediate benefit. This mirrors ecology,

where organisms gain a strong competitive advantage in a crowded environment by evolving unique/niche traits that improve natural selection (K-selected) (Cavalier-Smith, 1980); long-term business forecasting to integrate social values to meet future needs e.g. environmental norms.

This can be coupled with a broad range of short-term adaptations that improve the chances of survival through sheer volume (r-selected) (Parry, 1981); rapid business response to consumer demands for competitive advantage. Long-term environmental activities typically include costly changes to on-site buildings to include wind-turbines (Bahaj et al., 2007), ground source heating (Omer, 2007), green roofs (Dunnett et al., 2008; Molineaux et al., 2009), rainwater harvesting (Chilton et al., 1999); the adoption of such activities is highly dependent upon the sector in which the organisation operates.

If an organisation is unable to alter on-site operations in this manner, it is possible to purchase energy from an eco-energy provider (Bird et al., 2002). Business partnerships are a crucial aspect of an EMS as they demonstrate an organisations commitment to conduct external outreach activities with suppliers and consumers with like ethical codes. Another long-term activity can be the appointment of a specific environmental officer within the organisation whose sole focus would be to ensure that the EMS works efficiently and seeks out innovative methods to improve the system.

Alternatively environmental consultants could be employed to thoroughly implement an EMS, however this would require a significant short-term financial costs and may not produce mechanisms for continuous reflection and adaptation of activities. Many businesses operate to gain short-term benefits (Schwaninger, 2006b) such as financial paybacks to ensure that there are sufficient resources to pay monthly overheads, wages and any unforeseen financial costs. Short-term environmental activities involve relatively simple changes such as the installation

of water bricks, eco-friendly detergents, purchase of recycled paper, all of which require minimal funding and management once implemented.

Such activities focus upon internal operational modifications and the decision to opt for business suppliers who offer environmentally-friendly products and services (Handfield et al., 2002; Rao and Holt, 2005). Other short term activities are often reliant upon individual support and adaptation of normative behaviours: video-conferencing, double-sided printing or on-screen reading, car-pool systems, switching off lights and computer equipment. These activities need to be initially implemented by an organisation, but it is the social actors within the system that must choose to utilise such facilities.

Short-term environmentally-focused activities can include indigenous planting, wildlife habitats and responsible management of natural surroundings (conservation gardening); these activities are especially dependent upon social norms as there is no direct business benefit from them. It is the dependence of such environmental activities upon social values and economic constraints that has lead this project to a systems thinking perspective of the holistic interdependence of economic, social and environmental variables.

4.2 Viable Systems Model

Espinosa et al. (2008) suggest that efforts to develop sustainability can be aided by autonomy, cohesion, participation, meta-coordination of operations, eudemony and structural coupling with the environment. Beer's Viable Systems Model (VSM) defines a viable system as a group of interdependent operations that are able to adapt to internal and external fluctuations, a meta-system that performs a cohesive and regulatory function for the whole system, and the surrounding business environment in which the studied system is positioned (Beer, 1979).

The VSM is a neuro-cybernetic methodology (Leonard, 1992) that is comparable to Vedantic philosophy (Beer, 1994b), where systemic harmony is achieved through internal self-regulation. The VSM is a conceptual model that focuses upon the internal and external communication flows of an organisation as a primary determinant of system efficiency. The adoption of social constructionist and ethnographic research design (highly communicative perspectives (Section 3.3.2)) is ideally suited to the VSM's principle of efficiency through optimal communication, learning and adaptation.

From Ashby (1957) Law of Requisite Variety (Section 2.3.1), Beer identified three axioms of management pertaining to purposeful systemic design and the development of variety transducers between sub-systems. The axioms identified the necessity for the presence of sufficient variety regulators within a system, to ensure that each sub-system has the capacity to receive and digest the amount of information it is faced with (Beer, 1979, p.566-567):

“First Axiom: The sum of horizontal variety disposed by ‘n’ operational elements, equals, the sum of variety disposed on the six vertical components of corporate cohesion.

Second Axiom: The variety disposed by System Three resulting from the operation of the First Axiom, equals, the variety disposed by System Four.

The variety disposed by System Five, equals, the residual variety generated by the operation of the Second Axiom.”

Variety transducers convert information between system units to make it intelligible for each unit (presentation and context) (Schwaninger, 2006c); for example, a manager will act as an information converter between senior managers and their

own employee unit. Such transducers are required to filter useful information from the ‘noise’ that is generated from the complex interactions of system operations. Beer developed his VSM as an interpretive/learning model (Paucar-Caceres, 2009b), that can be used to diagnose the capacity of an organisations structure to absorb and reduce variety (Boisot and Child, 1999).

The VSM has been used by cyberneticians across the world to further understandings of financial systems (Morlidge, 2009), political institutions (Clarke, 2006; Tepe and Haslett, 2002), co-operatives (Walker, 1998), personal activities (Leonard, n.d.a), social identity (Stokes, 2006) and biological systems (Beer, 1981). A core concept of the VSM is the notion that viability results from the organisation responding or anticipating environmental changes, through effecting adaptations in its own internal dynamics that allow it to maintain an identity regardless of external stimuli.

Ashby (1957) identified that such an equilibrium or stability of system identity, is dependent upon the presence of homeostats within an observed system; always taking the form of feedback loops. Feedback loops are required to attenuate and amplify variety throughout system communications (Espejo, 2000), transmitting information of external disturbances and responding through internal adaptations. Attenuation of external stimuli within the metasytem enables the allocation of observed environmental fluctuations to the most relevant operational unit; enhancing efficiency through the optimal use of resources.

The knowledge gained from external analyses include constructive (tacit), bureaucratic (explicit), entrepreneurial (tacit-autonomy) and transactive (explicit-autonomy) (Yang and Yen, 2007). Alterations within the operational units are then amplified back to the metasytem through reporting mechanisms, and to the external environment through demonstrations of practical changes. An effective application of the VSM results in improved operational performance, decentralised/autonomous management of subsystems, centralised management of

resource distribution and corporate norms, and the capacity to adapt to external fluctuations (Leonard, 2008).

Operational activities are the primary source of organisational impacts within an environment; with social norms and structures being the cause/drivers of pursuing such activities. According to Stewart and Lewis (1997) business institutions are laden with operational control and demands, resulting in environmental issues often being removed from immediate strategic priority. This would suggest that there is need to identify a subtle approach to environmental management procedures that focus upon appropriate and purposeful changes to the system without causing a hindrance to operational regularity.

The VSM is designed upon the neural network of the human body (Figure 4.1(a)), a natural viable system that constantly self-regulates and adapts its internal functions in response to external stimuli; for example adaptations occur in response to environmental air conditions, digested materials, temperature, danger. It was Beer's intention to utilise the existing optimal design of the human neural network and apply it to business communication structures; autonomy and cohesion rather than top-down control (Espinosa et al., 2004).

The VSM parallels the behaviours and connections demonstrated within evolutionary insights of natural selection: adaptability, detection and response, decision criteria and environmental stimuli (Geisler and Diehl, 2003). Within the VSM Beer identified five systems that were present in the neural network that were essential to the self-regulation/control of the system (Leonard and Bradshaw, 1993): the organs, sympathetic nervous system, lower brain, mid brain and higher brain functions (Walker, 1998). The presence of all five functional elements (Systems 1 through 5) is considered to be essential for an organism or organisation to survive (Paucar-Caceres, 2009a).

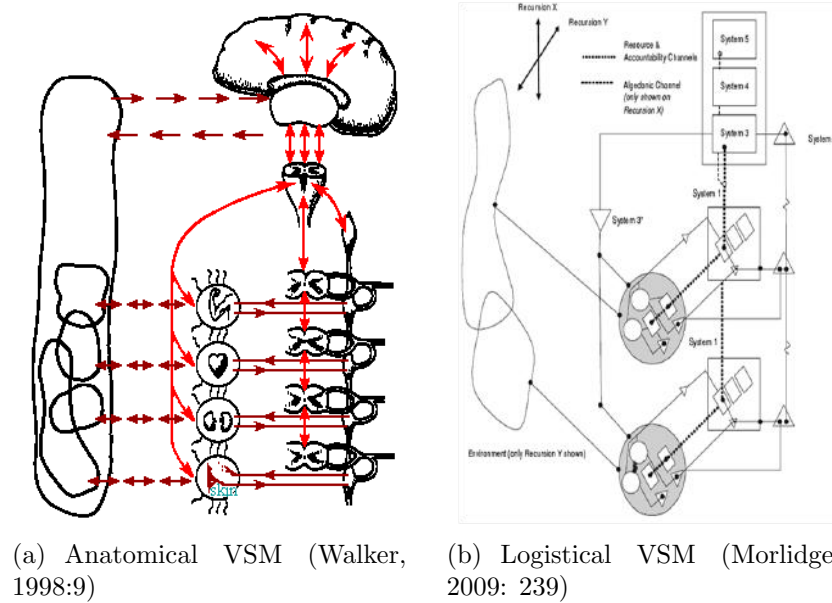


Figure 4.1: Viable Systems Model.

The VSM provided an innovative approach to diagnose the recursive nature of organisational structures through the ability to identify holes within communication networks and regulatory mechanisms. For any policy or operation to be successfully integrated into an organisation it is essential that the procedure is holistically adopted; change needs to be enacted within all recursive levels of the system to ensure effective communication and regulation of the new activity.

A core premise of the VSM is the notion that “...viable system contains, and is contained in, a viable system” (Beer, 1979, p.566). The metasystems contained within one level of recursion are equal to the variety of the primary activities within the higher level of recursion. This can be seen in Figure 4.1(b) where System 1 boxes are shown to contain the metasystem (three diagonal boxes representing S2 to S5), from the lower recursion.

Beer (1979) defines this link between lower metasystem to higher primary activities as the Law of Cohesion for Multiple Recursions of the Viable System. Espejo (1999, p.647) explains that “...a recursive organisation emerges from the interactions of primary activities, at several structural levels, each aligning their self-defined purposes with those of the more global organisation”. The purpose of defining such

aspects of the organisation is to identify parts of the system that should be able to work as an autonomous unit within the whole system (Beer, 1981).

An autonomous unit is a subsystem of the system-in-focus that is able to work in isolation from other units, whilst maintaining an operational synergy with the observed metasystem (Espejo, 1999). System 1 (S1) is concerned with the primary/purposeful activities of the organisation, those operations that are necessary to ensure that the intended purpose of the studied system (Level 0) is being achieved. Primary activities are considered to be autonomous (Tejeda-Paidilla et al., 2009) having the capacity to self-regulate through the presence of activity-specific management, funds, internal policies and a site of operation.

For example, the primary activities of a Higher Education establishment will be teaching, research and community outreach/professional networking; within one level of recursion. The VSM's System 2 (S2) focuses upon the co-ordination of the business activities (S1) and strives to facilitate optimal efficiency by providing support and administrative functions (Achterbergh and Vriens, 2002). According to (Leonard, 1992) Socio-Technical Systems and Total Quality Management can be used for S2 functions, to support and aid coordination of S1 activities. S2 regulates the information and communications shared between primary activity units (Schwaninger, 2004a).

S2 is the 'spinal cord' of the model, designed to dampen oscillations between operational units and resolve conflicts (Beer, 1981; Walker, 1998). S2 receives amplified messages of need from all S1 units that need to be attenuated to filter each request onto a scale of priority. Using the same example of a HE establishment attenuation and amplification between S1 and S2 can be identified in support processes such as room allocation for teaching sessions, timetables and informal networking.

System 3 (S3) seeks out synergy (Leonard, n.d.a) between the operational units (S1), resource distribution, umbrella policies and changes within the external environment. A core condition for viability is that the system exhibits a structure that balances autonomy (to distinguish itself from what is outside) and cohesion (to synchronise its parts and orchestrate a joint enterprise); this function is completed within S3. This cohesion/synergy strives to provide optimal resource allocation, accountability of task completion and corporate norms within the system by monitoring the self-regulation of S1 and S2.

Traditional EMS focus upon task responsibility which only fills the ‘accountability’ aspect of S3, limiting the framework to a single mechanism within a viable entity; supporting prior assertions for a need to develop more holistic approaches to environmental procedures (Section 4.1). Within a HE establishment the S3 function could be seen within academic review and ethics committees, where the primary goals of the group are to ensure that internal standards meet the criteria set by external bodies e.g. HEFCE.

It is within the S3 function that corporate norms and policies are established and it is here that environmental values need to gain prominence. By embedding environmental activity standards within S3, operational activities will become audited (S3*(Schwaninger, 2006c)) upon their ability to conform to corporate environmental norms. The S3-S4 homeostat (internal-external regulator) enables the organisation to monitor environmental values held within external social systems (customers, business partners, governments) and alter internal norms to complement such values.

The S3-S4 homeostat is a pivotal function of an organisations ability to balance autonomy and control of its subsystems (Davies, 2002). System 4 (S4) of the VSM progresses to define the influence of external environments upon business operations (Shen and Midgley, 2007), providing information for future forecasting and adaptive management procedures. From this perspective any viable system has to be aware of

changes within its niche market, in order to remain competitive. S4 acts as a third-eye for the system, focusing upon precautionary scenario building, preventative and reactionary procedures; (Espejo, 2003b) refers to this as the ‘Intelligence’ function of the VSM.

Within a HE S4 activities are viewed as new legislation, competitor strategies, national student surveys and academic certification. Maturana and Varela (1987) view the interaction of an organisation and its environmental niche as a ‘structurally coupled’ dance, where both entities react to changes in the other system similar to that of the yin/yang transformation. In this context ‘structure’ is viewed as recurrent patterns of social interaction in a human activity system (Checkland, 1981; Maturana and Varela, 1980); linking organisational systems to basic ethnographic principles of human interaction.

Each level of recursion has its own S4 environmental niche, which should be considered as an inter-recursion monitor. System 5 (S5) of the VSM provides organisational closure and uses the S3-S4 homeostat to identify the system boundary (Hoebecke, 2006): stability of internal cohesion, environmental fluctuations and organisational niche. According to (Schwaninger, 2006b) Intelligent Organisations have a fourth dimension to their operations that includes a social ethos, identity and vision; similar to Potocan and Mulej (2007) suggestion that Sustainable Enterprises will house economic, ecological, social and ethical normative structures.

This fourth dimension supports S2 and S5 of the VSM, and is also aligned with the concepts of sustainable development and environmental management. Within a HE organisation, using Level 0 as defined earlier, S5 acts to establish if system policies match those performed by S1 activities. Within a democratic organisation S5 would consist of all employees, in an autocratic organisation S5 would consist of the Senior Management Team and Vice Chancellor. S5 establishes internal policies, identity and goals while also determining strategies for adaptation (Terenzi, 2006)

to maintain a ‘healthy fit’ with the external system environment (Hoverstadt, 2010); for example in response to internal/external social and external business metanorms.

The metasytem (S2 to S5) regulates operational activities, provides internal and external auditing (social ethos and vision), and defines the system boundaries (identify); the ideal location for incorporating environmental values within an organisation. Espejo et al. (1999) discusses the identification of TASCOI variables within a VSM diagnosis to explore system Transformation, Actors, Suppliers, Customers, Owners and Interveners (Table 3.1). This is a variant of Checkland’s CATWOE analysis for Soft Systems modelling: “CATWOE supports the creation of meanings in the collective’s information domain, TASCOI supports the production of meanings in their operational domain” (Espejo, 2002, p.29).

TASCOI	Economic	Social	Environmental
Transformation	Money	Employees	Raw Materials
Actors	Operations Management	Employees	Energy
Suppliers	Products or Services	Values	Surrounding Biodiversity
Customers	Sales Revenue	Market Demands	Byproducts
Owners	Senior Management	Employees	(-)
Interveners	Accreditation Bodies	Customers	Resource Limits

Table 4.1: TASCOI analysis incorporating economic, social and environmental variables

Transformations within the system occur to change external inputs into a useful output for the organisation; in the form of unique products or services, and internal consumption demands (e.g. electricity, water). Actors are those individuals who are responsible for ensuring that internal operational procedures are effectively transforming external inputs to the system. Suppliers are considered to be those organisations or individuals who provide any form of external resources to an organisation. Customers are viewed as any organisation or individual that receives an output from the transformation process.

Owners are those individuals who oversee the whole transformation process to ensure that it is functioning properly. Interveners are those entities that are external to the system that determine the type and manner in which transformations occur (Reyes, 2001). A thorough TASCOI analysis can aid the VSM diagnosis by identifying the external stakeholders and customers who determine transformation

needs (open systems perspective (Section 4.1.1)), and internal operational and monitoring systems that affect system performance. The VSM provides the holistic diagnosis of communication channels within and between each of these TASCOI variables, identifying the presence and efficiency of feedback loops within the system.

4.3 Cultural Analysis

As an ethnographic study this project places significant worth upon understanding the social values that structure a specific community. It was determined in Section 3.3.2 that the researcher will act as an observing participant so that they can monitor and analyse social responses to environmental issues and any changes that may occur in such values as the project progresses. The following section explores the role of cultural analysis in developing practical activities that benefit society and the natural environment.

Theron (2002) identify that environmental protection as a normative behaviour is gaining global attention. Even so there is still an enormous global debate over the negative impact of humans upon the environment and the limits at which individuals will alter their own behaviours (Section 2.1). Cultural values determine a diverse range of social phenomena:

1. Social choice to have a national welfare system or not (Michalski, 2003).
2. Business choice to donate excess resources to charity (Alexander and Smaje, 2008).
3. International environmental agreements (Ball, 2009; Barrett, 1994).
4. International and national discrepancies in environmental valuation (Ayoagi-Usui et al., 2003), beliefs (Castro and Lima, 2001) and actions (Corraliza and Berenguer, 2000).

5. Personal norms that dictate recycling behaviour (Bratt, 1999).
6. Business development of Corporate Social Responsibility (Birch, 2004; Cockburn, 2007).

These examples are not seen to be a global representation of national policies, organisational ethics or cultural values, they are adopted by different social systems at varying degrees of commitment. Cultural analysis is deemed to be beneficial to EMS design for the purpose of identifying those values that drive social choice to pursue such activities.

4.3.1 The Need for Cultural Analysis

Bateson (1972, p.65) suggests that when two cultures interact both groups may merge, one or both be lost, or an equilibrium will be reached. These interactions are governed by affective unity (emotional), economic unity (materialism), chronological and spatial unity (time and place), and sociological unity (integration) (Bateson, 1972, p.66). Within the context of environmental issues there are three core social groups: deep ecologists, shallow ecologists and non-environmentalists (Fox, 2003). Each of these groups will contain individuals with differing attitudes and perspectives towards environmental activities; personal preferences need to be accounted for in order to understand social distinctions.

Kortenkamp and Moore (2000) identifies ecocentrism, anthropocentrism and non-environmentalism as the contexts by which humans place value upon nature; the environment has its own value, the environment is valuable to humans and the environment has no value, respectively. The use of Ravetz's Total Metabolism Model proposes that social values need to be fed upwards into a system, supported by downward input of human impacts (Midgley, 2000). Bamberg (2002) suggests that environmental action is aided when there is an implementation-intention and

reward incentive for pursuing the activity; for example peer perceptions and money, respectively.

This is quite typical of individual choices of action, where activities that cause the least personal disruption (owned car and loft insulation) while also providing a positive return (convenience and reduced heating bills), are most likely to be adopted (Gintis, 2008); Olli et al. (2001) refers to this as environmental Attitude-Behaviour-Response (ABC). De Young (1993) suggests that the experience of practical environmental actions enables individuals to gain confidence in pursuing such activities effectively. This places environmental values and actions as learned behaviours, which would suggest that they can become a regular habit with continued experience; an evolved cultural norm, similar to stigmergic self-organisation within animal groups (Susi and Ziemke, 2001; Bonabeau, 1998b).

Dawkins (1976) introduced memetics as the evolutionary mechanism that steers social action towards survival, often through short-term perspectives of immediate and urgent needs. Ehrlich (2002) indicates that cultural evolution requires: leadership, social diffusion and contagion, longevity and ideation. These five variables can all be considered as developmental stages of social norms. Senge and Carstedt (2001) suggests that we need to engage with consumer perceptions that drive the want for personal ownership of material objects, as they can enjoy equal benefits from community resources e.g. personal versus public transport.

However, engagement and advertising of such issues can often be counterintuitive in the UK, Milton (1996) suggests that environmental value is not effectively translated within this country due to the use of confusing terminology. Similarly Penn (2003) suggests that media advertising is partially responsible for consumption-cultures as it is deliberately focused upon making people unhappy with themselves physically/emotionally and to dislike their belongings, playing at our instinctual needs for higher social status to attract the opposite sex. Hughes and Sharrock

(1997) identify that human thought is dependent upon culture and that words are affirmed by action.

Pojman (1999) illustrates that knowledge comes from our sensory perceptions meaning that we learn from experiences that we can tangibly interact with through sight, smell, sound, touch and taste; within environmental contexts these areas could be broadly examined through visits to landfills, noise pollution, conservation projects and organic food. Visual engagement can enable researchers to access the subconscious values of individuals and can provide a creative approach to community learning through artistic projects that enhance environmental literacy (Jacobson et al., 2007), and provide an easily relatable message that can cross cultural and social divides (Bateson, 1972).

Simon (2006) provides the example of artist Agnes Denes who transformed a landfill site into a living field of wheat. Such symbolic interactions enable individuals with like values to engage in a common discourse of the topic matter, however if people with similar or opposing values interpret the art work differently discourse can become fragmented and unproductive (Vilar and Inglesa, 2001).

4.3.2 Group Behaviour

Using the context of self-preservation (an interpretation of sustainable development) as a driver for individual and group activity, it is possible to look for similarities between the human and animal kingdom. For example, social cooperation increases the chance of survival (meerkats (Ross-Gillespie and Griffin, 2007), fish schools (Zheng et al., 2005)), individual actions that compromise group stability are punished (alpha male battles (Kutsukake and Hasegawa, 2005)), and future generations learn from internal group activities with innovation coming from adaptation (feeding strategies (Maturana and Varela, 1987)).

A distinct difference between the two groups is that animals do not tend to destroy their surrounding environment as humans do, as it would increase their visibility to predators and adverse weather conditions, reduce food and clean water sources, and compromise the ability to harbour offspring. There is no naivety from the researcher at this stage, human society does not have the same structure as those of animal communities, and our methods of environmental conservation are far removed from animal practices.

It is possible to ‘learn’ from the community synergy/cooperation that is present within many animal groups (Bonabeau, 1998a; Bradley, 1999; Stephens, 1996; Wey et al., 2008). It should not be assumed that the adoption of sustainably-orientated behaviour is free from personal motivations/betterment i.e. neighbour perception, improved goodwill and enhanced marketability (Maronick and Andrews, 1999). The drivers for such behaviours are linked to reciprocal altruism (Section 2.3.2), in which an activity is performed to improve peer perceptions with the hope that this will lead to expanded and stronger social networks.

Sigmund (1998) suggests that most forms of human reciprocity occur through economic exchanges that can be modelled upon game theory (Section 2.1.1). Trivers (1971) explored the characteristics of human reciprocity and found numerous psychological factors that determined individual choices to cooperate or defect; including morals, trust, guilt and hypocrisy, amongst others. Nowak (2006) describes Hamilton’s Rule that altruism occurs when the coefficient of relatedness (genetic links) between a donor and an actor are higher than the cost-to-benefit ratio; kin selection.

le Galliard et al. (2003) propose that altruistic behaviour is more prevalent in low mobility groups, where social actors remain within close proximity to their childhood home. This proposes an intriguing concept of global travel, work, telecommunications and family dispersal, as drivers to the reduction in altruistic behaviours within society. This reduction can be linked to Gildenhuis (2003)

proposal that altruism causes an indirect benefit to the originator somewhere within the system; modern global outreach results in this indirect benefit being absorbed into a much larger social system than traditional community-based networks.

Conversely Lebra (1975) suggests that social behaviour is more closely linked to triadic reciprocity which leads to hedonism or altruism. Trivers (1971) work demonstrated the similarity of reciprocal altruism in humans to the cleaning symbioses and warning cries of animals; linking to the above assertion that it is possible to understand the evolution of human behaviour by studying animals. Axelrod (1986) expanded the Prisoner's Dilemma theory of human action to include the ability for social actors to punish those who choose to defect; normative behaviour.

The presence of normative behaviour is a result of cultural values as to what is deemed an acceptable social behaviour and the point at which punishment is deemed necessary. According to Alison (1992) altruism contradicts our genetic disposition to act selfishly to survive, with norms seen to be a social behaviour that has somehow surpassed basic instincts of self-preservation. Cooter et al. (2008) identifies that norms are based upon perceptions of 'others-are-like-me' (affirmation of action), and 'others-are-bad' (moral-based judgements).

Stokes (2009) suggests that norms cannot be used as a sole determinant of individual behaviour, as each person will determine their internal level of commitment and value to a specific topic. UK businesses are subject to legal punishment if they cause environmental damage through hazardous waste disposal, water contamination, noise disturbance and disruption to the habitat of protected animal species (NetRegs, 2010). These aspects of environmental degradation have reached a metanormative status.

The adoption of environmental activities that are not subject to metanormative punishment are seen to be the result of bespoke social group values of rational

behaviour; hence the need to analyse organisational culture. Smith and Stacey (2003) refers to ecological rationality as the process of cultural and biological evolutionary order (norms) that emerge from human interactions; they are not necessarily designed, but more the result of social development.

4.3.3 Forms of Cultural Analysis

Anger (2002) explores Hayek's theory of cultural evolution and defines the underlying construct of the theory as that of legislative and judicial variables; these are seen as spontaneous developments from group consensus. Using Hayek's theory it can be assumed that it is unlikely that an eco-culture will develop without supporting legislation. Similarly Guibentif (1996) identifies a similar concept within Habermas' theories pertaining to the production of law which develops through normative action, that has emerged from the continued communication of multiple social actors with a shared understanding/standard of legitimacy; this standard can be viewed as macrosocial hypernorms (Calton, 2006).

Axelrod (1986) refers to these legitimacy standards as metanorms, where actors within the system are punished for non-compliance to the 'rules', and those who turn a blind-eye to defection are also punished. Schwartz' Norm Activation Model (NAM) places social action into specific responsive stages: attention, consequences of action for self, anticipatory evaluation and defence (Blamey, 1998). The NAM is designed to identify and foster altruistic behaviour and moral value to a specific social activity, and as such can be used to develop individual belief in Environmentally Responsible Behaviour (ERB) (Corbett, 2005).

NAM has been used in regards to environmental behaviours in previous research, demonstrating a link between altruistic morals and the tendency of an individual to feel personally responsible in protecting the environment and other humans from environmental degradation (Stern et al., 1999). Altruistic behaviour in

this context is seen to follow the process of engagement with a social norm, that is then internalised to a personal norm at which point the degree of moral internalisation results in the choice of future behaviours (Hopper and McCarlnielson, 1991). A standard test used to conduct a NAM analysis involved the use of questionnaires including broad statements, such as “Humans are responsible for environmental degradation”, and asking respondents to measure their identity with the statement on a Likerts scale (DeGroot and Steg, 2009). Following Blamey’s (1998) extension of Schwartz’s theories, the cultural analysis will classify the case study organisation’s actions and knowledge into categories of Awareness of Need, Awareness of Consequences, Awareness of Responsibility and Acceptance of Policy. Blake (2001) identifies that collective environmental action is most likely to be adopted by postmaterialists, and will often be of lower priority when economic resources are low. Brown and Kasser (2005) findings support this theory in that individuals with more intrinsic values and community mindfulness tend to elicit stronger identification with environmental behaviour. Clayton and Brook (2005) proposes a social psychological model of behaviour towards conservation activities, through the study of an individual’s past/present knowledge and experiences alongside personal motivators for action. The cultural analysis that will be conducted within the organisation will be used to determine the knowledge and experiences of employees, to understand the socio-psychology of the community to enable a strategy for Norm Activation to be developed. In a sense this research adopts the concept of socio-cultural anthropology, attempting to understand the development of normative behaviour in an observed community.

Using the approach of action research, the researcher will become embedded within the case study organisation to engage with current normative behavior, work in participation with the present community and develop strategies for eco-transformation in line with community values. These values can be considered as a form of qualitative social contingency valuation of environmental activities (Gregory et al., 1993).

4.4 Social Network Analysis

Within Section 3.1 it was identified that the ontological perspective of social constructionism will be adopted for the research, to complement the research question that social networks and individuals are core aspects of business functionality. The research to be conducted is based upon the understanding that business organisations are laden with the normative behaviours of the individuals and social networks present within the system (McGovern, 2003). The following section explores the use of Social Network Analysis (SNA) as a tool to gather information regarding social actors and the drivers that determine their interactions.

SNA is closely linked to both cultural analysis and the VSM due to its core focus of both formal and informal communication networks within a system. The SNA has the potential to aid a VSM diagnosis as it can identify the actual communication networks (feedback loops through Systems 1 to 5) that are active within the system, and not just those that are intended to be there. The SNA analysis can be used to establish weaknesses in the feedback structure of system analysis, enabling the VSM practitioner to more easily target specific areas for improvement.

Milfont et al. (2006) suggests that social action can be considered as either harmonious (conformity) or mastery (innovation), which provide set rules for social integration and the capacity for individual autonomy within normative standards, respectively. According to Stewart (2000), cooperation is essential to social evolution with regards to specialisation, innovation and group survival abilities that are not possible for individuals. Developed by Moreno (Kadushin, 2005), sociometric research focuses upon qualitative variables that determine an individual's choice of social interactions (Freeman, 2004; de Nooy et al., 2005); for example, a researcher may ask "Who do you spend lunch with?" with the answer being "Bob, Margaret and Frank".

The use of qualitative indicators allows for the construction of a visual network of social interaction between specific individuals within a studied network; the resulting sociogram can then be used to produce quantitative analyses of network strength and efficiency. Granovetter (2005) indicates that business productivity is aided when those with expertise within the network are engaged within the planning process; such inclusion can be identified within SNA. The purpose of the analysis is not to identify broad social statistics, but to develop an in-depth understanding of a specific community.

van Kleef and Roome (2007) suggest that Sustainable Business Management (SBM) requires, amongst others, the ability to manage the differing values and goals of internal and external networks; placing importance upon the social dimension of sustainable enterprises. Amidon (2005) explores Senge's Fifth Discipline of organisational analysis (systems thinking) as having the ability to engage with the social networks that determine the direction of the company. Senge and Carstedt (2001) identify that organisations need to engage the social networks present within the employee group to understand the values of the workforce; these values can then be translated into corporate ethics, likely increasing staff retention.

The use of SNA can also be highly beneficial in gaining access to social 'mastery' such as Local Environmental Knowledge (LEK) (Crona and Bodin, 2006); the vernacular knowledge present within an established/native community that is laden with socio-environmental synergies, entrepreneurship and innovations (Berggen and Silver, 2009; Borch et al., 2008). Within the questionnaire that participants are provided with opportunities to suggest and comment upon areas of the organisation that are perceived to require improvement (local knowledge).

Environmental activities are best suited in a utopian society where altruistic behaviour is a normative function of social interaction. The closest form of behaviour to altruism exhibited by businesses, is that of reciprocity in which the philosophy of 'I'll scratch your back if you scratch mine' can be used as a political

manoeuvre (Section 4.3). In the same way that cybernetics is laden with the concept of circular causality so is the idea of reciprocity (Section 4.3.1), in that a return/feedback is required to complete the system of interaction: both follow the process of interaction-response-interaction.

It is through this interplay of reciprocal behaviour that trust and reputation building is developed in both society and business environments, with strong networked relationships viewed as drivers to prevent inter-actor deceptions and maintain social standing (Granovetter, 1985). Engaging with the social behavior present within the studied system allows for the development of visual networks of reciprocity, that in turn identify those individuals who see value in continued positive social relationships (Tullberg, 2006).

According to Pelling and High (2005) the use of SNA in conjunction with norms can develop an adaptive capacity within a social group, especially within the context of climate change issues. Further to this four areas of social adaptation are identified: coordination of existing social capital, education, activation of latent social capital and voting (Pelling and High, 2005, p.312). Within the context of environmental issues each of these areas can be defined as green activists, community engagement, peer pressure and green lobbyists; in line with Bateson's (1972) identification of sociological, economic and affective unity in cultural interactions.

Within the SNA a 'snapshot' is taken of the social interactions present within the observed system, providing a visual representation of the connectivity of individuals and key players within the network. Within SNA individuals are defined as a 'node' with interactions between network actors depicted by lines (Figure 4.2). Each node/individual will exhibit different traits (e.g. eco-activist/pacifist) and it is through the use of additional questions that the four areas of unity can be identified within the network. This network can then be split into different categories of like individuals dependent upon personal attributes; for example, in Figure 4.2 same coloured nodes could represent actors from the same business unit.

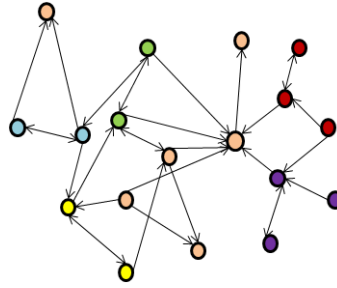


Figure 4.2: Example of an SNA diagram.

Actors/individuals are differentiated by colour/role within the diagram and directed lines are used to show the inward and outward communications of each node. Reciprocal/dyadic interactions can be seen where a double-arrow line is present between two actors; within the example network mutual communication is only exhibited in internal interactions of same colour nodes. This would suggest that for this example network individuals will interact with others who have the same personality traits (colour) as the relationship is reciprocated.

Within-group connections can cause additional friction as individuals expect trustworthy interactions from members of the same group, potentially leading to heightened disappointment in ‘kin’ relationships that fail to reciprocate fairly (Koopmans and Rebers, 2009). Cross-trait interaction is not reciprocated within the figure and this is often exhibited where there is either a distrust or lack of worth attributed to other groups. Within SNA dyadic interactions exhibit a form of network strength through mutual appreciation/reciprocation.

Structural holes within the network (missing communication channels between nodes) can cause communication problems unless weak ties are present to bridge the gap (Burt, 1995). Schwaninger (2006b) uses the example of the three preventable deaths in Shakespeares’ Romeo and Juliet as a failing in closed loop social systems, where communication barriers (structural holes within the social network) prevent vital information from reaching the necessary targets. This can also be linked as a negative aspect of eavesdropping upon signaller communications that are intended

for other receivers who contain the necessary attenuation filters (McGregor and Peake, 2000).

Reciprocal connections are identified in the analysis of the ‘indegree’ and ‘outdegree’ of each node, establishing the centrality of the actor within network communications; social capital contained within the network (Everett and Borgatti, 2005). This analysis provides a numerical value between 0 and 1 (0 = little communication, 1 = highly involved in network), enabling the identification of ‘weak ties’ and ‘prestige’ (Granovetter, 1983). Weak ties are connections between network groups/colours that foster innovation and optimise the dissemination of information throughout the network; heterogenous ties (Jack, 2005).

Significant problems can be caused when weak ties are not present with information becoming stagnated, from the lack of new knowledge and opinions being brought into the network. An actor that receives high input and has little/no output is considered to have ‘prestige’ within the network, as they are viewed as a core contact by other individuals and are able to function in isolation. Broker roles are exhibited by the position of actors within the network referred to as coordinator, itinerant broker, representative, gatekeeper and liaison; Figure 5.25 adapted from Batagelj and Mrvar (2007, p.30).

A coordinator is an individual who acts as the ‘bridging’ communicator between two or more nodes within its own subset/cliue, see ‘A’ in Figure 4.3(a); this actor monitors the internal regulation and cohesion of the subset. Bodin et al. (2006) identify these bridging communicators as core contributors to development in the co-management of natural resources. An itinerant broker is an actor ‘B’ who is the only communication point between two nodes from a different subset (Figure 4.3(b)).

This role seeks to fill the structural hole present within a subset different to its own, acting as a consultant (Berlotti, 2009). An actor ‘C’ that is the sole

communicator between its own clique and a node from another subset is referred to as a representative (Figure 4.3(c)); this actor amplifies the activities of its own subset towards another clique, exhibited by bottom-up communications.

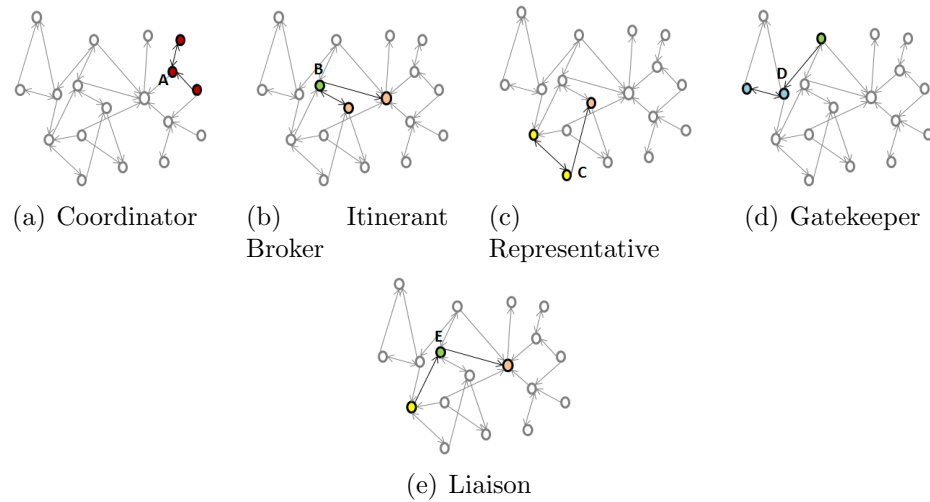


Figure 4.3: Broker Roles of SNA

A gatekeeper is an actor who holds communications from external subsets before the dissemination of information to its own subset, see ‘D’ in Figure 4.3(d); this role can be considered as an importance filter and is typically visible in top-down communications. Hammersley and Atkinson (1995) identifies gatekeepers as pivotal social actors within ethnographic research. An individual who acts as an outside mediator to other nodes is referred to as a liaison, see ‘E’ in Figure 4.3(e); this actor ensures that different departments of the network function simultaneously, usually depicted within the finance, purchasing and sales cycle.

Each of these types of actors represents a vital role in the network, but Tichy et al. (1979) suggest that it is the liaison and gatekeeper roles that are of prime importance. ‘Betweenness’ is a measure of the frequency by which a node is present on the paths between other nodes in the network (Newman, 2005); this analysis produces a value between 0 and 1 (0 = no connections, 1 = all possible connections). Ohtsuki et al. (2006) identifies that low connectivity or the fewer links between nodes within a network, will reduce the level of cooperation present within the network.

This is due to the lack of cross-group reciprocity, which restricts the development of trust between different groups. ‘Incloseness’ and ‘outcloseness’ measures are used to establish the shortest path from each node to all other actors in the network; again producing a value between 0 and 1 (0 = low centrality, 1 = high centrality). A node is considered to be highly centralised when it requires few bridges to access the whole network (Brass et al., 1998). When attempting to establish a new activity within a social system, it is essential that those nodes with high centrality are actively engaged within the change process.

4.5 Team Syntegrity

The cybernetic model of Team Syntegrity (TS) will be used to facilitate employee design of environmental activities within the case study organisation. TS works to develop a non-hierarchical participative discussion platform that enhance business decision-making processes (Beer, 1994a); Santos et al. (2006) discusses the benefits of stakeholder participation within sustainable management practices. The following section explores the processes by which the TS model enhances discussions between employees and management, to produce future strategies laden with tacit and explicit knowledge.

White and Lee (2009) recount their use of the VSM and TS methodologies to tackle issues of sustainability within a UK city. The use of TS and Soft Systems Methodology workshops in which members work within teams to optimally disseminate information and clarify the direction of devised strategies (Schwaninger, 2000) significantly aids the value of S3 within VSM diagnoses (Espinosa and Mejía, 2006). In order to optimise internal analysis it is desirable that representatives from all S1 units and S2 activities (Section 4.2) are present within TS discussions; bringing tacit knowledge.

The presence of S3, S4 and S5 representatives add explicit knowledge to the discussions to ensure that developed strategies are in line with external demands and organisation policies. It is proposed that the TS methodology is the most effective tool to encourage cohesive group discussions within a community due to its focus of group equality, participative discussion and development of purposeful strategies bespoke to social needs (Leonard, 1996).

Many business decisions about environmentally-oriented action are made at the top level of the hierarchy and then informed or communicated to the staff in a top-down approach (Potocan and Mulej, 2000). The TS approach provides an organisation with the ability to design future strategies from a mixture of employee groups (department and hierarchy) that can access the knowledge and social values contained within the system, developing a bottom-up strategic plan. The advantage of developing participative decision making practices, is that employees feel empowered as their opinions have been included within vital business plans; senior managers and shop floor workers are considered to be equal within discussions (Flood, 1999).

Similarly it is far more efficient for strategies to be developed by employees from all positions within the organisation, as they will have practical knowledge of any deficiencies in current business practices and provide holistic representation of the system. According to Beer (1979) the ‘true boss’ of an organisation is its cohesive processes, with synergistic couplings a primary influencer of efficiency. Anker (2007) discusses Buckminster Fuller’s development of ‘ecological synergy’ in which the geometric structure and energy contained within a whole system is considered to be stronger than its individual subsystems.

This strength comes from the ‘tensegrity’ of geometric patterns: a strong resilient structure can be built from ‘weak’ materials when forethought is awarded to the presence of compression and tension within the whole structure. Motro (2003, p.17) quotes Buckminster Fuller as stating tensegrity is “...islands of compression

inside an ocean of tension”. Fuller developed the concept of ‘tense integrity’ (Espinosa and Harnden, 2007a) to identify the benefits of designing architecture upon geodesic domes; an example of this can be seen at the buildings at the Eden project. Beer used the concept of tensegrity (Holmberg, 1997) to form the basis of his TS methodology in which synergistic tensegrity is used to optimise group communication.

4.5.1 TS Design

The TS protocol follows that of a workshop setting where thirty participants meet for three consecutive days to discuss a range of organisational issues, based upon participant choice of topics (Beer, 1994a). Through the use of TS sessions a cumulative set of workforce norms can be derived, with any extreme attitudes or opinions clearly discussed and addressed by participating members before the final set of future action plans are designed.

Participants (the Infoset) are asked at the beginning of the protocol to define a general question that encapsulates the issue-in-focus of the event (Schwaninger, 2006a). The TS event is structured upon the pattern of an icosahedron where thirty individuals represent the struts/lines of the structure (Beer, 2004), and twelve discussion topics are positioned as nodes within the model (Figure 4.3).

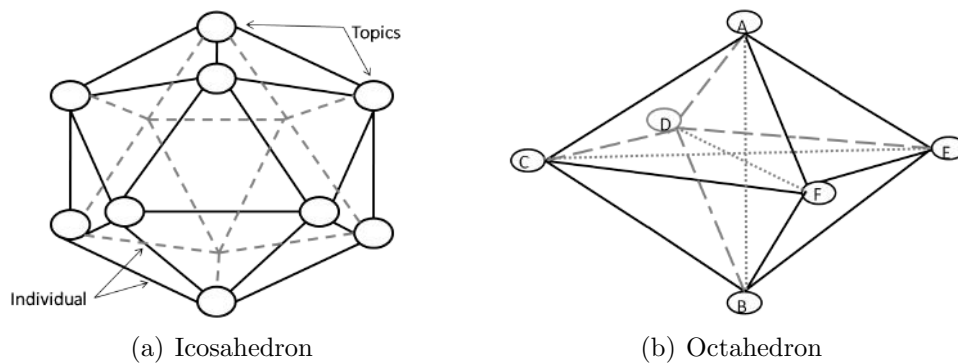


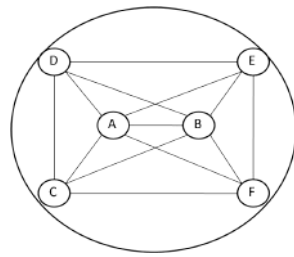
Figure 4.4: Tensile structures.

From initial discussions with the case study organisation it is clear that a reduced protocol will be chosen by management and as such the remainder of the section will discuss a Short-Form Syntegrity; octahedron (Figure 4.4(b)). The octahedron is adopted within Short-Form Syntegrations (Truss et al., n.d) for organisations that are unable to devote thirty members of staff for three full business days to the event. The InfoSet are initially required to suggest specific issues that they would like included within the event; this process is referred to as the Problem Jostle (PJ) (Beer, 1994a).

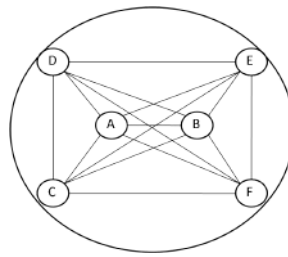
Idea generation is promoted through the use of wall displays, where participants are encouraged to write down their thoughts on 'sticky' notes (Leonard, n.d.b), add them to the wall and collectively group the suggestions into like categories (Statements of Importance (SIs)). The PJ requires that InfoSet members spend significant time suggesting and filtering potential SIs. This stage focuses upon the participatory culmination of topic themes and enables InfoSet members to create discussion groups based upon their own needs; each participant's ideas are recorded and debated.

In summation of the PJ Aggregated Statements of Importance (ASI) are produced from the filtered SI list (Schwaninger, 1997b), which form the key objectives of the TS event. These are then filtered further through the use of Hexadic Reduction, which allows participants to identify subjects with similar core concepts and place them into like topic groups; producing Composite Statements of Importance (CSIs) (Truss, 1994). It is the responsibility of the InfoSet to determine the polar opposite positions of the CSIs (topics for discussion) upon the octahedron's structure during the PJ (Jackson, 2003).

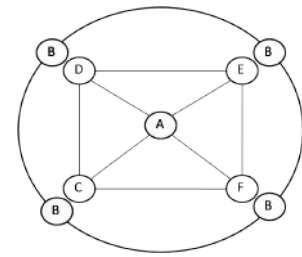
Figure 5.27 demonstrates the interconnectivity of the subject topics within the TS technique using the smaller structure of a octahedron (12-18 participants, 6 topics); where alphabetic labels denote vertices/themes and connecting lines represent individual actors.



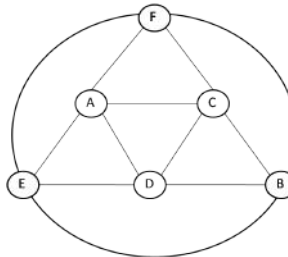
(a) Edge-centered (AB) planar projection of an octahedral surface



(b) Edge-centered (AB) planar projection of an octahedral with tensile braces



(c) Pole-centered (A) planar projection of an octahedral surface



(d) Face-centered (ACD, ACF, ADE, BCD) planar projection of an octahedral surface

Figure 4.5: Octahedron Team Syntegrity Structure Adapted from Beer (1994, p.193-194).

If two CSI are laden with social characteristics such as community engagement and staff education, these could be coupled under the heading of ‘Human dimension’; using Figure 4.5(c) these two topics could then be placed at A and B in the structure. The pole-centered planar projection of all individual topics can provide a clear visual representation of indirect connections between each CSI; for example, Figure 4.5(c) immediately shows that persons CD, CF, DE and EF are indirectly linked to CSI ‘A’.

Once the final ASI and polar positions are decided upon, it is necessary for each participant to indicate two topics that they would prefer to discuss. Facilitators then attribute each individual to two topics in the role of ‘Member’ and in two additional topics as a ‘Critic’; within a full syntegration participants would be a critic to only one topic (Beer, 1994a). A person interested in topics ‘A’ and ‘B’ would become the ‘Member’ AB and would be the only person assigned to that edge/line Figure 4.5(a). This process is known as the Topic Auction.

Within the Syntegration each topic is assigned a specific colour, so participant AB would be referred to as Mr. Pink-Green within the practical workshop, with no other person allocated to this role. Mr. Pink-Green will also act as a 'Critic' of another group, where he will be required to play 'Devils Advocate' and challenge Members' strategies. This can be viewed in terms of the Prisoner's Dilemma game of cooperation (Member) and defection (Devils Advocate) (Section 2.1.1).

Once the CSI are allocated to specific nodes/polar positions and participants to a specific strut, discussion groups are established which are referred to as Outcome Resolves. Each Outcome Resolve includes the simultaneous meeting of two polar opposite groups, which occur until all topics have been debated once. The Outcome Resolves are then reiterated so as to allow individuals to amplify the discussions of their three topics (e.g. A-B-C) into one another (e.g. A into B and C, B into A and C, C into A and B), allowing each group to attenuate/filter complementary strategies from other topics.

With reference to the structure of the TS and application of Outcome Resolves (OR), the logistical positioning of participants creates a 'tensile reverberation' of ideas throughout the group, ensuring that the Infoset can create a list of Final Statements of Importance (FSI) with somewhat equal understanding of the topics involved (Jackson, 2003). The tensile reverberations that occur as topics are discussed indirectly pass information to participants from topics that they are not directly involved in; demonstrated in Figure 4.5(b) with extra lines between topics C-E and D-F. For example, person AC will gain information regarding topic E when they join person BE in discussion of topic B.

The FSI are then seen as the purposeful strategies to be adopted by the organisation as a result of the TS event. As the FSI have been created from the combined effort and cooperation of a broad representation of business employees, it is likely that the developed strategies will be positively received throughout the organisation; participation reduces resistance to change (Miller and Monge, 1986). This technique

enables the bottom-up creation of future activities empowering employees with the knowledge that they have shaped the business, which should minimise the resistance that can be felt in top-down/dictated management approaches.

Face-centered planar projections can be used to further coordinate topic discussions at the end of a TS event (Truss, 1994); Figure 4.5(d). The FACE planning procedure requires that the three topics surrounding one ‘face’ of the octahedron are merged into a singular action determined by the InfoSet as a whole (Truss et al., n.d). The merger of the three topics can be further supported by the SSM of conceptual modelling, ensuring that purposeful activities are included within the future strategy.

The following section condenses the conceptual theories presented within this chapter into the framework for Socio-Environmental Cohesion for Sustainability (SECS).

4.6 Socio-Environmental Cohesion for Sustainability (SECS)

The methodological framework for this research has been designed via a seven stage process of organisational engagement for socio-environmental development. The key theme throughout this chapter has been the interdependence of holistic systems thinking, normative behavior, social networking and participatory decision-making in the implementation of environmental action within an organisation. The diagram below demonstrates the intended connectivity of the framework (Figure 4.6), with each concept feeding into the cyclical learning process of action, lead by the core goal of self-regulation for sustainability.

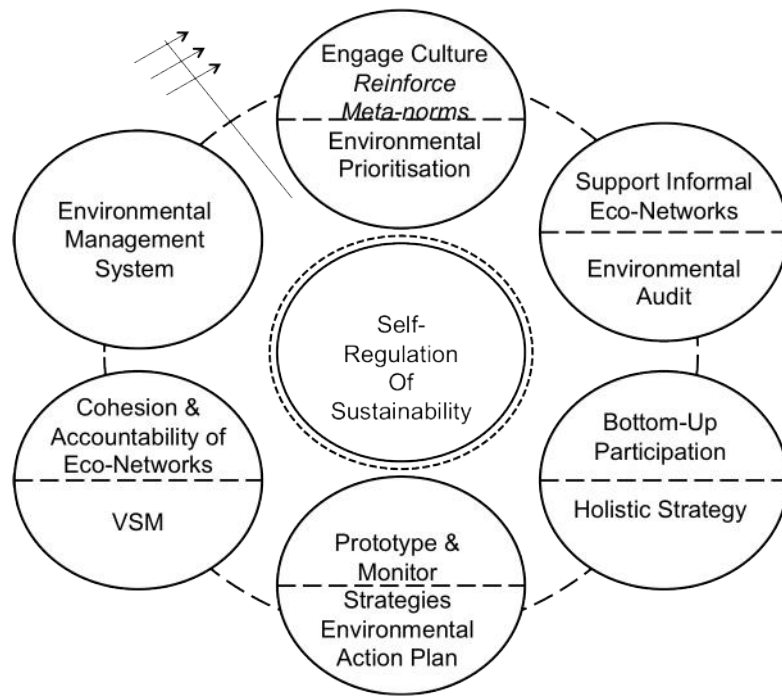


Figure 4.6: SECS Socio-Environmental Cohesion for Sustainability (Knowles, 2010, p.39).

The SECS stages of implementation are as follows:

1. Diagnosis of existing culture and scaling of environmental prioritisation.
2. Identification and support of informal networks operating in environmental actions.
3. Collaborative design of environmental strategies through participatory discussion platforms.
4. Prototyping and monitoring of environmental strategies.
5. Design of structural mechanisms to foster cohesion and accountability of informal eco-networks.
6. Consolidation and reinforcement of metanorms.
7. Development of self-regulatory mechanisms for critical issues for sustainability.

The multimethodology used in this research includes Cultural Analysis, Social Network Analysis, Team Syntegrity, Rich Picture modelling and the Viable

Systems Model 3.4. It is proposed that using this structure of implementation will enable the organisations community to gradually become accustomed to ‘environmental thinking’ and contribute to the change process. Community involvement will increase the identification of any activities of environmental concern (tacit knowledge (Espejo, 2002)), and help members to understand the importance of implementing the new strategies.

The initial stages of the proposed framework for change (Socio-Environmental Cohesion for Sustainability (SECS)) are focused towards social development of environmental action (Cultural Analysis, SNA and TS workshops). The later stages of the framework will focus specifically upon cybernetic tools for EMS design and implementation (TS, VSM and Rich Picture analysis), with the continued view of holistic organisational development as a key driver to an efficient EMS.

4.6.1 Stage 1: Diagnosis of existing culture and scaling of environmental prioritisation.

As there are few legal requirements in the UK to undertake environmental activities (Section 2.2.1), it is through the motivation and drive of employees that an organisation will undergo such a transformation. Therefore, it is essential that the current social interactions and cultural norms present within an organisation are accessed. The implementation of traditional EMS is often coupled with the claim that the organisation has become ‘environmentally-friendly’, however it is the view of the researcher that the culture and community of an organisation are often overlooked or ignored (Section 2.2.1).

In the previous chapters it has been suggested that an environmental metanorm must be embedded within an organisations culture so that a true EMS is implemented in both regulatory and practical actions. Leading to the initial research question of this project:

Research Question 1: A holistic design of EMS requires social commitment and the establishment of environmental awareness/action as a normative behaviour.

In order to engage the organisational culture to diagnose the current environmental prioritisation of the community, an ethnographic approach has been adopted for the study, alongside action research techniques (Sections 3.2.5 and 3.3.2). Cultural analysis is developed through practical engagement and observation of the case study community, requiring a statistical/quantitative and interpretive/qualitative study of individual and group choice of personal and work-based activities. The use of Schwartz's Norm Activation Model can identify strengths and gaps within the present eco-network (Section 4.3), with future activities for norm creation developed upon facilitating change in those areas desired by the community.

4.6.2 Stage 2: Identification and support of informal networks operating in environmental actions.

This stage of the research is used as an initial analysis of the research question:

Research Question 4: The identification and fostering of natural eco-leaders and informal networks, better the possibilities of breaking through established views and practices.

Natural eco-leaders can be identified through Social Network Analysis with questions focused towards the identification of key environmental contacts within the organisation (Section 4.4). Analysis of the present social networks allows the development of a picture of the formal and informal communications channels of the organisation. In order for a successful EMS to be implemented it is essential that information regarding procedures, work instructions and contacts are

fully disseminated throughout the organisation; any deficiency within the formal communication network will hinder this process.

The SNA can identify any informal environmental network present within the organisation and the breadth of employees i.e. departmental representation, that belong to such a community or are aware of its existence; this will determine the holistic outreach of and community status of eco-individuals. It is intended that any identified environmental networks can act as a starting point for change. Individuals who have chosen to be members of such a group will already view environmental action as a normative behaviour and are likely to champion practical methods for improvement (Roseland, 2000). This can then be used to enhance the formal network structure with the informal environmental community already in place.

4.6.3 Stage 3: Collaborative design of environmental strategies through participatory discussion platforms.

Other studies have illustrated cases where there were needs for organisational re-design in order to allow for higher degrees of integration and cooperation and to encourage better self-regulatory practices (Espejo and Stewart, 1998; Stewart and Lewis, 1997; Schwaninger, 2006b). Furthermore they have all identified the need to design participatory mechanisms for decision making to manage complexity on environmental issues (Kay et al., 2003; Hoverstadt and Bowling, 2005). Within these studies, the role of participation is intimately linked to the importance of both co-operation and autonomy in realising viability for environmentally-oriented organisations and networks (Espinosa and Umpleby, 2005).

The use of TS as a method to improve communication is undertaken at an early stage of the transition process, to initiate the implementation of participative behaviour in organisational decision making and strategic planning from the outset of the project (Section 4.5). A wide range of employees are included within the TS to reduce

apprehension and resistance to the change process, by empowering the employee group as ‘owners’ of the developed environmental strategy. Participation can be enhanced through the facilitation of an employee Environmental Working Group (EWG). Such a group should consist of employees that represent all departments and hierarchical position within the organisation.

Employees with an interest in environmental issues are initially targeted as they are most likely to be proactive in group discussions. The EWG can then become responsible for overseeing the design and maintenance of environmental strategies within the organisation, with regular meetings scheduled to improve the regularity of environmental discussion within the group and dissemination to peers. This stage of the SECS focuses upon the amplification and attenuation of environmental action throughout the employee group, between the organisation and external businesses, and utilises the knowledge contained within employee social networks.

4.6.4 Stage 4: Prototyping and monitoring of environmental strategies.

The fourth phase of the study constructs a basic Environmental Strategy for the organisation, detailing policies derived from the Environmental Action Plan developed within the TS workshop. Strategies are monitored and evaluated upon their speed of implementation, development of further activities and projects, management support and community use of added facilities. The development of methods to improve environmental communication channels are a significant aspect at this stage, as it is necessary to invoke a community-led approach to the change process. Social commitment and pressure to embrace and evolve environmental activities are seen to be key drivers to long-term implementation; initial foundations for an environmental metanorm.

To support the development of environmental action as a subconscious/normative behavior, practical changes are used to provide visual or tangible evidence of organisational support to the new strategy set. Similar to Stage 3, this stage of the SECS will be reliant upon the efficiency of amplification and attenuation filters within the organisation. The TS approach also serves to enhance the feeling of empowerment within the employee group; it is essential that the developed strategy results in practical projects or employees could feel that they have wasted their time or that the organisation does not respect the subject matter.

4.6.5 Stage 5: Design of structural mechanisms to foster cohesion and accountability of informal eco-networks.

This stage of the framework requires the development and implementation of attenuation and amplification filters to support embedded environmental networks. The fifth stage of the research will be focused upon the development of mechanisms to support and award value to informal eco-networks, addressing a further research question:

Research Question 3: To manage the complex learning process tools are needed to support individuals and networks leading environmental policy and strategy, alongside current management practices.

The improvement of communication channels internally and externally enhances the capacity for the EWG to coordinate group activities and maintain a ‘presence’. This stage of the SECS is designed to work in conjunction with current business practices; environmental communication channels utilise the existing communications structure to minimise disruption of implementation (Section 4.2). Employees are asked to voluntarily join an EWG that will monitor the implementation of environmental activities at the organisation.

The researcher provides administrative support, resource applications and technical advice on environmental projects, with the purpose of making environmental action as ‘easy as possible’ for employees. Following the identification of core actors within the organisation’s environmental and work networks (Stage 2), employees are targeted from different departments to produce Rich Picture analyses of environmental activities within OrgX. The VSM’s capacity to improve communication networks directly links the model with the initial stages of SNA, by addressing the communication channels that are actually present and not just those that are ‘meant to work’ formally.

This enables the EMS to be designed upon a holistic representation of the organisation (formal and informal communications), increasing the chance that the values and principles of the system will be fully disseminated throughout the business. The position of EWG members within the organisation are used to establish the location of environmental values within Systems 1 through 5, in each level of recursion.

4.6.6 Stage 6: Environmental Management System.

The sixth phase of the research develops an Environmental Management System (EMS) within the current management structure that focuses upon employee engagement and operational efficiency. The new EMS will focus upon a scoring system, by which an organisation is analysed upon the amount of environmental activities it pursues. This results in a tiered accreditation system by which an organisation receives points for practical environmental activities; not intended/future plans. The EMS consists of an audit of operational and social activities that have been undertaken to reduce environmental impacts.

A general environmental audit of operational and social activities pursued by OrgX is conducted at the beginning of the project; this is based upon researcher

observations and information gathered from the informal environmental network during Stages 1 and 2. These baseline activities can then be used as a ‘minimum’ standard for operational efficiency, to compare with the final set of environmental activities within the organisation (post Stage 3). The EMS audit will allow employees to have access to a holistic account of the organisation’s present activities so that they can see a clear list of their environmental achievements and set targets for improvement.

4.6.7 Stage 7: Development of self-regulatory mechanisms for critical issues for sustainability.

The final stage of the project will be to design self-regulatory mechanisms to monitor and progress the ideals of sustainable development within the organisation; through the establishment of environmental behavior as a progressive normative behaviour. Mechanisms to prevent crisis and establish early alarm systems to respond to external/internal fluctuations are developed. One of the research questions to be explored is the notion that the design of mechanisms with the capacity for autonomous regulation will greatly benefit the design and efficiency of system performance:

Research Question 2: The design of EMS should be developed with complexity management concepts, to heighten self-awareness and self-regulation, in order to facilitate community learning.

Social, economic and environmental mechanisms for self-regulation are developed throughout the SECS framework. Stages 1 to 3 of the SECS focus upon the social dimension of an organisation; providing the qualitative analysis that is omitted from traditional EMS. Stages 4 focuses upon developing the implementation of practical environmental activities in line with employee demands; merging the

qualitative/social and quantitative/measurable dimensions of change. The support of informal environmental networks, employee strategy design and practical changes with the organisation, serves to develop environmental action as a normative behavior; social self-regulation.

Stages 5 and 6 diagnose the viability of the organisation and audit the implementation of environmental activities within the current business structure. An EWG that contains representatives from all departments and meets regularly, can coordinate environmental activities throughout the whole organisation; economic self-regulation. The adoption of strategies to reduce human impact (e.g. grounds maintenance) and increase biodiversity (e.g. indigenous wildlife) onsite, improves the ability for the natural environment to self-regulate. It is the culmination and equal value attribution of operational, social and environmental activities that makes this SECS framework a unique design.

This chapter has provided the conceptual background that will be used to develop environmental activities within the case study organisation. A multimethodology design has been chosen to develop environmental activities from the social values (Section 4.3) and informal networks (Section 4.4) held within the employee group. These social attributes are then combined with the practicalities of the real-world business environment. The use of cybernetic methodologies (Sections 4.2 and 4.5) are used to optimise communications between the social and business dimensions of EMS design. The following chapter presents the application of the conceptual framework within OrgX.

Chapter 5

Case Study

The seven stage methodology SECS has been trialled within a higher education establishment referred to as OrgX, and the results of the research are discussed within this chapter. Each stage of the methodology is designed to build upon the previous, with the framework following an inductive process which is mirrored within the ensuing analysis. This chapter focuses upon providing a narrative account of the conducted action research, detailing both positive results and difficulties that were encountered within the study. A critical analysis of the research techniques used within the project is conducted within Chapter 6.

5.1 Stage 1: Diagnosis of existing culture and scaling of environmental prioritisation; leading to the consolidation and reinforcement of metanorms

The initial cultural analysis of the organisation started, in part, before the research project became formalised. The researcher had been associated with

the organisation for three years prior to the PhD research and was engaged by management to pursue postgraduate research on ‘greening’ the organisation. In order to understand the current environmental culture of the organisation, it was necessary to identify the normative behaviour of broad social groupings within OrgX (Section 2.3.2).

OrgX is a higher education establishment within the UK that is associated to a larger organisation referred to as OrgX(b); the two organisations merged in 2000 and are located in two separate geographical locations. OrgX(b) defines the majority of policies that govern both organisations; OrgX is currently seeking to increase its autonomy. Environmental policies have previously conformed to legislative requirements and OrgX has decided to develop additional activities to improve its Corporate Social Responsibility (Section 2.1.3).

OrgX provides a range of undergraduate degree courses within four academic schools, some ad hoc postgraduate courses and houses one academic school dedicated to the delivery of university foundation awards and community outreach initiatives. The organisation has an informal Environmental Working Group (EWG) that includes academic and support staff who joined together voluntarily to improve environmental activities of the organisation. The group was established at the end of the 2005/2006 academic year with the intention that members would cooperate to identify environmental activities that could be developed within their own departments and across OrgX as a whole.

Through prior involvement with OrgX the researcher began the project as a member of the employee EWG from its inception (2005). This initial entry into the organisation provided the opportunity to gain access to the social dynamics of the organisation and choose problem structuring methods (PSM) (Mingers and Rosenhead, 2004) in line with employee needs (Section 3.4). White (2009) suggests that the chosen research approach of social constructivism provides a richer process

of PSM, by accounting for the complex range of behaviours and social interests contained within an organisation (Section 3.2.5).

Through involvement with the EWG the researcher produced a research proposal for OrgX, focusing upon developing environmental activities within the organisation. Following this proposal OrgX provided some initial funds to contribute to the tuition fees of the researcher's studies. The researcher adopted the role of an 'observing participant' (Section 3.3.1) and group secretary to record meeting agendas and coordinate group activities. The research project was registered within the business and environmental science departments of the case study organisation and resonates Fowler and Schreiber's (2008) call for the combined study of biological and political issues to understand human behaviour.

Intertwining both of these disciplines presents a range of academic theories, which identify relationships between human/cultural perceptions and the constructs that underpin societal groupings i.e. business and communities (Section 2.2). The potential benefits of overlapping these academic disciplines has been demonstrated within the multimethodology design of SECS (Section 4). The position of the project within business, humanities and science domains is seen to complement the three dimensions of sustainability: economic, social and environmental.

Using Blamey's (1998), extension of Schwartz's Norm-Activation Model four key areas of cultural analysis have been used to analyse the organisation: awareness of need (AN), awareness of consequences (AC), awareness of responsibility (AR) and acceptance of policy initiatives (AP) (Section 4.3.3); addressing Systems 3 through 5 of OrgX. An initial observational analysis (Section 3.3.2) of the embedded culture suggested that there were three clear types of individual attitude to environmental issues: eco-activists (talk and action), eco-enthusiasts (talk and easy actions) and eco-skeptics (apathetic talk and no voluntary action); with the majority of people falling into the two latter groups as potential hurdles to environmental change (Simkins and Nolan, 2004).

OrgX appeared to be mostly unaware of the environmental consequences of their actions (AC), downplaying personal responsibility (AR) and viewing accountability as compliance with environmental legislation (AP). For example, little is known about the end product of site waste recycling (AC), the benefit of individual action is not easily quantifiable (AR), and accountability falls to specific job roles directly related to environmental impacts (AP). Within 2005 OrgX management and EWG identified the need to improve the environmental impact of the organisation (AN) and sought a researcher to use the organisation as a case study project.

With regards to the development of a baseline cultural analysis, management engagement with the researcher to conduct the study clearly demonstrated a desire to progress OrgX towards an environmentally accountable organisation (AR). The main focus at the start of the project were to establish whether this drive was viewed as a business opportunity, ethical stance or mixture of the two (Weaver et al., 1999). By understanding the perspective of the organisation the researcher could design the project towards the present anthropocentric or ecocentric belief system (Section 4.3).

It was determined that in order to instigate change a deeper understanding of the normative behaviours of the community was needed, in order to establish the drivers for change (Bawden, 2005). It was decided that the most effective method to engage and increase the potential for change, was through the use of bottom-up strategies to embed an environmental metanorm within the community (Section 2.3.2); with specific focus upon creating a unity between Systems 1 and 2. The cultural analysis began with the use of a basic 'Environmental Questionnaire' that was distributed to all staff and students at the organisation (Appendix B).

The questionnaire contained generic socio-demographic questions such as age, gender, position in OrgX etc. to establish a general stereotype of those individuals willing to take part in such a study. The strongest characteristics of the response group were to be viewed as defining traits of an 'Environmental Stereotype' within

OrgX. Further questions were included within the questionnaire to identify both the formal and informal networking present within the organisation (supporting Stage 2 of the framework (Section 4.6.2)).

This was conducted alongside a brief analysis of individuals' networks outside of the organisation to indicate trends between external social interactions and levels of environmental awareness. Environmental activity awareness within the organisation were tested against individuals' practical actions at home. This would then indicate if environmental awareness initiatives at work and practical actions at home, influence one another; example questions within Deikmann and Preisendörfer (2003) provided a guide as to the type of activities to be included within the questionnaire.

In order to use time productively and prevent employee frustration from excessive contact and disturbance, a questionnaire focused upon both cultural analysis and informal network analysis was designed, satisfying the first two 'circles' of SECS (Figure 4.6). The questionnaire was initially distributed to all employees and students via email in early December 2007. Shortly before this distribution the researcher was informed that they could not have access to employee names at OrgX; directed from System 2 and System 3. This resulted in email distribution being the only method by which to ensure that all employees were given a questionnaire.

This in turn made it quite difficult to determine precise response rates. Based upon verbal conversations the researcher was provided with two approximate figures of 110 full-time employees and 220 employees in total. Benefits of using the electronic form included minimal paper consumption and an easy medium that respondents could complete at their workstations, without the need to locate a physical post-box. This initial questionnaire distribution throughout OrgX proved ineffective with fewer than twenty responses; approximately 11% of the employee group.

This low response rate links directly into the AN and AR variables of Schwartz's model and was also experienced in a similar study by Midgley and Reynolds (2001). This provided an initial indication that employees did not have a strong self-identity with environmental issues (Whitmarsh and O'Neil, 2010). Following this the questionnaire was again distributed, this time as a hard-copy, to OrgX employees and a selection of students. This gained a more positive reaction to the survey, however due to some issues of accessibility a few individuals still had to be accessed through a second attempt at broad departmental emails.

This situation immediately fed into the initial characteristics of the eco-culture within the organisation, in that any environmental action needed to be manifested by a person who could meet individuals face-to-face. Such individual meetings would serve to both explain the purpose of the study and encourage completion of the form. Using the approximated employee figures the response rate for the questionnaire was 59.1% of full-time employees and 14.5% of part-time employees.

Averaging the total response rate to the total number of employees results in a 40% return rate. This low response rate indicated that as a 'whole' many employees did not consider themselves highly responsible for environmental activities (low AR); a lack of System 4 identification with the external environment. In comparison OrgX(b) sent an online carbon management survey to all staff and students in June 2008; approximately 1997 staff members and 15,408 students (UoH, 2008a,d). This resulted in 117 responses (0.67 %) as identified by OrgX(b) counterparts: 61 from staff (3.05% of total staff) and 56 from students (0.36% of total students) (UoH, 2008c).

This low survey response would suggest that OrgX employees do in fact have a much greater AR than OrgX(b) counterparts. Even so, it is still maintained that OrgX's 40% return rate demonstrates that at least half of the employee group lack an enthusiastic-identification with environmental activities.

5.1.1 Questionnaire Analysis

The following analyses do not include the questionnaires completed by undergraduate students as few responses were returned and those received came primarily from one student group studying for an environmental degree; with the potential to unduly bias the results. Responses from postgraduates are included within the analyses as they provided a more equal representation of academic departments within OrgX. Postgraduates are referred to as part of the employee group for the remainder of the thesis, as most perform teaching and training duties within OrgX.

The general Environmental Stereotype that linked social traits to environmental awareness was developed from the questionnaire analysis: females aged 41 to 50 years old, from the UK, within academic departments (67% of total responses), are lecturers, are full-time employees and use the internet as their main information source (Figures 5.1 to 5.6). The developed stereotype would suggest that the research should develop mechanisms to encourage males and service personnel to become involved in environmental projects and use online engagement platforms that are easily accessible to most employees.

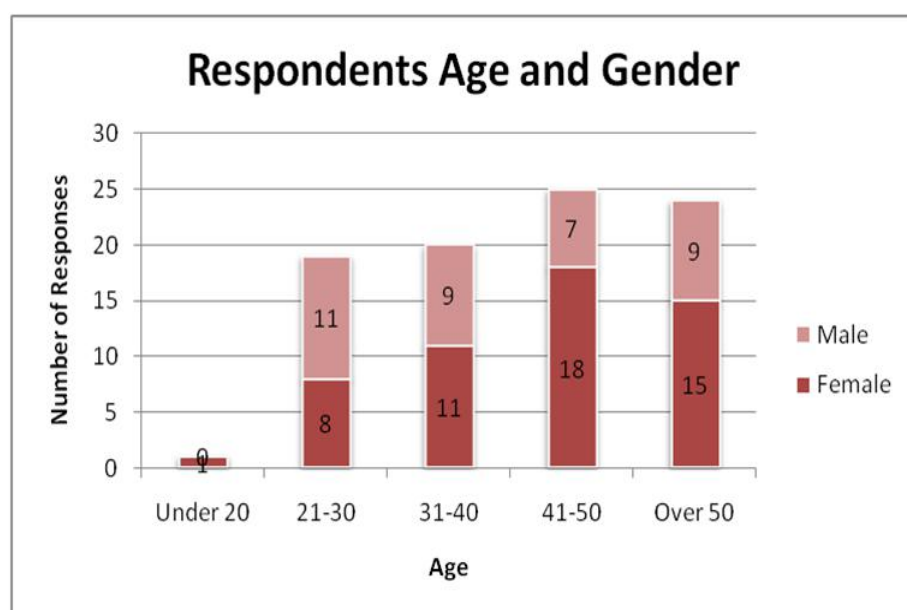


Figure 5.1: Age and Gender Comparison of Respondents.

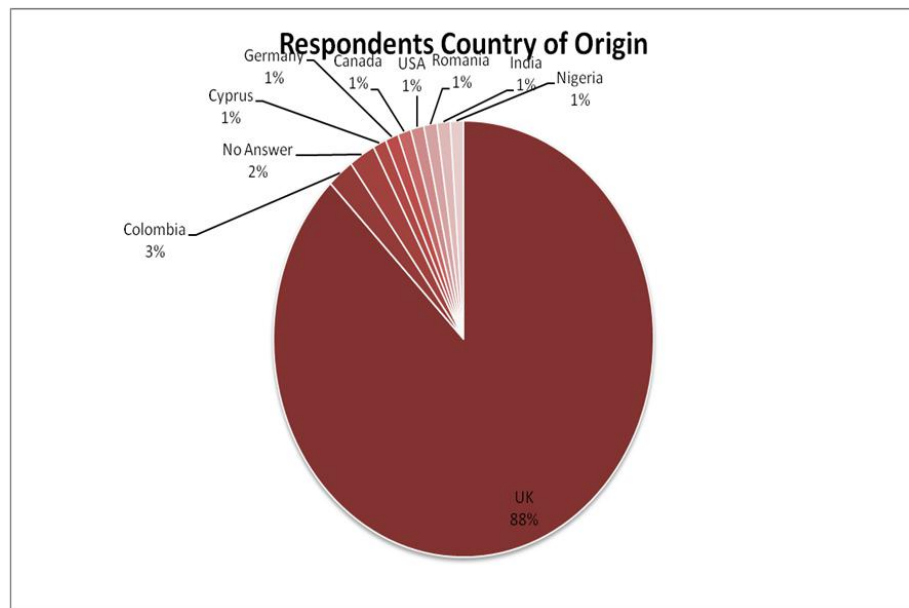


Figure 5.2: Respondents Country of Birth.

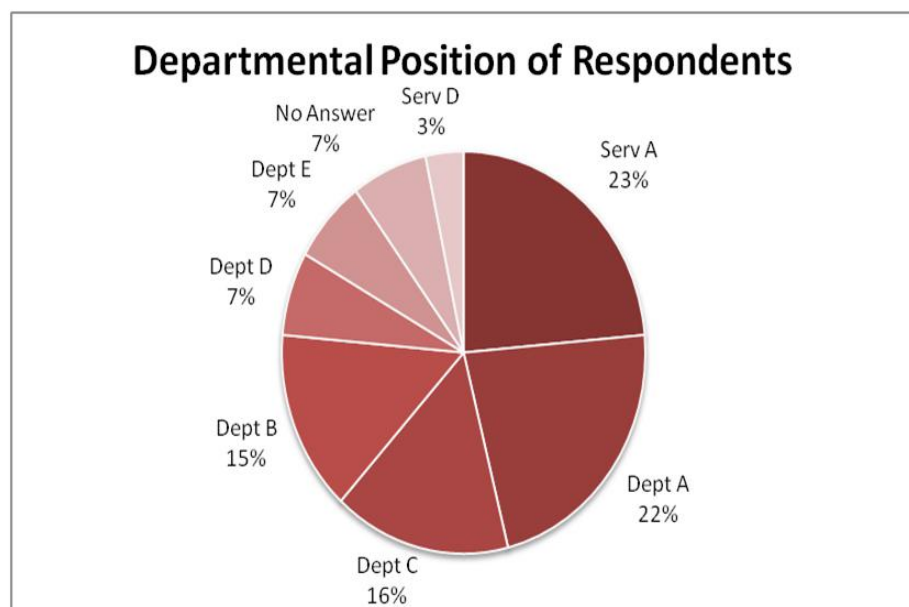


Figure 5.3: Departmental Responses.

When asked about the regularity of environmental discussion, respondents indicated that this happened either occasionally (38%) or little (31%) (Figure 5.7). When compared with the most popular workplace discussions (Figure 5.8), environmental issues were placed higher than topics such as administration, OrgX, food, gossip, IT and future work.

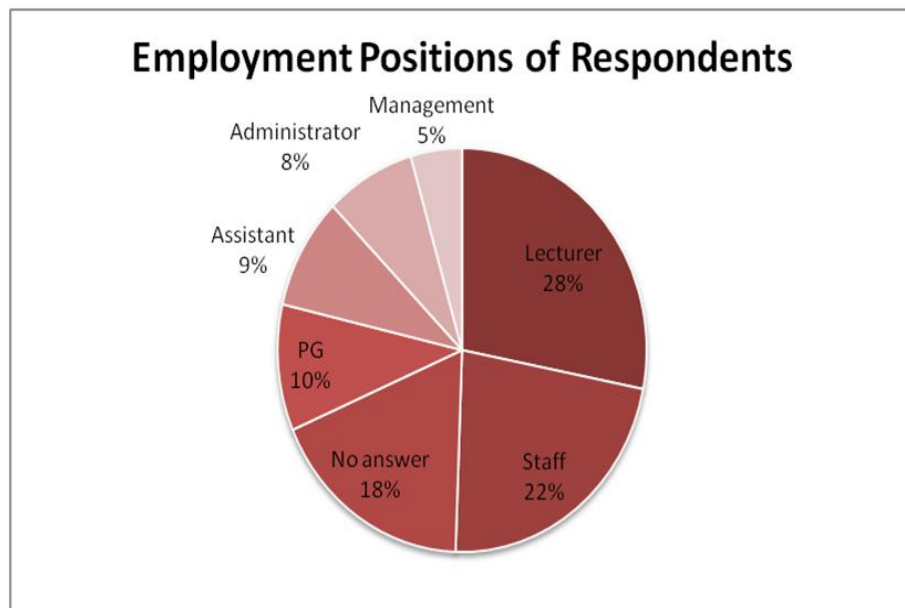


Figure 5.4: Employment Status of Respondent.

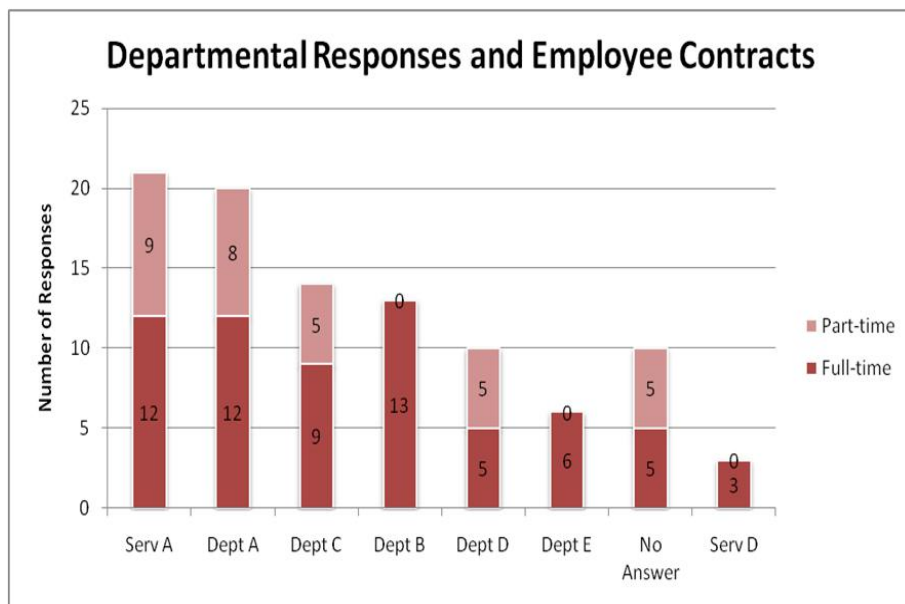


Figure 5.5: Work Contract of Respondent.

It had been anticipated that environmental issues would not be discussed more than core aspects of work such as basic job activity, but it was surprising to see that the topic ranked closely to OrgX's remit of teaching, learning and research. This was an unexpected result as the three latter activities are primary tasks (S1 (Section 4.2)) of the organisation, which would suggest that environmental activities are being discussed as regularly as routine business operations. However, it is possible that

the topic was ranked highly as a result of the respondents completing a questionnaire about ‘environmental issues’; a subconscious trigger.

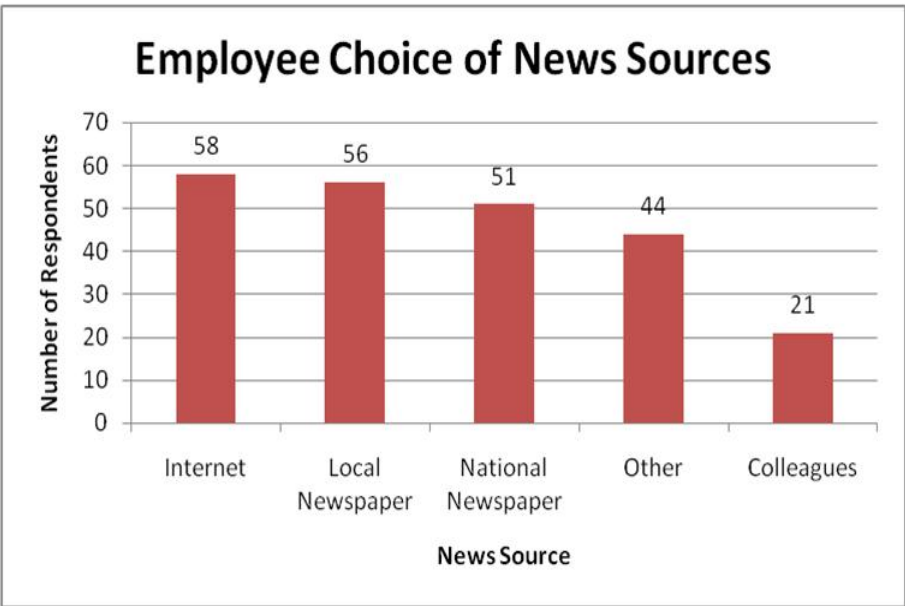


Figure 5.6: Typical News Sources.

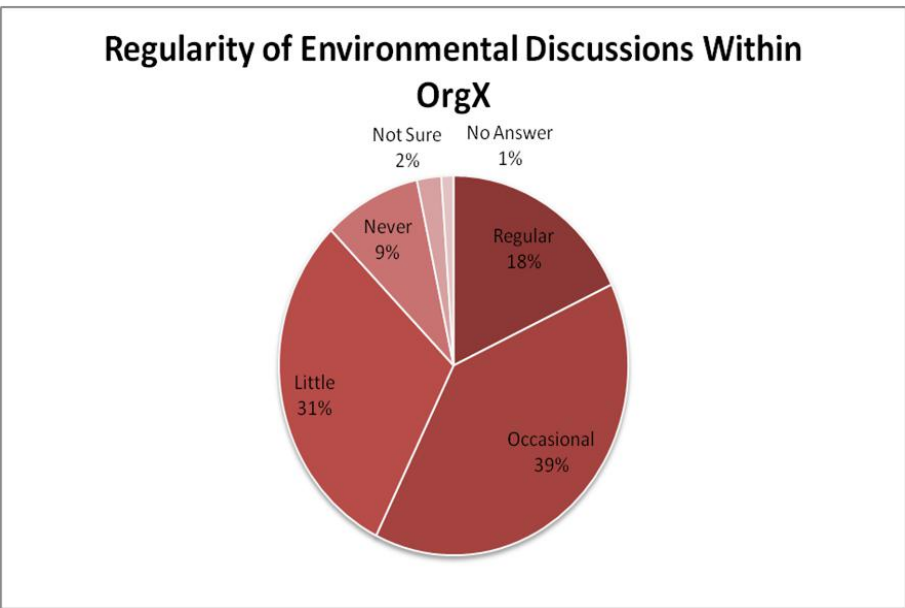


Figure 5.7: Regularity of Environmentally-focused Workplace Discussions.

The questionnaire was closed with a section of questions focused towards establishing the environmental activities employees are aware of in OrgX, and those activities that are pursued at their home residence (Figures 5.10, 5.9).

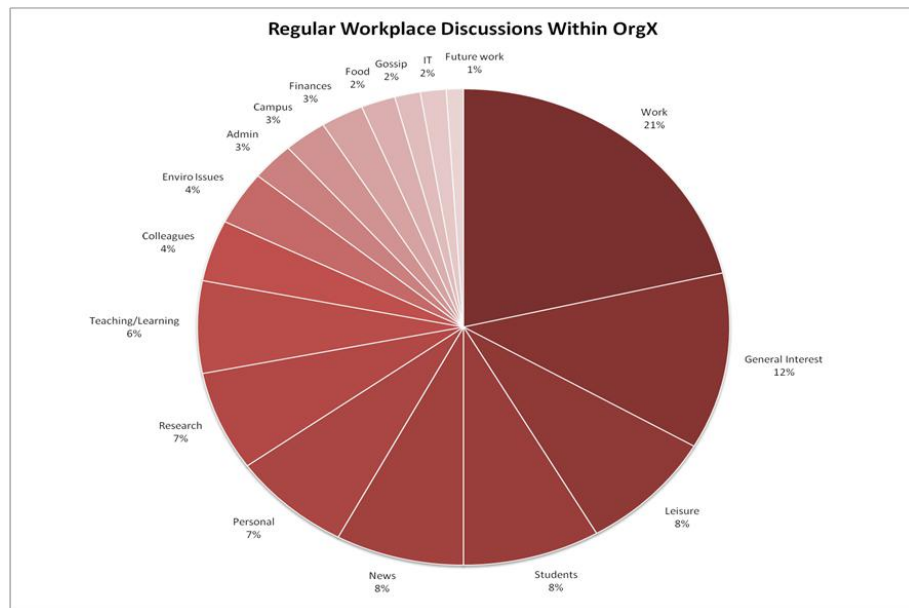


Figure 5.8: Typical workplace discussions.

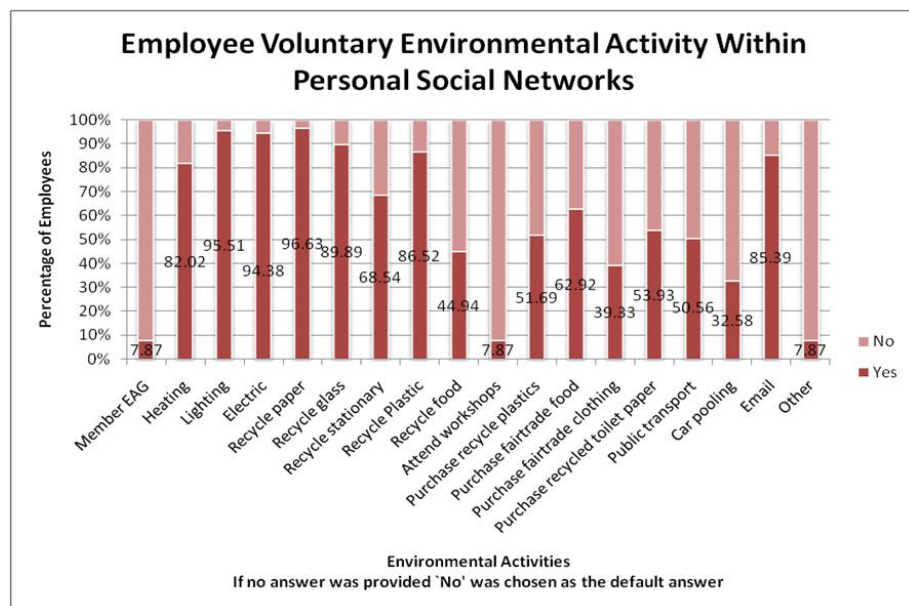


Figure 5.9: Individually pursued environmental activities

For all but one of the environmental aspects chosen for comparison, respondents indicated that they pursue more activities at home than they are aware of at OrgX (Figure 5.11). Using an ANOVA Single Factor Analysis (Burns and Burns, 2008) the difference between work and home-based environmental activities was tested further (Figure 5.12).

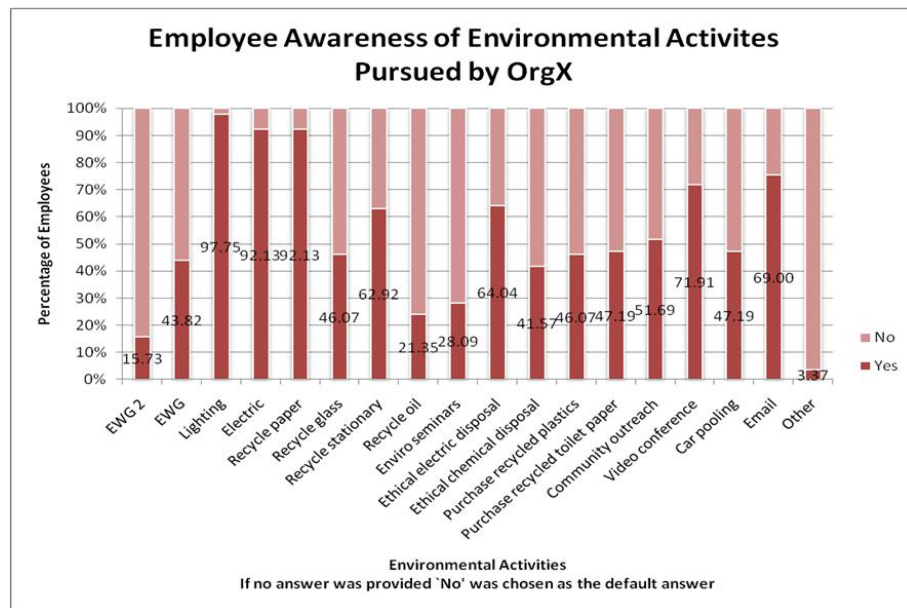


Figure 5.10: Environmental activity awareness in the workplace

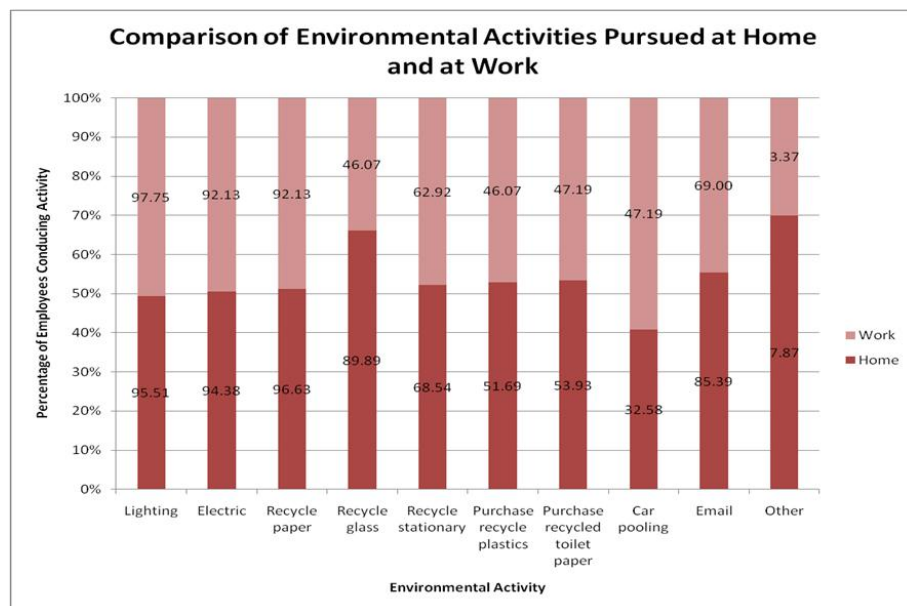


Figure 5.11: Comparison of environmental activities at work and at home.

The null hypothesis asserts that awareness of environmental activities at OrgX and environmental activities pursued socially, occur equally. The analysis determined with 95% certainty that the null hypothesis; could not be rejected; $F_{crit} (4.41)$ is greater than $F (0.30)$, $P\text{-value} (0.59)$ is greater than the significance level (0.05). This demonstrates that people are aware of those activities pursued by OrgX that mirror the types of environmental actions they adopt at home. It was not possible to ascertain if individuals continued their home-based environmental actions at work,

as many of the activities within OrgX were controlled by one service department; demonstrating a lack of cohesion between System 2 and the rest of the systems.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Home	10	676.4045	67.64045	931.925		
Work	10	603.8315	60.38315	833.542		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	263.3423	1	263.3423	0.298326	0.59164	4.413873
Within Groups	15889.2	18	882.7335			
Total	16152.54	19				

Figure 5.12: ANOVA analysis of environmental activity comparison between work and home.

Despite this lack of significance, Figure 5.11 clearly shows that some activities are more prevalent within normative social environments. For example 90% of respondents are prepared to collect glass at their home residences and take it to local collection points whilst shopping. Therefore it is surely plausible that they would use an onsite glass recycling facility, if OrgX were to expand its facilities. Informal discussions with community members also support this claim, with consistent levels of frustration at a lack of awareness and facilities onsite.

The provision of a dedicated onsite recycling facility could also reduce individual car trips to community centres; due to the rural location of the area walking to recycling locations is usually not feasible. Figure 5.13 shows that 2% of respondents indicated that they car pool to OrgX from their home residences. Car pooling to OrgX(b) occurs on an ad hoc basis, primarily arranged by individuals within the same department who are attending the same meeting at the sister site.

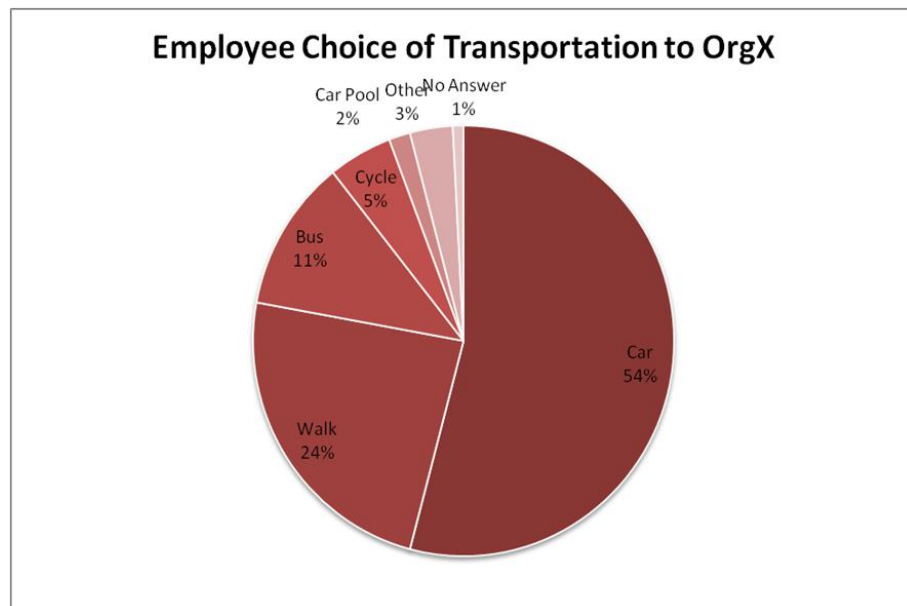


Figure 5.13: Choice of transport to workplace.

There is no formal communication structure to encourage car pooling and the process is highly dependent upon an individual's choice to seek out like-minded colleagues; an indication of a lack of support within System 2 to encourage car pooling. Therefore whilst half of the respondents were aware of the potential to car pool between OrgX and OrgX(b), there is no way to monitor if the activity is pursued (Figure 5.10). Car pooling is also not encouraged by OrgX(b)'s policy to reimburse staff members per mile driven in their own vehicles.

The questionnaire also analysed the level of perceived environmental responsibility attribution. The results provided in Figure 5.14 clearly demonstrate that most employees felt that management and facilities departments have primary responsibility to ensure environmental activities onsite are improved and maintained. Students and staff were scored as both having medium levels of responsibility in pursuing environmental activity within the organisation; overall students received the lowest accountability ranking out of the four groups. The responses could suggest that staff respondents are placing responsibility upon management and facilities personnel, instead of recognising their own individual accountability.

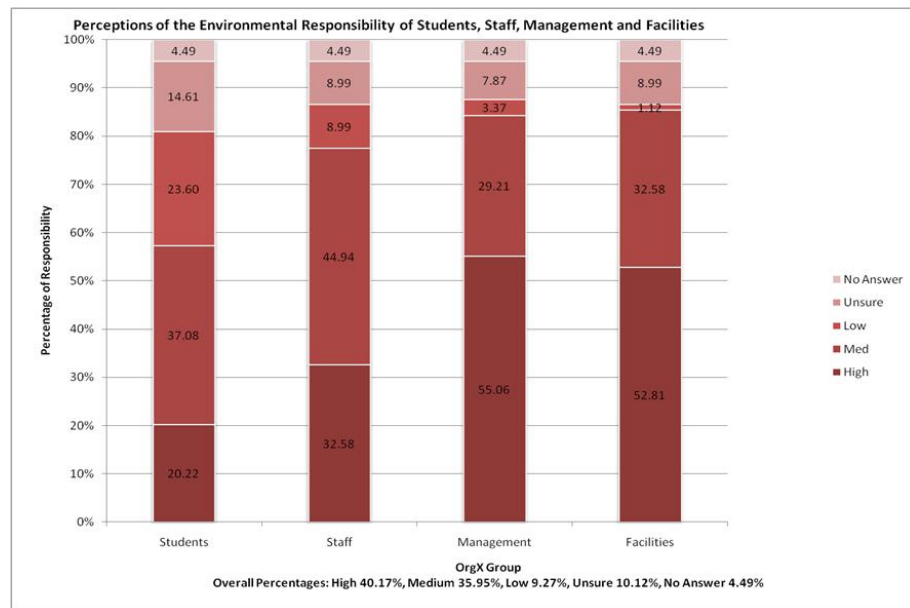


Figure 5.14: Environmental responsibility attribution.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
High	4	160.6742	40.16854	278.9		
Medium	4	143.8202	35.95506	46.29045		
Low	4	37.07865	9.269663	102.1546		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2246.138956	2	1123.069	7.884047	0.010509	4.256495
Within Groups	1282.035097	9	142.4483			
Total	3528.174052	11				

Figure 5.15: ANOVA analysis of environmental responsibility attribution.

Using an ANOVA Single Factor analysis the difference in the perceived environmental responsibilities within each actor-group were tested (Figure 5.15). The null hypothesis asserts that high to low environmental responsibility will be equally distributed across all actor-groups within the organisation. The analysis determined with 95% certainty that null hypothesis can be rejected; F crit (4.26) is less than F (7.88), P-value (0.011) is less than the significance level (0.05). This

demonstrates that there is a clear difference in the social perceptions between high, medium and low environmental responsibilities within the organisation.

High and medium responsibility for environmental action totals 76.12% across all OrgX groups. This is a surprising contrast to the earlier identification of environmental discussions as occurring occasionally or little within OrgX (Figure 5.7). This would suggest that whilst employees place a high responsibility upon OrgX for environmental action, they do not mirror this within their regular work discussions. This narrow attribution of responsibility was viewed as another obstacle to cultural change, with the need to develop accountability throughout the whole system (Walton et al., 2000).

These results identify that the organisation would benefit from an Environmental Management System (EMS), that provides a clear guidance structure of environmental responsibility for both students and employees. The questionnaire responses and analysis are summarised in Table 5.1, using Blamey's extension of Schwartz's Norm-Activation Model. Stern et al. (2005) provide an example of regression testing to analyse multiple variables that affect the norm activation model, based upon respondent's perceptions. A statistical analysis has not been produced for the case study as the researcher wanted to focus upon practical evidence of normative behaviour.

Variable	Initial Culture
Awareness of Need (AN)	Evidenced by presence of Environmental Working Group, OrgX management support of research project
Awareness of Consequence (AC)	No evidence
Awareness of Responsibility (AR)	Evidenced by self-organisation of Environmental Working Group
Acceptance of Policy Initiatives (AP)	Evidenced by implementation of OrgX(b) policies related to environmental legislation

Table 5.1: Norm Activation Model - Baseline Cultural Audit

OrgX demonstrated AN when academic management sought a researcher to conduct an environmental analysis of the organisation; demonstrating an environmental drive within Systems 3 through 5 in OrgX. The formation of employees into an informal EWG showed AN and AR within the social group. AC was not considered to have a strong presence within OrgX beyond Health and Safety requirements. AP was observed to be controlled by OrgX(b) representatives who set facilities directives and distributed resources within both organisations. From this analysis it was determined that AC and AP needed the greatest development within OrgX, with AN and AR already being fulfilled by the EWG and academic management.

5.1.2 Cultural Development Project

Following the initial cultural analysis it was determined that clear management support of the employee EWG was needed to maintain the voluntary motivation and commitment of the group (Ramus, 2002a); with the intention of creating an autonomous EWG within System 3. Numerous attempts were made to develop this support with the researcher working in conjunction with the EWG group leader (who held a management position and could champion the cause (Gattiker and Carter, 2010)), from the perspective that continuous discussion of environmental issues with other managers would instil the topic as a normative standard.

The main difficulty experienced during the survey arose within OrgX's service departments (S2 activities), with many refusing to complete the questionnaire. This was the direct result of the one of the leading service managers taking exception to the Social Network Analysis questions. When provided with the opportunity to further discuss the survey, the SNA aspect of the research was thoroughly explained in a face-to-face meeting and one of the service departments chose to become involved in the study. In total there were twenty-six responses from service areas from the total eighty-nine questionnaires that were returned; representing just 29% of the total.

Conversely, one service department was immediately very helpful when initially approached with the survey, but the researcher's prior association with those in managerial positions probably aided the situation. Initial recycling at OrgX included a few white paper recycling bins and stationary reuse that were dependent upon departmental choices for collection, plastic recycling specific to Facilities operations and reuse of some cooking materials within catering areas. From the initial analysis of OrgX it was clear that many individuals were unaware of the recycling facilities available onsite, or external businesses that could improve or expand recycling capabilities.

Additional confusion was caused by one support department having access to glass recycling facilities that could not be used by any other department. Following the initial questionnaire and increased presence of the researcher onsite, it was identified that one member of staff actively collected all recyclables from their shared office and carried this material to designated waste areas; demonstrating voluntary environmental actions outside of the EWG (this particular individual was not a member of EWG, nor had they completed the questionnaire).

At the same time the researcher also began to receive numerous requests for increased recycling facilities which were relayed to the EWG. It became clear that these requests were initially ignored, but were implemented after repeated discussions in EWG meetings (Appendix A). EWG members began to query the potential increase of paper (originally white paper only) and plastic recycling facilities onsite as these were common to residential collections in the area.

It became apparent that local authority facilities for business and residential properties significantly differ in the region due to the volume of waste; similar to glass recycling facilities. Each of these issues voiced by the EWG and broader employee group had the potential to be answered easily by facilities management, but there had previously been no clear drive to provide environmental communications. Recycling facilities were gradually increased onsite to include batteries, electronic equipment (in line with the WEEE directive (EP, 2003)), cardboard and used furniture.

In the last quarter of 2008 OrgX employed an individual to maintain site appearance and collect recyclable materials from offices. This was communicated to the EWG at which point this development was communicated to most employees via email or word of mouth. By the summer of 2009 there was still some contention amongst employees as to efficiency of this new system, with many still having to store recyclable materials in their offices; a lack of successful communication from System 2 to the rest of the systems.

It was determined that a cultural transformation would not be possible until practical changes were supported by efficient communication channels (Stage 4 of the framework). This would provide sufficient time for employees to develop trust in the importance of related activities and the continued commitment of OrgX management (Jo and Shim, 2005). Shortly after the questionnaire the organisation developed a University Foundation Award in conjunction with the researcher to deliver environmental awareness training, for individuals and businesses within the local region of OrgX.

This course did not receive sufficient applicant numbers to be held on numerous occasions, suggesting that environmental issues were not a prime concern within the local community. However a similar module for undergraduate medical students was developed by the researcher for OrgX(b) that did in fact gain the necessary student numbers; the course ran in 2009/2010 and is scheduled to run again in the 2010/2011 academic year.

The choice of both the OrgX and OrgX(b) departments to support these courses demonstrated a clear cultural motivation to provide students with a greener curriculum; also increasing organisational competitiveness (demonstration of effective S4 integration into S3 strategic decision making). These courses are dependent upon the social values of the student group and the motivation to enrol on the course; student interest-led (Warburton, 2003). This provides a link to previous assertions that EMS and related activities need to be sufficiently flexible to adapt to a range of social values (Section 2.3).

This first stage of the research provided the researcher with a valuable insight into environmental value attribution within the employee group. The decision by OrgX management to support the research and develop environmental strategies, demonstrated to employees that the organisation was expanding its Corporate Social Responsibility (CSR) efforts. It also served to raise awareness of the employee Environmental Working Group (EWG). The distribution of an environmental

questionnaire encouraged employees to consider their own values of the topic, which led to some individuals actively seeking communication with the EWG.

Upon completing the initial cultural analysis of the organisation it was determined that this phase would become heavily indoctrinated into all aspects of the research project and could not be contained as an isolated stage of the work. As expected, it was felt that the cultural analysis of pro-environmental behaviour was too complex to be completed by just one research tool (Kollmuss and Agyeman, 2002).

In Section 4.6.1 it was suggested that the first research question would be evidenced at this stage, but during the action research stage that it was actually proven within Stage 4 (to be discussed later). Due to the reliance of environmental activity upon cultural acceptance of the responsibility to change, a final cultural assessment will be provided within Chapter 6 to determine if successful engagement has been achieved.

5.2 Stage 2: Identification and support of informal networks operating in environmental actions

In order to understand the strength of social connections and level of reciprocity within OrgX, Social Network Analysis (SNA) was included within the questionnaire distributed during Stage 5.1 of SECS. This enabled the researcher to produce one questionnaire for both analyses, to minimise the amount of paperwork and disruption to employees. The sociograms produced by the SNA are used to represent the presence of actors within a system by quantitatively analysing the strength of interactions between individuals, producing a visual depiction of the studied network (Freeman, 2000).

Within OrgX individuals were asked to identify three colleagues (de Nooy et al., 2005) they work with regularly and those individuals they would contact for environmental queries/concerns. At the start of the project there was no official/formal environmental representation within the company besides the newly formed EWG; informal environmental action group. Therefore any specified contacts would have been suggested upon social perceptions of knowledge, experience and/or merits of activism amongst the peer group.

Whilst conducting the initial survey it quickly became clear that response rates would significantly differ between academic and service areas, due to specific objection of SNA from a senior services manager (Section 5.1.1). Within academic areas most employees (administrative and academic) were willing to indicate who they interacted with most at work within the SNA, either through name or job title, and the minority who did not simply bypassed the question.

However, service areas had an extreme aversion to describing their immediate networking at work, with many refusing to complete the questionnaire at all. Even after thorough discussions of data anonymity, an offer to tailor the questionnaire to their liking or alternatively conduct a departmental interview, the definitive response for many was non-cooperation. Further discussion with support-based employees identified that these employees felt that they either had no control to affect environmental change within support services, or viewed academic departments as the main cause of environmental impact e.g. paper usage for course materials (Appendix C.9); S2 blaming S1 for over consumption.

However, from discussions with academic personnel it is often viewed that support departments cause the most environmental impacts as they devise the policies that demand the format of student assignment submissions and the range of hard-copy printed materials that must be provided to each student (Appendix C.12); S1 blaming S2 for over consumption. This supported prior assertions that communication channels needed to be improved, with both academic and service

All responses were assigned a unique numeric code; each individual identified as a person of contact was assigned an alphabetic code on a first-come-first-allocated basis. Within the developed sociograms it was not possible to display relationships of reciprocity, as receptacle actors (alphabetic code) could not be identified as a mutually responsive contact (originator/numeric code). Even though these diagrams did not clearly demonstrate particular networks of reciprocity, they did help to identify that certain people were seen as core social contacts for both workplace and environmental activities.

There is a considerable reduction in the range of suggested persons of contact within the environmental network (Figure 5.16(b)), but there is still no less than six individuals who are ranked as a high value contact in this area. Familiarity with the data and coding enables the researcher to identify these environmental contacts as individuals from a mixture of both academic and support personnel.

New sociograms were developed that did not display the results of individual responses to the questionnaire, instead grouping individuals by their department (Figure 5.17). The new diagrams for workplace interactions demonstrated a lack of connections (Figure 5.17(a)) and few strong interactions (Figure 5.17(b)) between multiple nodes.

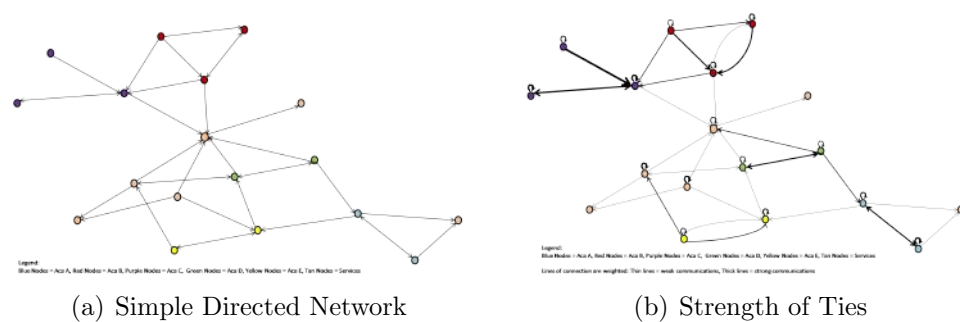


Figure 5.17: Social Network Analysis of Workplace Contacts.

For example, respondents from departments' Academic C and Academic B do not indicate significant interaction with any other besides each other and one service department. When visually analysing the strength of the ties within the network it became clear that the organisational structure is heavily dominated by

strong internal links within departments. Discounting the direction of the lines of interaction for the moment, communications within the network are calculated as having an overall centrality of 0.042 (Figure 5.19) and betweenness of 0.091 (Figure 5.18).

Work Net		Eco Net	
Node	Betweenness	Node	Betweenness
Purple		Purple	
a	0.033	a	0.106
b	0.000	b	0.012
c	0.000	c	0.000
Red		Red	
a	0.018	a	0.005
b	0.000	b	0.000
c	0.000	c	0.000
Yellow		Yellow	
a	0.097	a	0.000
b	0.013	b	0.000
Blue		Blue	
a	0.096	a	0.121
b	0.000	b	0.000
Green		Green	
a	0.070	a	0.010
b	0.116	b	0.006
Beige		Beige	
a	0.000	a	0.000
b	0.051	b	0.060
c	0.039	c	0.003
d	0.000	d	-
e	0.000	e	-
f	0.000	f	0.000

Minimum Connections = 0, Maximum Connections = 1

Work network:
Overall Betweenness 0.09126

Eco-network:
Overall Betweenness 0.10709

Figure 5.18: Betweenness for Each Actor

As discussed in Section 4.4 a centrality figure that is close to ‘0’ indicates a network that has little connectivity, identifying that inter-group communications are primarily weak ties (Granovetter, 1983). The betweenness figure indicates that

Work Net		
Node	Incloseness	Outcloseness
Purple		
a	0.278	0.167
b	0.167	0.111
c	0.000	0.139
Red		
a	0.167	0.238
b	0.167	0.152
c	0.000	0.233
Yellow		
a	0.222	0.244
b	0.156	0.218
Blue		
a	0.173	0.256
b	0.130	0.191
Green		
a	0.173	0.322
b	0.260	0.278
Beige		
a	0.190	0.000
b	0.467	0.111
c	0.194	0.226
d	0.333	0.000
e	0.160	0.000
f	0.000	0.253

Eco Net		
Node	Incloseness	Outcloseness
Purple		
a	0.711	0.328
b	0.421	0.328
c	0.000	0.250
Red		
a	0.125	0.321
b	0.000	0.125
c	0.125	0.281
Yellow		
a	0.355	0.328
b	0.000	0.233
Blue		
a	0.569	0.375
b	0.355	0.263
Green		
a	0.125	0.402
b	0.125	0.331
Beige		
a	0.882	0.000
b	0.711	0.292
c	0.125	0.269
d	-	-
e	-	-
f	0.000	0.269

Minimum Connections = 0, Maximum Connections = 1

Work network:
Overall Centrality undirected
0.041722
Centrality input/output not
possible due to lack of strong
connections.

Eco-network:Overall
Centrality undirected 0.63063
Centrality input/output not
possible due to lack of strong
connections.

Figure 5.19: Mean Geodesic Distance of Shortest Paths to All Other Actors.

the interconnectivity of nodes in the network is poor, demonstrating a low ability to facilitate inter-node interactions (Daly and Haahr, 2007). From Figure 5.20 we can deduce that two of the Service actors/groups within the work-network have ‘prestige’ (gatekeepers (Figure 4.3(d))) and are creativity barriers (Perry-Smith and

Shalley, 2003), in that they receive input from other groups but do not reciprocate this connection; limits of S2.

Work Net			
Node	Indegree	Outdegree	Reciprocity
Purple			
a	0.235	0.118	1
b	0.059	0.059	1
c	0.000	0.059	0
Red			
a	0.118	0.176	1
b	0.118	0.059	1
c	0.000	0.176	0
Yellow			
a	0.176	0.118	1
b	0.059	0.118	1
Blue			
a	0.118	0.176	1
b	0.059	0.118	1
Green			
a	0.059	0.176	1
b	0.176	0.176	2
Beige			
a	0.118	0.000	0
b	0.353	0.059	0
c	0.118	0.176	0
d	0.059	0.000	0
e	0.118	0.000	0
f	0.176	0.000	0

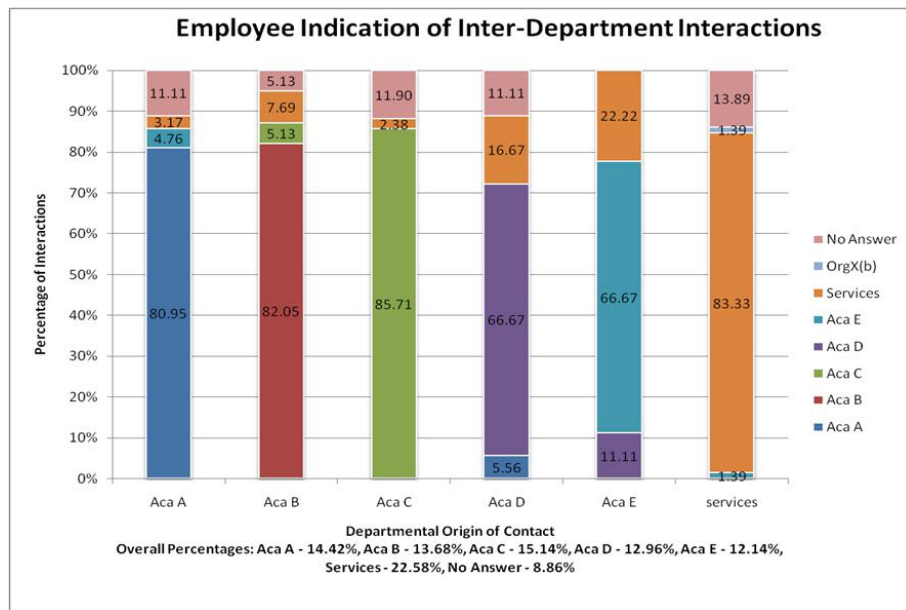
Eco Net			
Node	Indegree	Outdegree	Reciprocity
Purple			
a	0.533	0.267	3
b	0.133	0.200	1
c	0.000	0.133	0
Red			
a	0.267	0.067	1
b	0.000	0.067	0
c	0.067	0.133	1
Yellow			
a	0.067	0.267	1
b	0.000	0.133	0
Blue			
a	0.400	0.400	4
b	0.067	0.200	1
Green			
a	0.067	0.267	1
b	0.133	0.267	1
Beige			
a	0.867	0.000	0
b	0.733	0.200	2
c	0.067	0.200	0
d	-	-	-
e	-	-	-
f	0.000	0.200	0

Minimum Connections = 0, Maximum Connections = 1

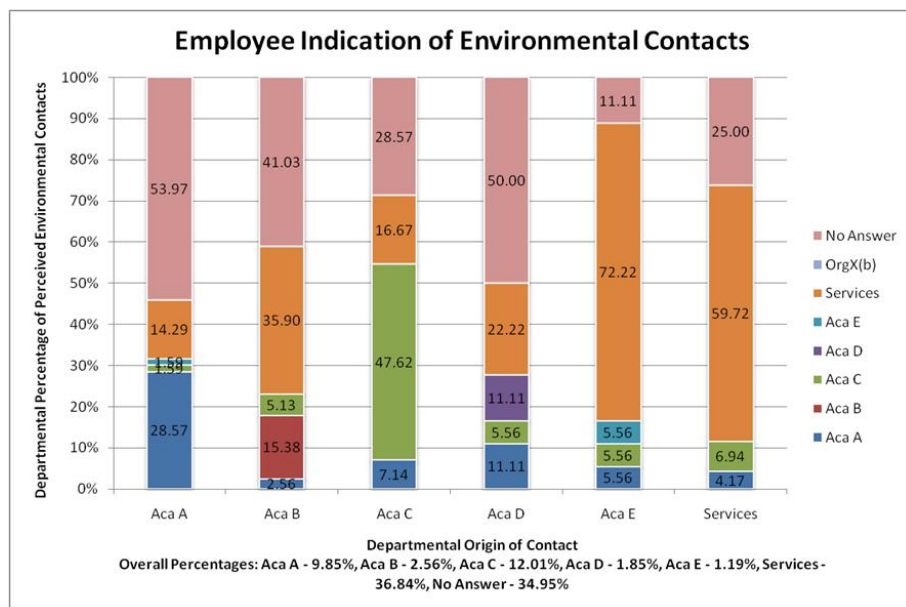
Figure 5.20: Degree Centrality of Network Actions with Diadic Analysis.

This lack of interaction results in structural holes, with communication channels either not reciprocated or not present at all (Figure 5.22(a)). Figure 5.21(a) provides a different visual representation of the collected data, showing the percentage of inter-departmental interactions. Within this graph Services departments have been merged into one column so as to provide primary focus upon academic departments (S1 activities) of OrgX.

The diagram shows that for Academic C core communications are mostly internal with connections to one other department, and the other five departments primarily contain internal communications with two clear inter-department links. These results were seen to be a potential barrier to the development of environmental communication channels within OrgX as the present work-related interactions were



(a) Workplace Interactions

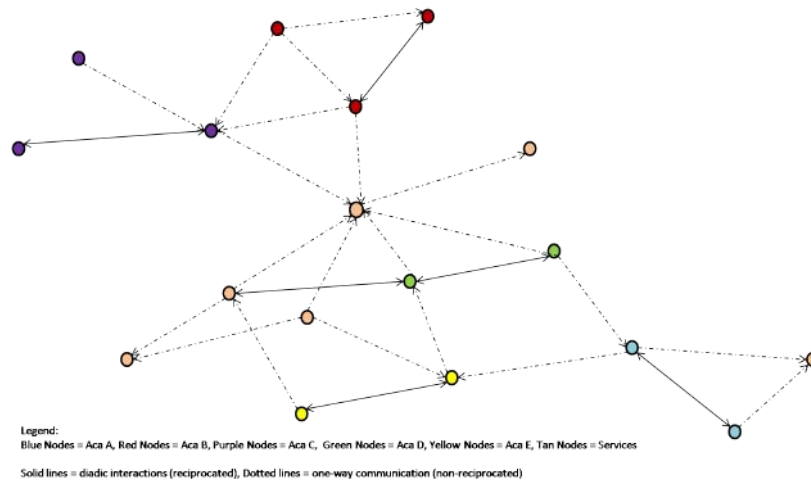


(b) Environmental Interactions

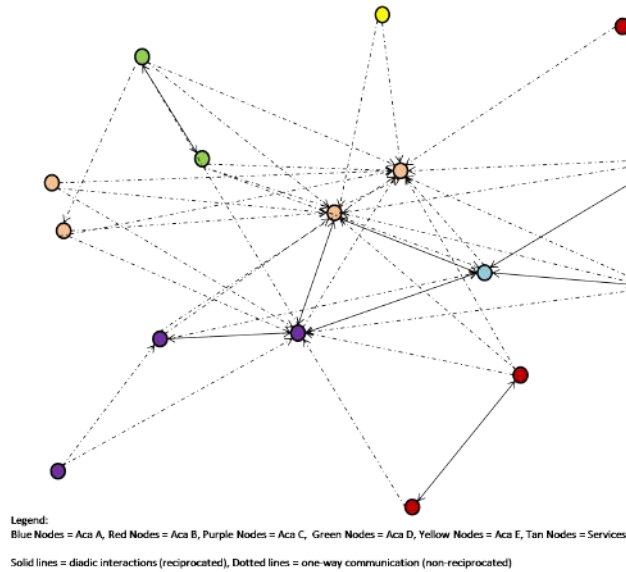
Figure 5.21: Traditional Graph Representation of SNA Analysis.

not optimised. This meant that utilising the existing communications network for environmental purposes would not produce a holistic outreach, and as such new communication channels would need to be designed and implemented.

When studying the new environmental sociogram using departmental groupings (Figure 5.23(a)), the variety of inter-departmental interactions become much more complex with connections becoming sporadic; through conversation with employees this was seen as a lack of formal identification of environmental responsibility. It



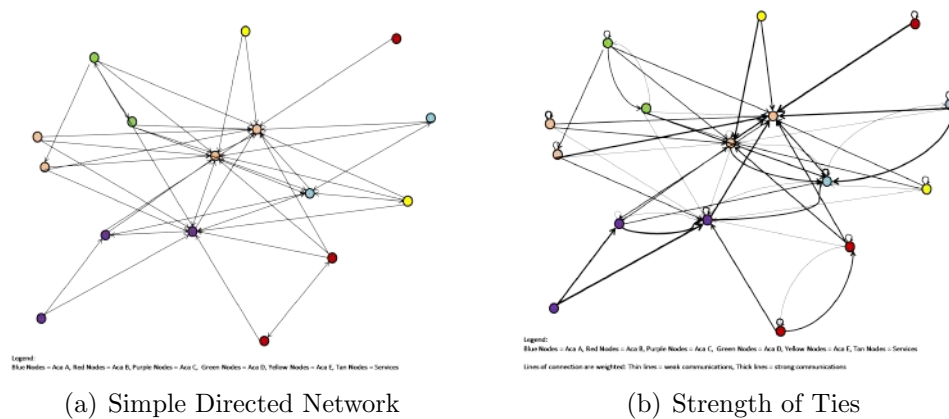
(a) Workplace Reciprocity



(b) Environmental Reciprocity

Figure 5.22: Diadic Analysis of Network Interactions.

is now clear that there are three core locations of environmental contacts situated within two support departments and one academic department.



(a) Simple Directed Network

(b) Strength of Ties

Figure 5.23: Social Network Analysis of Environmental Contacts.

Each of these areas of contact represented different aspects that one would desire within an environmental officer: procedural knowledge and structural control (as a support function), and environmental expertise (through academic specialisation), respectively. Upon analysing the strength of ties within the environmental sociogram (Figure 5.23(b)) the network is once again laden with strong internal department ties. However there is a significant growth in the amount of weak ties in almost all of the studied departments and related roles.

Weak ties are a demonstration of an individuals/groups outreach or expansion into another social or work network, that contain information (Levin and Cross, 2004) and instigate innovation (Hauser et al., 2007; Ruef, 2002) by developing access to different perspectives and experiences of activity implementation. Figure 5.21(b) shows that most respondents would either contact OrgX's service departments (36.84%) or no-one (34.95%) for environmental information. The graph also demonstrates that internal department communications are significantly lower than the work-based network. However inter-department communications are increased, with all departments having either two or three connections with other areas; a broader connection of S1, S2 and S3.

Discounting the direction of the interactions, communication channels within the eco-network are calculated as having an overall centrality of 0.631 (Figure 5.19) and betweenness of 0.107 (Figure 5.18). From Figure 5.20 we can quantitatively identify that only two of the Service actors within the eco-network have 'high prestige' (Chan and Liebowitz, 2006), with one having input from thirteen actors within the network (total network size is sixteen) and no outputs. This demonstrates that this particular service department acts as a 'black hole', by creating structural holes of non-reciprocation between itself and all other departments (Figure 5.22(b)); limits of S2.

This was again seen as a significant communication barrier and the development of communication channels between this service department and other nodes was

awarded a high priority. Tompkins and Adger (2004) identify open communication channels between community groups as contributors to social cohesion and normative behaviour changes. Therefore changes to social environmental behaviours within OrgX are dependent upon removing the barriers to communication caused by prestige-nodes. As a further comparator of both work and environmental interactions, the two networks were overlapped to produce sociogram (Figure 5.24).

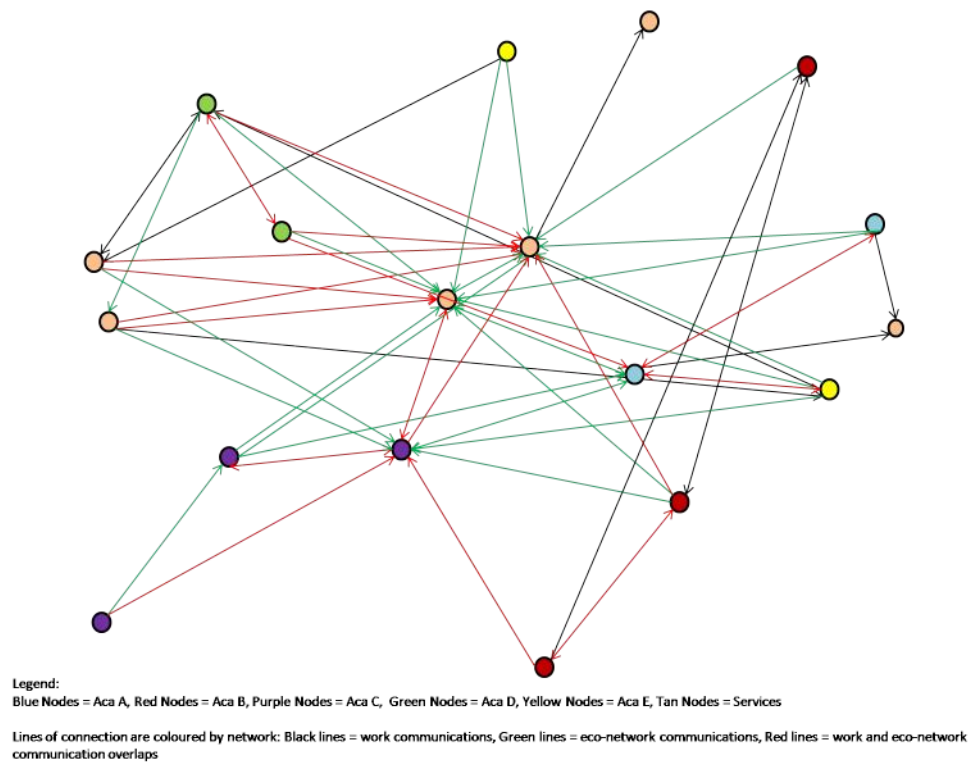


Figure 5.24: Merger of work and eco-networks.

It is clear from the diagram that environmental interactions are far more erratic than work-based communications, with the eco-network having direct connections to all departments; there is no clear department or employee position identified as ‘the environmental contact’. Observations and interviews within the organisation supported this finding with many individuals unsure as to who to contact for environmental information, and many suggesting members of the employee EWG as potential contacts (a voluntary group of eco-individuals, self-organised through a shared social value of the environment).

An interesting comparison of the work and environmental networks is the analysis of cutpoints within communications. Cutpoints are those actors within the network that are critical connection points, if they were removed the network would separate into two or more different networks (Wasserman and Faust, 1994). Figure 5.25 shows that within the work network there are three cutpoints, and within the environmental network there are no cutpoints. The presence of cutpoints within the work network are clear indications that the communication structure of OrgX is vulnerable to disconnection (Bogatti, 2006).

Work Net			
Node	Role	Contact	Cutpoint
Purple			
a	Coordinator	P-c to P-b	Yes
	Representative	Purple to Be-b	
	Gatekeeper	R-a, R-c to Purple	
	Liasion	R-c to Be-b	
b	-	-	-
c	-	-	-
Red			
a	Coordinator	Red	No
	Representative	R-b to P-a	
b	Coordinator	Red	No
c	-	-	-
Yellow			
a	Representative	Y-b to G-b	No
	Gatekeeper	Bl-a, Be-f to Y-b	
b	Representative	Y-a to Be-c	No
Blue			
a	Representative	Bl-b to Be-e	Yes
	Gatekeeper	G-a to Bl-b, Ce-e	
b	Representative	Bl-a to Be-e	No
Green			
a	Representative	G-b to Be-b, Bl-a	No
b	Representative	G-a to Be-b, Be-c	No
	Itinerant Broker	Be-c to Be-b	
	Gatekeeper	Y-a, Be-c to G-a	
	Liasion	Y-a to Be-b, Be-c	
Beige			
a	-	-	-
b	Coordinator	Be-c, Be-f to Be-d	Yes
	Gatekeeper	P-a, R-a, G-a, G-b, to Be-d	
c	Gatekeeper	Y-a, G-b to Be-a, Be-b	No
	Liasion	Y-a to G-b	
d	-	-	-
e	-	-	-
f	-	-	-

Eco Net			
Node	Role	Contact	Cutpoint
Purple			
a	Coordinator	P-c to P-b	No
	Itinerant Broker	Be-b, Be-c, Be-f to Be-a	
	Representative	P-b, P-c to Be-a, Be-b, Bl-a, G-b	
	Gatekeeper	R-a, R-c, Y-a, Bl-a, Be-b, Be-c, Be-f to P-b	
	Liasion	R-a, R-c, Y-a, Bl-a, Be-b, Be-c, Be-f to B-a, B-b, Bl-a, G-b	
b	Coordinator	P-c to P-a	No
	Representative	P-a, P-c to Bl-a, Be-b	
c	-	-	-
Red			
a	Representative	R-c to P-a, Be-a, Be-b	No
b	-	-	-
c	Representative	R-a to P-a	No
Yellow			
a	Liasion	Bl-a to P-a, Be-a, Be-b	No
b	-	-	-
Blue			
a	Itinerant Broker	P-b to P-a	No
	Itinerant Broker	Be-b to Be-a	
	Representative	Bl-b to P-a, Y-a, Be-a, Be-b	
	Gatekeeper	P-a, P-b, Y-a, G-a, Be-b to Be-a	
b	Representative	Bl-a to Be-a, Be-b	No
Green			
a	Representative	G-b to Bl-a, Be-a, Be-b	No
b	Representative	G-a to Be-a, Be-b, Be-c	No
Beige			
a	-	-	-
b	Coordinator	Be-c, Be-f to Be-a	No
	Itinerant Broker	P-b to P-a	
	Itinerant Broker	Bl-b to Bl-a	
	Representative	Be-a, Be-c, Be-f to P-a, Bl-a	
	Gatekeeper	P-a, P-b, R-a, Y-a, Y-b, Bl-a, Bl-b, G-a, G-b to Be-a	
	Liasion		
c	Gatekeeper	G-b to Be-a, Be-b	No
	Liasion	G-b to P-a	
d	-	-	-
e	-	-	-
f	-	-	-

Figure 5.25: Broker Roles of Each Actor.

Additionally the results suggest that whilst the environmental network is based upon weak ties of social communication, the network itself has a strong structure that will not collapse if a node is removed. To further analyse the social networks of OrgX, respondents were asked to indicate the social activities in which they engage with colleagues; for the purpose of identifying the strength of different forms of social relationship in the organisation (Figure 5.26).



Figure 5.26: Social activities pursued at work.

The graph clearly demonstrates that there is little social interaction between employees, with the highest activity ‘lunch’ pursued by less than half of the respondents. This lack of social interaction was not anticipated as the small size (employees and site) of OrgX generates a warm community atmosphere that is not reflected in the analysis. With regards to the SNA this lack of social engagement could have been a contributing factor to the low questionnaire response rate, with the potential that individuals were not necessarily reluctant to answer the questions but actually not able to.

This leads to the proposal that employees are socially active for the purpose of working effectively within a confined business community, but lose this social connectedness once faced with activities that are unrelated to job requirements. This had the potential to hamper any attempts to improve the environmental behaviour of the organisation, due to the voluntary nature of this activity and the dependence of such actions upon social cohesion (Section 2.3.2). This would indicate that the current eco-network will not be able to directly link with other social groups, as there are no clearly identifiable strong social networks within the organisation.

5.2.1 Social Network Development Project

The organisations EWG group meets voluntarily to promote environmental action and increase awareness across OrgX, but there is a constant battle to engage employees who do not have interests in environmental topics. This is by no means aided by the lack of social interactions in the employee group for simple activities such as lunch (Figure 5.26). Therefore it was necessary within this organisation to initially support the current social environmental network with efficient communication channels specifically related to environmental action.

It was decided early within the project (June 2006) that the EWG would meet at least twice per semester to develop new strategies for employee engagement, with the researcher acting as a facilitator and coordinator of communication within the group (Appendix A). The EWG decided to pursue small scale environmental projects that would gradually engage employees in related activities; bottom-up community action that can develop networks throughout multiple levels of organisation (Berkes, 2007).

In March 2007 the group delivered an Environmental Awareness Day in the recreational area of OrgX; this included a poster display of wildlife onsite, a jumble sale of employee-donated items and OrgX-donated refreshments. The core purpose of the day was to raise funds to add to the Alumni Development Fund of £10,000 awarded to EWG to refurbish the natural boundaries of the site.

The day proved beneficial as many employees who were unaware of the EWG presence were intrigued by the groups activities. The event was promoted primarily by word of mouth and EWG members sending generic emails within their own departments; due to organisational policies it was not possible to send an email to all members of the Campus.

This barrier to communication was frustrating in this instance, but the policy is generally an effective attenuation filter that ensures only those with information relevant to the entire community are able to send OrgX-wide emails. The Environmental Awareness Day took place at the beginning of March 2008 and raised approximately £130 for the purchase of a bird-box web-cam. The day was designed to coincide with the organisations Open Day to demonstrate to potential students that the organisation is striving to improve its environmental activities; attempting to improve S4 analysis and engagement.

The attendance to the event was quite low with many people arriving as a favour to members of the EWG, but others who did attend appeared to be keen enthusiasts of the environmental cause and asked questions about the group and its purpose. This was encouraging but upon reflection it was surprising that many people had not heard of the EWG before the event as the group had been meeting for almost two years (Appendix A).

This lack of awareness once again clearly demonstrated the current attenuation of environmental communication at OrgX, with EWG members bringing a variety of knowledge and community outreach into a small group with ineffective outward amplifiers. The Alumni Fund was used to purchase over twenty-five varieties of indigenous plants for the site to encourage wildlife into the area, which were selected by environmental specialists within EWG.

OrgX borders a golf course that was contacted to discuss the planting of the purchased plants, primarily to ensure that this would not cause any disturbance to their operations. Upon meeting with golf course representatives the planting project was approved and they offered to prepare the border for planting by allocating their grounds people to the project. The plants were sourced from a local nursery that employed people with special needs.

Through engagement with the local council, local environmental groups and council members themselves volunteered to participate in the planting project (Bringle and Hatcher, 2002). Nine community members, contracted gardeners who volunteered their time and four additional staff, thirteen students, two academics and one member of support staff who provided refreshments and food for all volunteers. OrgX contains a self-organised student group focused upon biodiversity projects who were engaged to help with the planting day and create a permanent link with EWG.

Unfortunately the student group did not want to join EWG as the employee group dealt with all forms of environmental projects, demonstrating a divide between staff and student subcultures of environmental values (Sharp, 2002). However a number of students did decide to become involved on the planting day of their own volition. The planting day itself was reported by the local town newspaper, local employee newsletter, OrgX(b) website and OrgX(b) alumni publication.

This stage of the project produced significant amplification of EWG environmental activities internally to OrgX and externally to local community members and previous associates of the organisation. A significant aid to the development of the environmental network was the engagement of departmental representatives (often managers) within semi-structured interviews (Appendix C). The interviews were conducted to allow managers to familiarise themselves with the project goals and become accustomed to the researchers presence.

Most managers were extremely helpful and willing to participate in the research allowing the researcher to attend departmental meetings to engage with employees. Appendix C contains summaries of interview discussions in which it was determined that there were six main priorities for environmental focus: management, community engagement, transport, technology, paper and energy use, and waste facilities. Within this general consensus of environmental priority there were

clear fluctuations in the degree of importance within each topic across different department.

For example, alternative technologies were highly important to one support and one academic department, whereas two additional support departments were more concerned with paper consumption and recycling facilities. Following the questionnaire distribution and manager interviews, the researcher was allocated formal agenda slots within most departmental meetings, enabling employees to put a ‘face’ to the project; resulting in a direct engagement with employees linked to S1 and S2 activities. The meetings were designed to allow employees to voice both pro and anti environmental opinions and make initial suggestions as to how OrgX should coordinate future strategies.

At this stage employees were invited to take part in a Short-Form Syntegration (Stage 3 of SECS), with each of the visited departments having at least one individual who wished to be involved in the event. The meetings served to amplify the environmental project to the employee group and the researcher was able to act as an attenuation filter of employee ‘will’ (Beer, 1983).

Following the meetings the researcher began to have employees approach them within social settings to ask about environmental developments and further ideas for future strategies. These developments supported the fourth research question (Section 4.6.2) that a self-organised group of environmental activists would gradually gain the attention of the surrounding community. It was suspected at this stage that the cultural dynamics of OrgX were being successfully engaged, with a growth in the amount of employees who were seeking out environmental activities of their own accord.

The outreach of the EWG was aided with a stall at the student’s Freshers Fayre in September 2008; following Stage 3 of SECS to be discussed later. A seasonal competition was held in November 2008 for all staff and students, raised £60 to

purchase five bat boxes for the site from an ethical supplier; this was positively received by local council members who identified that this would contribute to their Biodiversity Action Plan (Appendix C.22). EWG members and many colleagues donated their own belongings as prizes for the competition.

Following these engagement activities EWG members continued to be approached by employees with environmental queries, discussions of the topics within the EWG were then fed back to employees either in person, via email or EWG departmental representative. Once this added need for dissemination of information to the employee group was identified, the EWG began to meet informally once a month in the OrgX recreational area. This allowed the group to invite interested employees to partake in environmental conversations whilst also maintaining a visual presence in the community.

Following EWG formalisation (to be discussed more in Stage 4) the group began to meet at least three times per academic year with the support of formal OrgX administrative aid, with all meeting agendas fed directly to OrgX(b) EWG and Estates directorate. This further expanded the environmental social network as the researcher developed relationships with OrgX(b) representatives and became involved in their projects; this again supported the fourth research question.

In this case study the EWG began to be viewed as a source of specialist information within the organisation after two years. OrgX and OrgX(b) both experienced negative publicity when a UK newspaper published a higher education Green League table that placed the organisation in 85th position of 119 HE establishments (Independent, 2008); recognition of S4 analysis and potential impacts of external influences. Following this the organisation became more willing to improve its environmental achievements but it remained primarily a voluntary or ad hoc process.

Representatives began to be sent to competitor organisations to study their environmental technologies and projects, with a purpose of identifying those

techniques that could be applied to OrgX. This demonstrated a unique trait of ‘environmental networking’, in that competitor organisations are willing to freely advise and divulge their strategies (TCT, 2008).

The conducted SNA provided a general overview of the work-based and environmentally-focused communication channels within OrgX. From the analyses it was determined that the EWG had developed a network of weak-ties within OrgX that had a more holistic outreach than regular work channels. Whilst the environmental network had broad inter-department contacts, the work network was shown to contain a much stronger set of internal department communications.

The environmental network was shown to contain no cutpoints (potential points of network disintegration) making it more stable than the work network that contained three cutpoints. However the SNA also revealed that one service department was acting as a barrier to environmental communications; receiving inputs but not reciprocating contact. In comparison to work communications the environmental network contained far more communication channels; a combined result of the informal EWG and general employee confusion as to who to contact for such information.

The environmental network was shown to share some of its communication channels with that of the work network, providing an ideal location to begin embedding environmental issues within the formal communications structure. Following the SNA a Team Syntegrity event was designed and implemented to develop OrgX’s environmental strategy in line with social demands, the following section summarises the event.

5.3 Stage 3: Collaborative design of environmental strategies.

The third phase of the project was based upon generating a bottom-up environmental strategy through the holistic engagement of OrgX personnel. Bossel (2001) suggests that participation from numerous system actors is essential to the development of holistic management approaches for sustainable development; representation from individuals representing Systems 1 through 5 and all levels of recursion. An initial meeting was established with Manager A of OrgX and Academic A, who is also the main driving force to the organisations' EWG (Appendix C.1).

This meeting produced positive support of the research and the proposed Team Syntegrity (TS) workshop (Section 4.5), and enabled the researcher to gain a deeper understanding of the management commitment to the project. Schwaninger (2003, p.58) discusses the TS protocol and how sociometric analyses have shown "...significant increases of different measures of cohesion between the beginning and the end of the respective syntegration events".

Workshops are often considered to be a vital process of engaging community values and the facilitation of knowledge and skill transfers between attendees (Vidal, 2009). Clear support of the research was evidenced by Manager A offering to fund the lunch and refreshments for the workshop, attend the event as a participant and where needed encourage employees to become active within the research. The participative nature of the TS provided the ideal opportunity to access the knowledge contained within the local employee group, debate different values and reach a group consensus of future strategies (Schwaninger, 2004b).

The workshop was scheduled to take place in late August 2008, coinciding with Manager A's availability, to ensure clear management commitment was visible to all

of those in attendance (Post, 1994; Ramus, 2002b). During this initial meeting the researcher proposed some short-term strategies e.g. EWG web-site space, physical notice board onsite, facilitation of monthly community forums. All of which were supported by Manager A who provided vital contact details and suggested specific organisational budgets as potential avenues to fund the activities.

While these activities were suggested to demonstrate the potential of the organisation to affect simple change, the TS workshop was considered to be the prime opportunity to engage the strategic 'mind' (Schwaninger, 1987) of the employee workforce. Examples of environmental activity focus was identified within this initial meeting when it was highlighted that some staff were currently taking works material to their home residences for recycling due to the lack of facility at OrgX.

This suggested that there was already an immediate need to improve recycling facilities onsite, in terms of bin capacities and awareness of collection points, to ensure that employees no longer used their residential waste allowances for business purposes. Manager A also suggested the possibility of auctions for decommissioned equipment onsite (which began during the project timeframe). There was a brief discussion of current strengths and weaknesses within the decommissioning policies of OrgX in terms of legislative restrictions.

These suggestions were to be discussed at the TS event if the Infoset agreed and indicated that there was already a wide range of potential suggestions for future strategies. In order to ensure that all management groups are familiar with developments of the TS event and practical actions implemented, it was determined that the researcher would present their findings to OrgX's academic management committee as the project developed.

In order to produce a future strategy for environmental action in OrgX a twelve person Short-Form TS was designed, based upon Stafford Beer's Team Syntegrity

model (Stage 4.6.3). Representatives from each department attended the event and were selected from those who showed interest in the departmental interviews conducted in Stage 5.2. The event was designed to overcome hierarchical barriers to communications and treat each participant as an equal and valued resource of knowledge, allowing all members to speak in a non-confrontational environment (Espinosa and Mejía, 2006).

By developing a day-long workshop specifically focused towards environmental action, a generic understanding of the organisational culture and perception of community responsibility can be determined by all involved; the Short-Form TS protocol was reduced to one day at the request of OrgX management.

5.3.1 Pre-emptive Planning

Following meetings with most departments within OrgX there was ample support (participant numbers and funding) for the TS workshop to take place. The catering for the event was provided by OrgX and through further discussions Academic Team B supplied the materials necessary for the TS protocol e.g. stationary. Other departments also provided support through the loan of video cameras to record the event, room allocation, provision and setup of furniture and display equipment.

The event required two facilitators to be present throughout the topic discussions to ensure that the TS protocol was followed and a respectful debate environment maintained, without contributing personal ideas/opinions (White, 2002). A surprising cultural change was evident from departmental responses, in that those managers who had been adverse to the initial questionnaire (Stage 5.1) used within the research suddenly became very active in becoming involved within interviews and the development of the workshop.

It is proposed that for the administrative and facility departments the development of a practical activity (workshop) that stopped the research from being perceived as an academic project (questionnaire) meant that the project was now deemed as worthwhile. This was highly beneficial to OrgX's environmental strategy development as it meant that problem structuring processes (Rosenhead, 2006) contained a holistic representation of employees.

Initial meetings with Heads of Departments immediately demonstrated the need for added communication channels within the organisation, with no clear consensus across departments on one specific contact to direct environmental concerns. Most of the managers were able to identify a specific service department as a core contact for environmental concerns and were able to identify members from the department, but it appeared that the contact depended upon personal choice rather than job relevance.

Environmental priorities across departmental management were relatively consistent with most employees identifying the same areas of interest, albeit at differing values of priority. The researcher decided to inform interviewees of the priorities chosen by upper management to determine if they agreed, disagreed or had anything to add to the list of activities. These priorities became the generalised topics of discussion for the event that could then be altered by employees during the Problem Jostle (PJ) stage of the event.

Discussing these environmental priorities with interviewees served to ease participants who at times seemed confused as to what an environmental activity was when asked; with most interviews lasting one hour there was ample time for additional priorities to be identified through further discussion. The scheduled date of the workshop proved to be difficult for some departments as the August period was used by many staff for annual leave.

This could not be avoided as the event needed to be arranged in conjunction with the availability of Manager A to demonstrate the management support of the project. This did prove unfortunate as some employees were very eager to become involved in the event but were unable to do so due to schedules for annual leave. These issues were somewhat allayed as the researcher assured employees that the August workshop would not be the sole opportunity for staff to be involved in the environmental planning of the organisation.

It should be noted that employees who attended the event did so voluntarily and at a cost to their own regular working requirements. This resulted in participants needing to catch-up with their workload at a later time and having their colleagues provide additional work support whilst the event took place. This feeds back to the engagement of cultural values within the organisation (Stage 5.1), suggesting that employees identify with an awareness of need and responsibility for OrgX to address its environmental impacts.

5.3.1.1 Importance Filter

Following the departmental interviews the researcher had identified eighteen people who wanted to be involved within the TS workshop. Initial plans had been to hold a twelve person Short-Form Syntegrity, but with the added number of volunteers the protocol for a larger infoset was developed. Figure 5.27(a) depicts the new interactions with the added edges thirteen through eighteen.

Two topics were to be debated at any one time with all eighteen participants involved in one of the two discussion groups. For example, half of the Infoset were to be involved in debating Topic A whilst the other half simultaneously debated Topic B. In order to optimise the interactions of the internal struts it was decided that persons thirteen through eighteen should be assigned to ‘mirror’ one of the initial twelve edges.

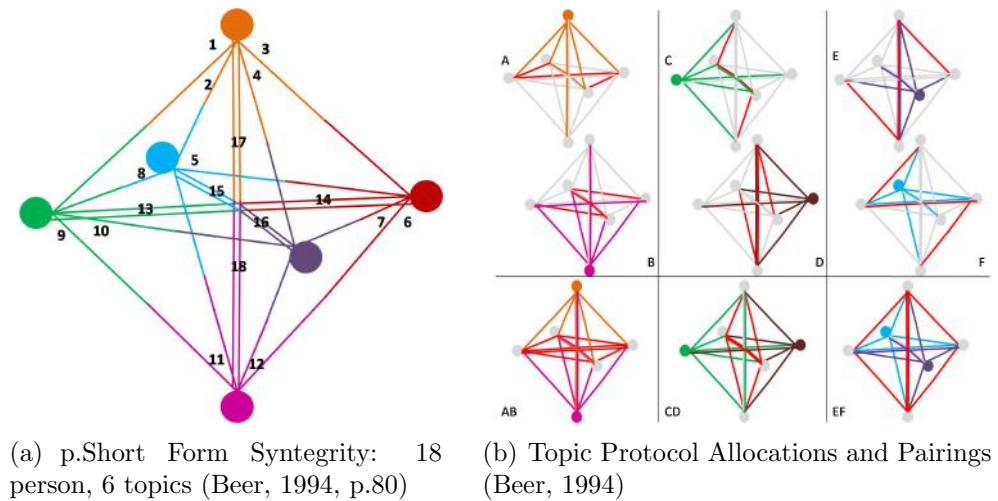


Figure 5.27: Adapted TS Protocol.

The decision to double-strut was made following the researcher's tests of numerous permutations in the topic-positioning of the internal struts and supporting advice from personal communications with Dr Allenna Leonard. To broaden the protocol to accommodate the larger infoset the tensile reverberations of the octahedron are used as person roles. Figure 5.27(b) depicts the topic assignment, member (orange, pink, green, brown, blue and purple lines) and critic roles (red lines) for each individual for the simultaneous meetings that were used within each iteration of the Outcome Resolve (OR) (Schwaninger, 2001).

Participants were required to indicate which of the six pre-established topics of discussion they would prefer to discuss before attending the event (due to time restrictions), enabling the researcher to allocate each person to the most suitable strut for their choices. The adapted protocol was further altered by the removal of participant involvement in the hexadic reduction of the topics (Figure 4.5.1), which would be impossible to schedule into the one day workshop agenda.

The topics were split by the researcher into human, technological and facility polarities; allying the dominant factors of dependence into pair-oppositions (Figure 5.28).

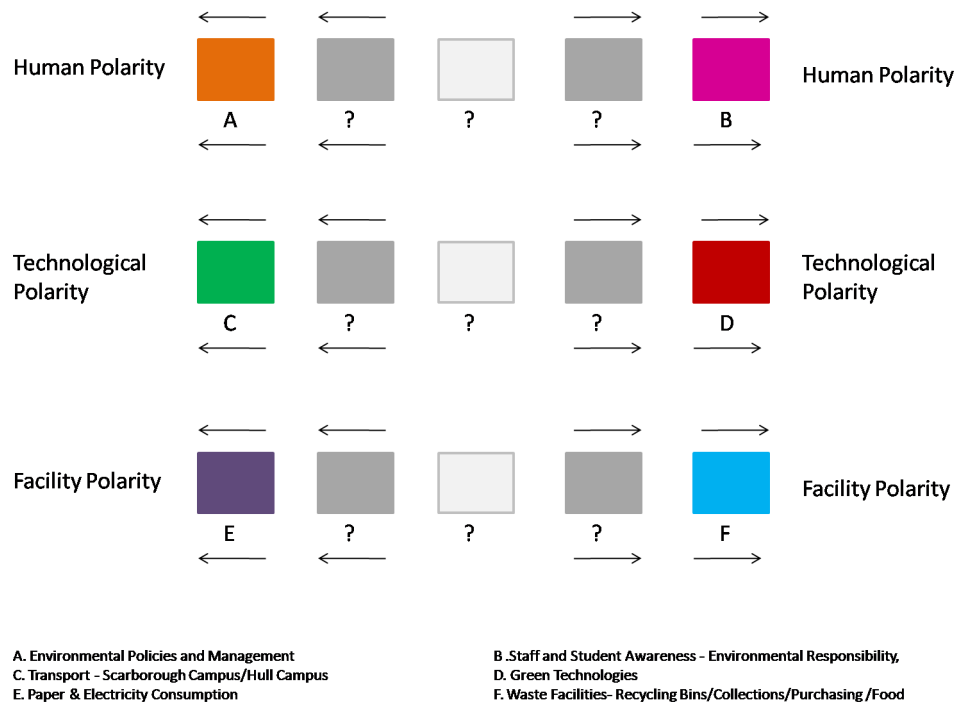


Figure 5.28: Hexadic Reduction.

Developed from Beer (1994, p.119).

Whilst these generalised topics and hexadic reduction were performed before the TS event for logistical purposes, sufficient time was allocated within the workshop timeframe for participants to alter topic discussions.

5.3.2 Environmental Workshop

The Environmental Workshop was held on 21st August 2008, seventeen members of staff attended the event, with only one person missing from the initial list of attendees due to illness. All five academic departments were represented at the event, as were three service areas and Manager A of OrgX; representing Systems 1 through 5. The broad departmental representation and attendee numbers demonstrated a clear 'initial step' within the organisations culture to one of higher awareness in self-responsibility in environmental issues (AC and AR in the Norm Activation Model (Stern et al., 1985-6)).

The event was unique within the organisation as previous attempts to conduct inter-department activity days, such as interdisciplinary research conferences, had failed to gain enough support for at least the prior two years. Similarly the use of the TS approach was completely new to all but one member of the Infoset (participant group), and it was with great appreciation that all attendees followed the protocols of the method, trusting the researcher in the value and worth of using the technique.

Many employees expressed to the researcher that they found the technique highly innovative and believed that it was a beneficial method of communication (Holmberg, 1997). Bateson (1972) suggests that art surpasses any cultural or lingual barriers, therefore as an added feature to the event a pictorial display was visible within the 'background' to enhance the cognitive engagement of employees (Section 3.1).

For the first half of the day the images were of the OrgX activities that were not considered to be environmentally friendly, followed by pictures of natural 'positive' local scenery throughout the remainder of the event e.g. waste paper and beach, respectively. The researchers peer Michelle Watts volunteered to act as a facilitator for the event alongside the researcher; due to unforeseen circumstances the primary research supervisor Dr Angela Espinosa replaced Michelle following the first OR.

5.3.2.1 Problem Jostle

A mini-Problem Jostle (PJ) was conducted at the beginning of the TS workshop, with each participant provided with a sticky note pad to add comments to the pre-determined six topics of discussion (Appendix C and D.1). Participants were initially provided with the six core topics of discussion that were developed during employee interviews as a guide for discussions.

The Infoset were informed at the beginning of the event that if they should collectively wish to change any of the core six topics that this would need to

be debated and altered before the first Outcome Resolve (OR). Due to the time restrictions of the event the PJ was conducted over forty-five minutes, which proved to be too short a time period for people to fully discuss establish a set of Aggregated Statements of Importance (ASIs) (Schwaninger, 2003).

It was quickly decided that the development of an initial set of ASIs should be the core objective for the first OR. The use of the sticky pads as an idea-amplifier proved very successful with the group, with all attendees contributing at least once to each topic; the sticky pads acted as a form of ice-breaker with the InfoSet finding it an entertaining method of communication.

For many individuals it seemed somewhat of a novelty to be in a meeting and have the freedom to express all of their ideas in a highly visual manner, whilst also being able to walk around and engage in light-hearted conversation. The group merged well and people with like interests soon found one another, each topic appeared to have a strong and equal interest from different members of the group. The group were ushered to begin clustering like ideas to progress to the OR with clear drivers for each topic.

5.3.2.2 Outcome Resolves

The InfoSet (participant group) quickly progressed from the PJ to the first OR with relatively little confusion. The topic discussions within each meeting focused upon the ideas generated within the PJ with each group reading and refining the sticky notes added to their topic. Within the first OR virtually all attendees complied with their ‘member/critic’ roles (Section 4.5.1), and credit needs to be paid to their efforts in following the technique in what was virtually blind-faith.

The following discussion of the workshop summarises the primary debates and decisions of the event, a full account of the information recorded throughout the day is available within (Appendix D.2). The first OR iteration focused upon

‘what’ environmental considerations needed to be addressed within OrgX (Appendix D.2.1). This iteration developed upon the comments made within the PJ narrowing the topics to a set of core environmental considerations, producing thirty-two ASIs across the six topics.

At the end of this iteration the Infoset were provided with lunch to provide a relaxing social atmosphere in which the topics continued to be discussed at a more leisurely pace. The second OR iteration further narrowed activities of prime importance and developed strategies to implement the ASIs within OrgX operations and social networks; both ‘what’ and ‘how’ (Appendix D.2.2). The Infoset commented within the second iteration that they could see the direct benefit of returning to previous discussions, noting the ability to establish interrelations between all of the topics.

An interesting aspect of the second OR was to see how eager participants were to revisit topics as they had identified connections and potential avenues for innovation across multiple topics. Participants established thirty-five Composite Statements of Importance (CSIs) (Leonard, 1996) at this stage that needed to be further refined to establish practical strategies for implementation (Appendix D.2.2). The third and final OR identified those individuals within the organisation that had the necessary authority and resources to implement the developed CSI (Appendix D.2.3); sole focus upon ‘how’.

The TS approach proved to be beneficial for environmental discussions as the Infoset were able to develop thirty-two Final Statements of Importance (FSI) of practical change strategies (Schwaninger and Leonard, 2004). The FSI for environmental management and policy placed primary responsibility upon EWG members to implement the strategies, Manager A to approve action plans and the researcher to coordinate the two stages of development (Appendix D.3.3). An added action at this OR was that of establishing an email account for the employee EWG to increase ease of communications; an improvement in S2.

Staff and student awareness FSI were allocated to service personnel (S2) to increase practical facilities onsite and educate the community on the appropriate use of such equipment, academic management to review possibility of environmental curriculum, senior management to approve action plans and employee newsletter editor to include an environmental section; addressing Systems 1, 2 and 3. Transport FSI were allocated to a range of employees with Manager A being responsible for continuing to encourage OrgX(b) employees to use video-conferencing facilities and the funding of a car-pool notice board (installed by facilities personnel), and all managers to promote the use of alternative travel to employees (S3 and S5).

Green technologies FSI were seen to be the responsibility of senior management to determine choice of equipment, with the EWG and OrgX(b) Energy Officer responsible for collecting and reporting technological advances through the employee newsletter, sustainable purchasing policies and departmental competitions to be coordinated by OrgX and OrgX(b) senior management (S3 and S5). Further to this there was also the identification that Manager A and the EWG needed to develop connections with OrgX(b) EWG to improve access to environmental innovations.

Paper and energy consumption FSI were seen to be the responsibility of OrgX(b) Energy Officer and facilities personnel to produce and distribute informative posters to be placed across the site, and IT personnel to test and install automotive PC shutdown procedures by October 2008 (S2 and S5). Waste facilities FSI were focused upon senior management approval of EWG, Service F development of informative pamphlets to be distributed at induction, EWG development of environmental projects and management evaluation of developing a postgraduate environmental degree (S1, S2 and S3).

5.3.3 Bottom-up Strategies for Development

Following the workshop it was decided that EWG meetings would be arranged informally on a monthly basis, for all interested employees to attend (Appendix D.3). Early within the project the researcher became a roving reporter for OrgX's employee newsletter, this increased the social outreach of the researcher and enabled the inclusion of environmental project updates to a broad audience.

A highly positive outcome from the event was the suggestion of a 'Green Week' which gained enthusiasm from many participants, especially Manager A. The thoughts behind the week were aligned with those of the 'international weeks' already scheduled within the academic year. The general purpose of such a week would be to devote all teaching and research towards environmental issues relevant to the different degree disciplines (Cortese, 2003; Holt, 2003), become a paperless organisation for the time period and organise sustainability events onsite.

Within the project time frame the 'Green Week' was not implemented, however OrgX(b) had developed a similar idea which included activities such as students bringing their recyclable materials to a centralised location onsite. Student groups developed a Fair-trade week that spanned both OrgX and OrgX(b) that can be seen to contribute to the Corporate Social Responsibility of the organisation. The TS event proved to be a success with the Infoset, with most members demonstrating enjoyment at partaking in an unfamiliar discursive environment.

The general underlying theme to the FSI was the need for improved communication channels between OrgX departments, OrgX and OrgX(b), employees and students. Communication amplifiers were deemed to be necessary for the EWG and a specific service department ('prestige' node (Stage 5.2)) to ensure that both active and future environmental activities were sufficiently disseminated throughout the organisation; top-down and bottom-up (Ramus, 1998). The developed FSI were viewed as those activities to gain immediate focus within the next stage of SECS so

that the Infoset could see demonstrable changes within the organisation, as a direct result of their involvement in the TS event.

Following the implementation of stages 2 and 3 of SECS the employee EWG were awarded the possibility of becoming a formalised committee within the organisation (S3); this was dependent upon the development of a clear Terms of Reference (TOR) for the group that required approval of the core managers and senior managers of OrgX and OrgX(b). It is believed that this opportunity for EWG formalisation came directly from the Final Statements of Importance in the TS workshop; this event displayed a united workforce demand for organisational support and commitment to employee efforts.

The TOR was approved in October 2008, with the group being given official administrative support for their meeting agendas to be sent directly to OrgX management and OrgX(b)'s overseeing Facilities directorate (Appendix A). It needs to be stressed that whilst this formalisation provided the EWG with an official reporting channel it did not receive any other form of formal support, retaining its voluntary status and informal organisation.

Overall the TS approach proved to be a useful method for merging social values into practical strategies for environmental change. The iterative discussion process proved to be a novel and enjoyable process for participants who voiced their appreciation of having a non-hierarchical discussion platform (Espinosa and Harnden, 2007b). The Infoset were able to develop a common narrative of what environmental action meant to administrators, academics, ecologists and non-ecologists; thus building a stronger capacity for local complexity management (Browning and Boudés, 2005).

Whilst the topics of discussion had practical connotations for OrgX operations, the workshop had a relaxed sociable atmosphere that was viewed to be a pleasant contrast to traditional structured meetings. By the second OR participants were

able to identify that each strategy for environmental change had connections to at least two discussion topics; the workshop facilitators also noted that topic reverberations (Leonard, n.d.b) were clear within the second OR.

These reverberations enabled simultaneous reflection and learning within the decision-making process; flowing through the systems dynamic analyses of reaction, adaptation, creation and generation (Panagiotidis and Edwards, 2001). The topic interrelations helped many participants to develop their understanding of the practicalities of business resource management, social values and requests for environmental change, and the practical needs of the surrounding natural environment.

5.4 Stage 4: Prototyping and monitoring of environmental strategies.

During the early summer of 2008 the researcher began to develop methods by which to advertise and increase the communication channels of the informal eco-networks; with strong focus upon S4 activities. This was intended to include both the EWG as a group and the eco-activities pursued by each member. The initial focus of the strategies was to amplify the communication of EWG within OrgX, in order to gain access to as many individuals within the community with a passion for environmental action.

The researcher established three initial activities to be undertaken within the short-term: web-site space, physical notice board on grounds and facilitation of a monthly community discussion forum. Upon meeting with Manager A of the site, support was given to all of these activities, appropriate contacts were discussed and potential avenues of funding explored. Following the August 2008 TS Workshop (Stage 5.3)

a set of Final Statements of Importance (FSIs) were developed to form the basis of the organisations new Environmental Strategy.

In conjunction with the TS event a baseline environmental audit was conducted by the researcher. The results of this audit were highly dependent upon informal contacts within the organisation who provided information with regards to procedural operations. The use of social connections in this manner was necessary as there was initial uncertainty within the organisation as to what the audit entailed, commitment of employee time and the context of the audit analysis; as with many organisations within the UK OrgX was unfamiliar with the ISO 14000 standards.

The ideal mindset that needs to be adopted when pursuing environmental audits is one of responsibility and acceptance, responsibility of both positive and negative activities, and acceptance that there is always the possibility for improvement; continual improvement is a key aspect of the ISO 14000 EMS (Delmas, 2002). An organisation needs to adopt a somewhat vulnerable stance, in which it is prepared to acknowledge the negative environmental impacts caused by its activities. OrgX(b) became involved in a carbon management initiative with a governmental body that initiated a committed management focus to environmental activities, which in turn benefited the implementation of TS FSI within OrgX.

While waiting for senior management to determine the preferred level of environmental auditing (e.g. general overview, ISO 14001, EMAS), meetings were scheduled with most Heads of Department within OrgX to gain a deeper understanding of operational procedures (see Figure E). Restricted access was initially placed upon the environmental audit limiting the analysis to those processes easily accessible to the researcher through informal contacts; such as water, electricity and gas consumption statistics (Appendix G).

The researcher attended most departmental meetings prior to Stage 5.3, to assess the Environmental Aspects of each team and report findings back to Senior

Management, Service Management and EWG. In July 2009 OrgX and OrgX(b) management agreed for an environmental audit to be conducted by the researcher; one year after the initial base line audit was completed suggesting cultural adaptation within management.

The audit was conducted using the generic headings of the ISO 14000 audit as a guide to those areas of organisational performance that should be analysed. Appendix G includes data gathered from meetings held in July 2009 with facilities personnel to produce a final environmental audit of OrgX; following informal discussions in July 2008 a baseline audit is included within the table for comparative purposes.

The network analysis performed in Stage 5.2 provided a summary of the main difficulties and structural holes between departments that were causing barriers to environmental activities. The environmental audit and TS event activities are discussed below using the categorisation of economic, social and environmental traits. Activities that correspond to the Final Statements of Importance (FSI) of the TS workshop are indicated as such.

5.4.1 Economic

Prior to the TS event the researcher was able to secure a space on the homepage of the internal website for the EWG logo that would link to a specific web-page dedicated to the group (FSI (Appendix D.3.3)). Within this early stage of the project there appeared to be different strategic focuses within the EWG group, with the leader wanting the researcher to ‘take the reigns’ and the majority of group members happy to pursue tasks within their own departments with little inter-department interaction.

Whilst operational autonomy acted as a source of innovative departmental activities (Ahmed, 1998), it also resulted in departments unnecessarily duplicating time and resources to pursue like strategies; a failing in strategic autonomy (failing of communication between S1, S2 and S3). Following the TS event employees appeared to realise that it was necessary to coordinate and record their activities through platforms such as the new EWG web-page. An additional support to the internal communication network of EWG was the establishment of a dedicated email distribution list for group members; this was initiated within one week of the TS event (FSI).

Video conferencing facilities were improved onsite but remained restricted to specific rooms (FSI). The primary achievement of the video conference facilities was the determination by OrgX management to encourage/insist that their OrgX(b) counterparts used similar meeting format. This reduced at least one manager's travel between sites to one/two days per week, instead of four/five days per week. With regards to transport to OrgX a car pool white board was installed within the staff room onsite (FSI).

Local transport facilities were improved during the project timeframe with a town Park and Ride scheme developed for the area. Management were able to negotiate with the local council so that OrgX became a set destination on the bus route at a reduced fare (effective coordination of S3 and S4); this was beneficial for employees and students who lived in the town suburbs, but not overly useful for those within the town itself who were still required to use the traditional bus routes which are irregular.

Additionally OrgX had already established a reduced product fee for bicycle purchases for employees at a local store. To further increase the use of car sharing and Park and Ride facilities OrgX introduced a new onsite parking criteria that resulted in far less individuals being awarded parking permits (FSI); this also had social implications with regards to students parking at nearby residential areas (S4).

OrgX itself has two vehicles for employee usage that are often used (Appendix C.29); a System 5 control from OrgX(b), over Systems 2 and 3 of OrgX. However there continued to be no measures to establish if individuals are car pooling with these vehicles. The use of an on line car pooling system was dismissed by employees as there was a concern that students would be able to establish the location of individual employees.

There were numerous attempts by the researcher to establish an employee-specific on line car pool system but this became a lesser priority to other business needs. Part of OrgX's remit is to improve the diversity of its student base which often requires employees to travel to foreign countries to provide services to local residents, attend international conferences and advertise the organisation to a broad audience. These activities are essential for OrgX to retain a competitive position within a globalised world (Altbach, 2004).

Similarly existing students are sometimes taken to foreign locations to improve their knowledge base and expertise in applying techniques learnt through OrgX's service provision (Appendix C.14). It is not yet feasible in these circumstances to use transport other than air travel as it is the cheapest and quickest form of transport to the desired destinations and as such this is seen as an activity with significant environmental damage that cannot be avoided.

OrgX use sustainable purchasing guidelines set by OrgX(b) to procure consumables from contracted suppliers, with focus placed upon individual choice to choose the best alternatives possible (Appendix C.9). Paper consumption continued to be a strong issue for the organisation but the development of electronic resources was improved for some student services e.g. online coursework submission. Students within certain departments were able to trial a new Virtual Learning Environment that proved to be useful for providing service materials and employee contact.

Paper copies of service materials were still made available due to concerns over disability discrimination and the prior experience that many students did not read documents online; requiring a coordination of System 2 and System 3. It is seen that this needs to be another cultural transition in the organisation towards more online service provision as a normative operation; with enhanced facilities and discretion for disabled students to request accessible formats of the documents. This system already works quite successfully for the Open University (Roy et al., 2002).

Facilities have been implemented to enable students to submit documents to OrgX electronically and there has now been the purchase of printers with duplex printing capacity. The greatest consumption of electricity comes from the computer suites and administrative offices, it was determined within the TS workshop that an automatic shutdown of computer systems should be trialled and implemented within OrgX; an improvement of S2. Following trial periods, an automatic 30 minute shutdown procedure was installed within all student access computers (FSI); employee computers were not subject to the same protocol.

Energy consumption was improved with the installation of movement sensitive lighting in some areas of the site (FSI), the installation of energy efficient boilers and sub-meters within renovated areas and new builds. Onsite gas heating was also adjusted to switch off when fewer students are onsite, which is typically for the five summer months of the year (Appendix C.29). Monthly monitors consist of a computer system that automatically feeds meter readings to OrgX(b) energy officer; this acts as a sufficient attenuation filter of consumption statistics (Darby, 2006).

However it would be more efficient if the system sent information directly to OrgX employees; current interactions involve OrgX amplification to OrgX(b), for OrgX(b) to then attenuate results back to OrgX; a System 5 control from OrgX(b), over System 2 of OrgX. It is suggested that the current monitoring system is a step forward for OrgX but it should aim to become autonomous in this activity. Water

consumption was improved with the installation of water bricks in all site cisterns and push taps in all site bathrooms.

These improvements were conducted following the free assessment of OrgX by their water supplier who provided some of the equipment necessary to enact the changes. Special taps were also installed onsite to reduce excess consumption and prevent water backflow that can cause Legionellosis to develop. Similar to energy consumption, Legionellosis consultants analyse site water systems and feed their results to OrgX(b) employees rather than providing the information directly to OrgX (Appendix C.29).

This is a new development of environmental communication and monitoring between OrgX and OrgX(b) (FSI). The implemented Legionellois computer monitoring system requires data to be fed into the system for an external contractor to review or a nonconformity is registered. During these monthly checks employees remove, replace and sterilise shower equipment onsite. While the legionellosis system forms part of an EMS these systems were implemented due to health and safety requirements; it is relevant to the environmental audit but did not appear to come from an environmental drive.

5.4.2 Social

In line with TS strategies the researcher was allocated a permanent section within each employee newsletter to provide EWG updates (FSI). Following the TS event employees began to contact the researcher with updates for the newsletter (FSI). The researcher decided at one stage to do a brief update report of the tree planting project designed by the EWG.

Upon contacting the group member who was driving the planting scheme it was determined that the trees and shrubs had in fact been planted two months prior

to the date; these were the larger items that could not be included in the EWG planting day. A clear concern that was highlighted during interviews with Heads of Departments and full departmental meetings was that virtually no one was aware that the EWG's tree planting project had already been implemented; an activity managed by S2, who continued to block outward communications of activities.

Quite simply the amplification process adopted by the group had been successful for the Environmental Awareness Day (Section 5.2.1), but the natural tendency of the group to attenuate their activities immediately resumed. Once again this lack of communication was held within the 'prestige' service node identified in Stage 5.2 who were responsible for implementing the planting project; however there was a continued lack of acceptance in the responsibility to inform others of their activities (Stage 5.1). The organisations EWG continued to be observed in their commitment and impetus to implement the Environmental Action Plan (Stage 5.3).

The project progressed towards the development of strategies to enhance and embed environmental action as a normative behaviour. Through early interaction with the EWG the researcher began to suggest a variety of small environmental activities that could be implemented within OrgX. Over time these suggestions were slowly embedded within the organisation by members of the EWG who had the authority to make such changes. Examples of these activities included energy efficient light bulbs, toilet cistern 'water bricks' and cardboard recycling, amongst others.

The Environmental Action Plan was considered to hold the future goals of the EWG, which were met with much enthusiasm following the TS event. In October 2008 the EWG was formalised by the OrgX management as the organisations official environmental body (FSI), developing the organisations Awareness of Policy in environmental norms (Section 4.3.3); demonstrating successful engagement and integration into S3. With the developed terms of reference detailing the groups responsibilities to include the review of site operations, new build plans and continued community engagement (FSI).

The formalisation of the EWG supported the first research question (see 4.6.1) that a holistic approach to EMS requires social commitment (Stage 5.3) and establishment of environmental activities as a normative behaviour (formalisation). The majority of departments were required to have a representative within the EWG and all departmental meetings were required to have an environmental update section (FSI); two departments did not have volunteers for the group. This enabled the EWG to advertise how well they were conducting their activities to the upper management of OrgX(b) (Creighton, 1998); OrgX S3 feeding directly to OrgX(b) S3 and S5.

Student engagement was viewed by the researcher as a primary area for the development of environmental strategies in OrgX (Sammalisto and Brorson, 2006). The benefits of holistic engagement were not completely appreciated by the EWG, with some members indicating that students did not have the ability or impetus to change. Regardless of this, a few strategies were developed to increase environmental awareness in the student community, starting with the introduction of a EWG stall within the Freshers Fayre (FSI).

This was received well by the students with 59 individuals leaving contact details to be involved in future meetings and activities with EWG. Students were also given the opportunity to grow an oak tree from acorns provided by the group, which proved to be quite popular. This stall also served to amplify the current, present and future activities of the staff EWG, especially with the wildlife projects onsite, Pumpkin and Autumn Hamper Raffles (FSI).

Most of the students who registered for the student EWG group also registered with the OrgX SHRUBs society, a dedicated group of students whose remit was the identification and monitoring of species in the local area. It was decided that it would be beneficial to work in conjunction with the SHRUBs as they were a well-established student group already working with an environmental ethic.

An initial meeting with this group was arranged, with the Chair of the society eager for collaboration with staff but unwilling to commit the group to any activity without a clear consensus. The group provided a mixed reaction to the prospect of working with staff members, some felt that there could be a reciprocal benefit to this collaboration; others felt that the initial proposed activities i.e. wildflower planting, were not a legitimate goal of the group (Ishihara and Pascual, 2009).

The group was structured via nested task forces with members of management represented by those individuals who spearheaded self-organised projects for the group. Any individual could become a member of SHRUBs management if they established their own self-organised activity. This resulted in group decisions following a voting policy from a wide range of individuals who undertook projects such as tree surgery, bird watching, through to student year group representation (appendix C.24).

This structure enabled a few individuals to veto any collaboration with the EWG, which could have allowed the group to gain additional support and resource for their activities. It was viewed that even though this group was the student eco-community they were not actually environmentally focused; for example, the attitude that was displayed by the group was ‘Yes, I would like to survey and monitor local wildlife. But no, I do not want to undertake practical activities to increase wildlife habitat’.

This is a broad generalisation as there were members, including the Chair, of the group who did want to be involved in the EWG activities. As such, it was decided that even though the EWG could not engage fully with SHRUBs, collaborations would continue to be offered to those individual students who were interested.

5.4.3 Environmental

During the decision making process of the tree planting scheme mentioned earlier in Section 5.2.1, a meeting was held with representatives from the neighbouring golf course to ensure that plans for the joint boundaries were suitable for all parties. The golf course representatives were extremely cooperative, offering to have their own gardeners fell some of the dead trees onsite and remove concrete posts used by golfers to measure distances (Section 5.2.1).

Upon walking the grounds the researcher identified that the golf course had a composting bin, situated directly on the joint boundary with OrgX. The idea of having a similar facility onsite was discussed within EWG more than once but each time it was dismissed as a potential vermin attractor; a limit of S2 decision making processes. The researcher made numerous attempts to explain that as a bin was already situated at the borders any issues of vermin control would already have been identified.

It quickly became apparent that this was a stumbling block within the normative behaviour of the organisation (Awareness of Responsibility (Stage 5.1)), in that composting was seen as a difficult or ‘dirty’ activity to pursue and would therefore not be considered as a potential activity; a limit of green action (Gärling et al., 2003). In July 2008 a EWG member informed the group of their development of eco-bags to be distributed to all staff and students at the beginning of the next academic year.

Eco-bags had already been a prime discussion between the researcher and a service department (Appendix C.17), who were considering spending their own budget on the purchase of such products. Without the researcher linking the two departments’ efforts, there could have been different advertising brands on each product and an inefficient use of the departmental budgets. At this time it was also determined that OrgX had just been awarded Fair-Trade status, which appeared to have

been advertised within the local surrounding community but not within the OrgX community itself (Appendix A).

With regards to Fair-Trade items OrgX provides a range of related products within the canteen service and this should be triumphed as a positive social effort by the organisation; successful use of S4. According to Heslin and Ochoa (2008) demonstrations of positive social action are likely to lead to increased staff retention and also attract ethically minded workers to the organisation. It was therefore essential that OrgX develop more effective strategies to promote both its Fair-Trade and environmental efforts.

Effluents or dirty water are produced primarily from domestic waste, rain water and some departmental research activities. The organisation takes a reactive approach to effluent disposal and does not typically check the system unless a problem arises (Appendix C.28); as of July 2009 there is the proposal that the system will return to the prior format of annual analysis. With regards to rain water a new build onsite has the potential to drain water into a purpose built lake, this is still subject to health and safety considerations.

An employee offered the organisation their old pond and equipment free of use and plans have been made to install this onsite and for an interested student group to maintain and monitor the present wildlife (Appendix A). A meeting with local council members suggested that this project would be beneficial to the local BAP and could potentially lead to the Campus championing a specific listed species (Appendix C.22).

Waste facilities significantly improved onsite with the recycling of paper, plastic and some glass. Cardboard, garden waste, food waste, electrical equipment and batteries are recycled through the use of external companies. Old furniture onsite is either rejuvenated or transferred to other properties owned by the organisation (Appendix C.29). Where possible OrgX also donates items to local charities and schools to

not only prevent landfill disposal (Appendix C.26) but also add to community regeneration.

During 2009 OrgX(b) enforced a new policy across both sites resulting in the removal of all office bins to be replaced with twenty centralised recycling locations at OrgX; this was a top-down directive. This was deemed inappropriate by EWG and was supported by the findings of Brothers et al. (1994), but OrgX(b) viewed this as the most efficient method to improve recycling and reduce costs.

Due to the lack of local autonomy within OrgX there was an uncertainty as to the ability to challenge this new policy, despite EWG worries that this could discredit the achievements they had made in employee engagements since 2006 (Appendix A); a System 5 control from OrgX(b), over System 2 of OrgX. A benefit from the change was that recycling guidelines were circulated to OrgX members (FSI). OrgX does not have a significant packaging facility but does at times offer conference packs to students and where possible these consist of environmentally friendly items (Appendix C.12).

Excessive packaging is received by service departments who purchase products often (Appendix C.9, C.16 and C.17), this is somewhat unavoidable and requires future plans to insist suppliers remove packaging once UK producer responsibility law is strengthened (OPSI, 2007; INCPEN, n.d.c). External site appearance is maintained by a specific employee who conducts general checks of the buildings and when possible collects recyclable items from offices (Appendix C.29). Cleaners for the site only use environmentally friendly detergents and are not allowed to use spray devices; with the exception of fly spray when needed.

All paper towels and toilet rolls are made from recyclable materials and the installation of modern hand dryers onsite is reducing the need for paper towels in bathrooms. Fire policies are in line with national legislative requirements. Solvent emissions are not a considerable problem for OrgX as they occur rarely in service

provision and site renovation, but when they are present signs are stationed in the necessary areas and significant ventilation procedures adopted.

5.4.4 Follow-up TS workshop

An interesting social development occurred within the EWG directly following the TS workshop discussed in Stage 5.3. The EWG suddenly became very active within their internal email communications to ensure that the activities within the new environmental strategy were implemented (August 2008 (Figure 5.29(a))). The email figures do not count those sent by the researcher to help coordinate the EWG activities, so as to show the ‘actual’ communications of the informal network.

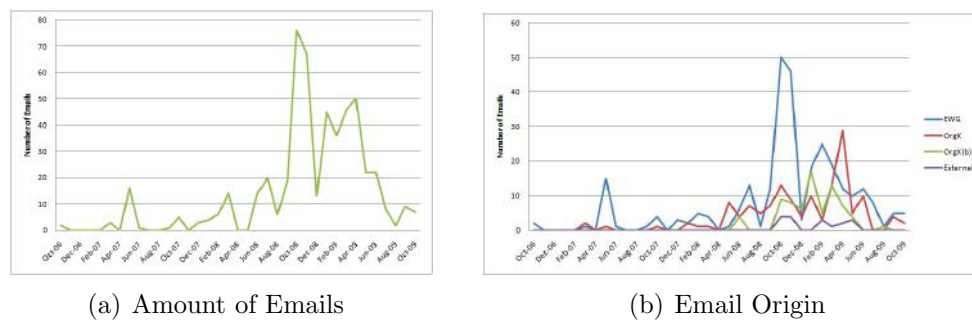


Figure 5.29: EWG Email Communications

This would indicate that when an organisation provides an informal network with recognition and support, it serves to both empower and motivate employees. Figure 5.29(b) breaks down the email communications into those performed internally by the EWG with other OrgX members, OrgX(b) colleagues and external organisations. In April 2009 the EWG experienced a significant growth in communications with OrgX(b) as the result of a joint effort to develop a sustainability-orientated Staff Development Day.

The increase of environmental communications within the EWG maintained a clear increase for eight months, in which time 56% of the environmental strategy from the TS was developed (eighteen out of the thirty-two FSI); a significant achievement of the SECS framework. It was observed that communications began to reduce

when the EWG struggled to secure resources to implement the remaining FSI. The Staff Development Day was focused upon sustainability in the workplace; including finance, health, social well-being and environmental factors.

The researcher was invited by OrgX(b) organisers to provide a workshop to employees on how to improve OrgX operations. This was taken as an opportunity to review the implementation of the environmental strategies developed in the August 2008 TS event. It was not possible to schedule a Short-Form TS in the timeframe provided, so instead the participants were informed of the prior FSIs and asked to determine methods by which to pursue those actions that had not yet been implemented.

The workshop was designed for voluntary participation so attendance was dependent upon employees being interested in developing OrgX strategies; in total eighteen individuals joined the group debate, including OrgX senior management personnel. Only one member of the employee EWG attended the workshop and it is assumed that as the topic was something familiar to group members they felt that they did not need to partake in the discussions.

This was an unfortunate occurrence as the workshop acted as an attenuation filter of environmental ideas and suggestions from a broader audience, whilst also amplifying the current achievements of the EWG. A highly positive outcome from the event was the development of informal networking between the researcher and OrgX(b) employees who were able to offer suggestions for grants schemes and successful environmental activities that they had pursued in the past (FSI).

At the time of the event OrgX(b) counterparts were impressed with the amount of community engagement projects that were being implemented by the EWG at OrgX; activities were viewed to be more prevalent than those at OrgX(b) despite additional resources available in that location. These changes were implemented by

the EWG who had no set budget and continued to operate as a voluntary group despite their formalised committee status.

Formalisation focused primarily on the recording of official meeting minutes, to be communicated to OrgX and OrgX(b) EWGs and management; an essential development (Herremans and Allwright, 2001). Attendees of the follow-up TS were split into service and academic personnel due to the restricted timeframe of one hour, to allow individuals to discuss the topics with colleagues that they were familiar with and who approached discussions in a similar format. The workshop focused upon developing the fourteen strategies that were outstanding from the TS event.

The group identified that there still needed to be improvements to environmental communication channels; which were still being hindered by the ‘prestige’ node who had the authority to enact changes and were doing so, but not communicating this to employees; barriers still in place within S2. The results of the workshop were for policies to be developed that included the enforcement of environmental issues in all department meetings (in conjunction with the EWG TOR), food waste composting and a coordinator of activities that was independent of all departments.

The group suggested that staff and student engagement would benefit from an environmental week and environmental curriculum, with raised funds going to EWG strategies, improved communication channels and an activity coordinator. With regards to transport the group felt that video-conferencing facilities had already greatly improved but still needed further work, added bicycle facilities (storage and bonus scheme) were necessary, timetables and pricing of the local Park and Ride scheme should be distributed to all staff members.

Green technology development was linked to transport related improvements of video-conferencing, need for autonomy from OrgX(b) in purchasing guidelines and an energy upgrade of the site (energy reducing consumables). Paper and energy consumption were primarily seen as an awareness building project which required

posters and peer pressure, alongside the expansion of electronic submission facilities to all academic departments. Waste facilities became a controversial subject due to the new policy for the removal of all office bins onsite, resulting in attendees wanting to ensure that all departments were represented in the EWG.

There was also a consistent iteration from employees of the need to find a permanent replacement of the researcher (consultancy or in-house job) after the research project was complete, and the expansion of environmental projects that directly benefit local wildlife. The workshop was summarised and fed back to workshop attendees and the EWG group. The main achievement of the event was the outreach of environmental strategies onsite to a broader audience outside of the EWG.

Most attendees did not belong to the EWG but had chosen the workshop instead of two sessions regarding personal development and creativity in the workplace, and a talk with the event's key note speaker (a prominent member of national media programmes for many years).

Practical environmental changes occurred within OrgX, with 56% of the initial TS strategies implemented within eight months. The EWG developed social engagement activities, onsite wildlife improvements, upgrades to building equipment and purchase of environmentally-friendly alternatives where possible. A follow-up TS workshop was conducted in conjunction with OrgX(b)'s Staff Development Team, to reaffirm the EWG's activities within the employee group.

This resulted in EWG gaining recognition from its OrgX(b) counterparts with communications between the two networks becoming much stronger. Communications between the two groups became regulated when OrgX's EWG was established as a formal management committee. Emails received by the researcher from attendees following the event were seen as positive indicators of action, with individuals noting a marked difference in environmental activities onsite since the project inception.

In order to improve the communication channels within OrgX as defined by both the TS event and follow-up workshop, a VSM diagnosis was conducted to establish the required changes in the current communications structure to improve the environmental network. It was viewed that prototype strategies and informal networks were improving and becoming a permanent feature of the organisation, but there was still a need to create much more stable communications between all departments.

5.5 Stage 5: Design of structural mechanisms to foster cohesion and accountability of informal eco-networks.

Within OrgX the development of environmental activities has been dependent upon social values that have started to become integrated into the existing management and operational structure. OrgX has been established for many years and has found that its present management system and operational procedures work effectively, for what they want. As there have been no plans to alter management procedures, it was necessary to design activities to complement the current organisational structure.

This led to the VSM diagnosis of the organisational structure shortly following Stage 5.3, to optimise the ability for new activities to be integrated easily and productively. The following section describes the process of organisational diagnosis and the identification of avenues in which to embed environmental activities into OrgX.

5.5.1 Cybernetic Methodology

Raul Espejo's cybernetic methodology has been used to guide the application of Viable Systems Model (VSM) alongside Checkland's Soft Systems Methodology (SSM) to merge social values within a cybernetic context (Section 4.2). Espejo (2000) suggests that for many organisations decisions are made within higher management who will typically have less complex interactions. The TS workshop had already served to identify and merge the information and motivation of multiple system actors (Schwaninger, 2007).

SSM rich picture modelling was used within this stage to further understand the distinctions of environmental values across the social group; following Checkland's Law of Conceptualisation that states "that if a system needs to be modelled then the system it serves must first be modelled" (Davies, 1989). Espejo (2000) uses the example of Eskimo classification of different shades of the colour 'white', to describe the need to focus upon distinctions that are made by the social group of a system. Rich pictures were used within employee interviews (Appendix E) to analyse the environmental culture within the employee group and identify social values that could contribute to the SSM modelling (Holwell, 2000).

It was expected that the researcher would be able to identify the general social perspective of environmental issues within OrgX after the participatory discussion platform of the synteegration. Due to time restrictions and availability of employees it was not possible to schedule an SSM modelling workshop within the project timeframe. As a result, the researcher conducted the SSM modelling herself using the collected rich pictures and interview data to develop a conceptual perspective of the organisation. The use of SSM without the employee group was by no means an ideal scenario and in fact contradicts the core purpose of social engagement.

However it was felt that the conceptualisation of the system would be beneficial to the organisational analysis and whilst direct employee involvement could not be

performed, collected data could be used to create a researcher perspective conceptual model. This adapted version of the root definition process was supported by Neves et al. (2004) who conducted a SSM study to analyse energy efficiency initiatives, partially from their own interpretation (non-owners of the problem situation).

The cybernetic diagnosis of OrgX began with the use of SSM to identify the root definition of the system-in-focus (Gregory and Jackson, 1992), clarifying the boundaries of the OrgX analysis and the intended ‘purpose’ of an EMS within OrgX. The root definition for the diagnosis was defined as:

A system to monitor and regulate the transformation of OrgX into a ‘green’ organisation, in order to improve its environmental footprint.

The corresponding TASCOI analysis identified the desired emergent transformation of the system (Table 4.1), as the progression of OrgX from an organisation that followed environmental legislative needs into an organisation that voluntarily adopts environmental activities beyond minimal legislative requirements. Actors of the system are seen to be students, employees and the surrounding community, however primary focus was placed upon ‘employees’ as they had the highest ability to enact change and had responded well to project engagement; the same social networks were also seen to be customers within the system.

The owners of the system are the senior management of OrgX (business perspective) and employees (social perspective of bottom-up participation). The interveners within the system were seen to other higher education facilities, businesses, ISO 14000 and EMAS. During the interview process only two support-based employees produced rich pictures with most pictures coming from academic personnel. Interviewees were asked to name three core attributes of their manager, at which time all service personnel and one academic refrained from answering.

Whilst these reactions did not have direct connotations for environmental activities it did suggest the presence of an autocratic management system (Appendix D.3.3) that would need to be considered when designing activity implementation. The rich picture produced by one service employee (Figure 5.30) depicted environmental issues within three columns: EWG, consumption and the natural environment. This suggested that OrgX was currently fulfilling the economic/EWG, social/consumption and environmental aspects of the Triple Bottom Line.

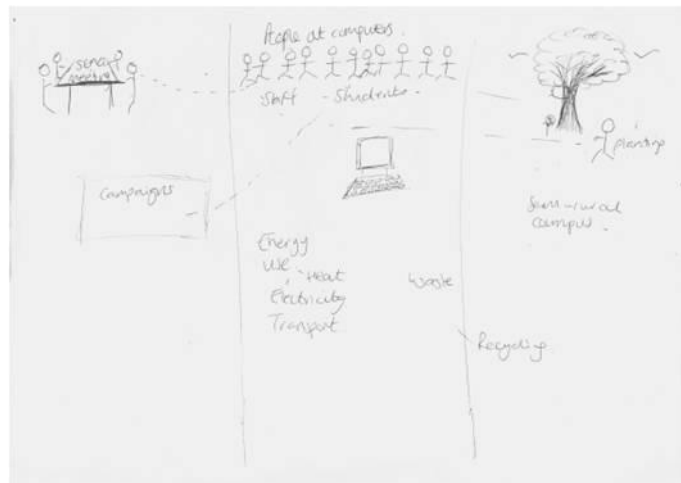


Figure 5.30: Rich Picture - Service A.

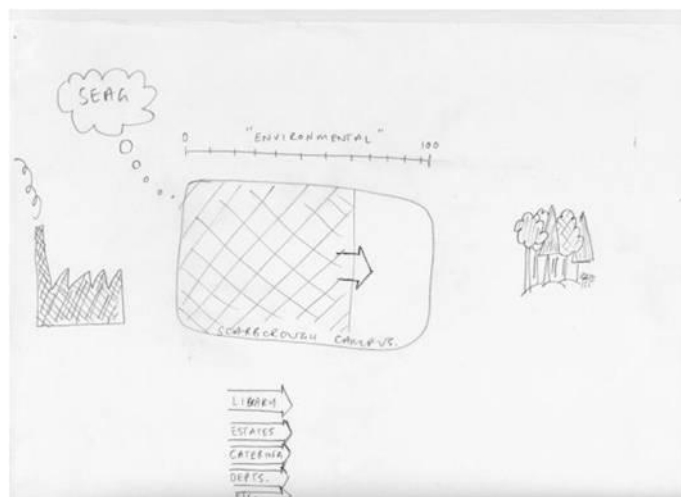


Figure 5.31: Rich Picture - Service B.

The other support personnel rich picture (Figure 5.31) depicted OrgX against an environmental scale of 0-100%, with an arrow suggesting that the EWG is progressing the organisation towards a more environmental focus having already achieved over one half of the transition. This is quite different to the rich picture

(Figure 5.32) produced by an academic individual who clearly has the opinion that paper consumption is still a major issue for the organisation.

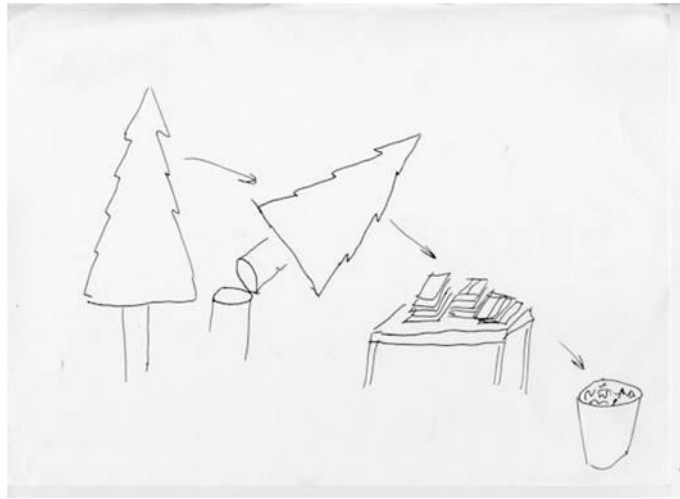


Figure 5.32: Rich Picture - Aca C.

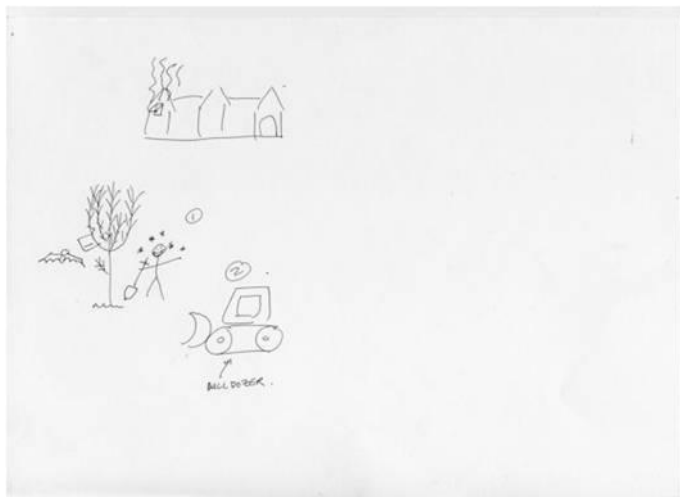


Figure 5.33: Rich Picture - Academic E(b).

Paper consumption is of significant priority to OrgX especially within academic departments, which could be aided by a quicker progression to electronic course materials and assignment submission. Another academic depicted the heat wastage of OrgX buildings and the EWG planting day followed by a demolition truck (Figure 5.33). This can be explained by a large transport development project in the local region situated next to the site, and also the repositioning of plants onsite to accommodate a new build.

There was concern that the new build would ruin the EWG planting achievements but Service F personnel were very eager to ensure that minimal damage was incurred; this was not actively communicated to staff until the researcher spoke directly to employees. This lack of amplification became a constant issue within the project as this information was contained within the node of ‘prestige’ making it difficult to improve communication.

Another rich picture (Figure 5.34) produced by an academic focused primarily upon the structure of OrgX departments with Service F identified as having core responsibility for environmental action. The picture indicates that even though responsibility lies with Service F the academic department is also linked to environmental activity. Figure 5.35 depicts a chaotic relationship of environmental actions, with Service F dictating departmental activities and departmental representatives coordinating into the EWG, who then feed back into all OrgX departments.

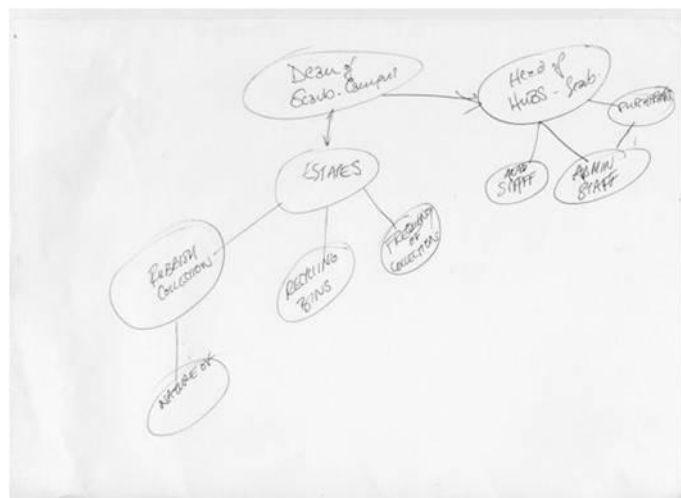


Figure 5.34: Rich Picture - Academic B.

The picture indicates that it is the EWG who assesses the environmental performance indicators of OrgX, which would suggest that the group is seen to have a higher awareness and initiative for environmental activities within the organisation. The final rich picture (Figure 5.36) developed by an academic showed a very simple diagram of different sized circles completely unconnected. This

would suggest that the individual views environmental activities as having no clear structure.



Figure 5.35: Rich Picture - Academic A(b).



Figure 5.36: Rich Picture - Academic A.

This diagram was produced by a core member of the EWG and it is assumed that the sporadic depiction of the organisation is a result of their continued difficulty to gain project support. The observations of these employees highlighted a common theme of social responsibility across all departments and the presence of barriers to communication; these social perceptions of barriers are supported by the SNA diagnosis of structural holes within the organisation (Stage 5.2).

5.5.2 VSM diagnosis

The unfolding of complexity for the organisation began with the identification of OrgX(b) as Level 0 of the system analysis (Figure 5.38); OrgX is a subsidiary of OrgX(b) and is therefore at a lower level of recursion. OrgX(b) was determined to have seven areas of primary activity (academic schools); with OrgX housing smaller versions of four of these departments at the secondary business location, within recursion Level 1.

S2 activities within Level 0 are responsible for overseeing the quality of services provided to students, effective documenting of OrgX(b) operations to multiple stakeholders (students, staff, government bodies), and administrative support to coordinate academic activity (research grants, student enrolment, student assignments). The S3 function is primarily performed by the Senior Management Team who coordinates the executive decisions made within their own departments and respective committees. S4 activities at this level are viewed to be concerned with future strategy formations (Devine, 2005), to maintain a niche position within the higher education industry.

Focus is placed upon attaining new research grants whilst also keeping current avenues of funding, remaining an attractive university to students through competitive degree choice and tuition fee charges, and expanding the diversity of the organisation. S5 at Level 0 contains the University's Senior Management Team that establish the policies of conduct that are expected of the organisation from both a moral standard of academic worth and legislative requirements of suitable business operations.

At Level 1 the VSM diagnosis identified the link of academic schools between OrgX(b) and the subsidiary organisation OrgX (Figure 5.37); all of the VSM diagrams developed within this research are adapted from Beer (1981, p.157). The S1 activities for Level 1 mirrored those at the higher recursion, containing five

academic departments, demonstrating a consistent alignment of primary activities within both organisations. OrgX S2 activities again mirrored those activities of OrgX(b), with the difference that OrgX's reporting channels fed directly to OrgX(b).

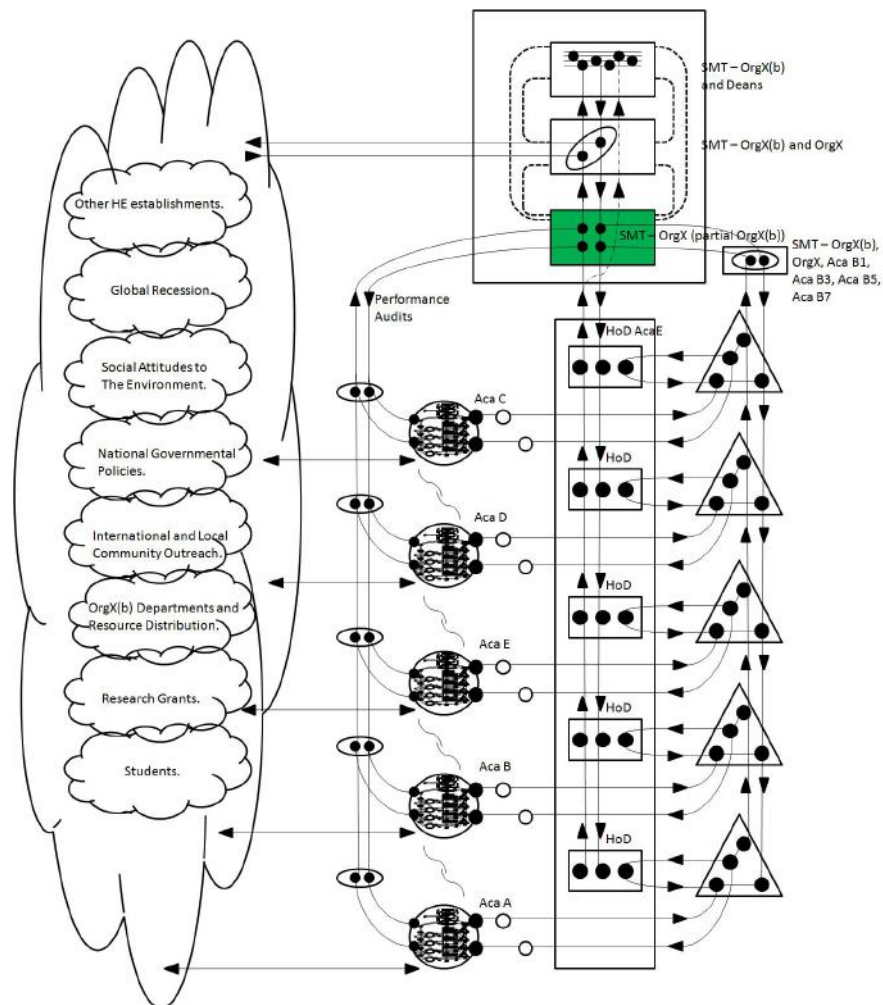


Figure 5.37: VSM Diagnosis Level 1.

With regards to operational interdependencies there was strong input from Academic E into Academic C that occurred early within the research project (Appendix E.1.3). Due to management reorganisation Academic C was positioned within Academic E, primarily for administrative requirements, remaining as a distinct academic department but having a different set of reporting channels. S3 and S5 functions were performed by OrgX's academic and student support

executive committees, that contained representatives from all academic and support departments alongside senior management representatives from OrgX(b).

Resources are allocated following a top-down filter of prioritisation, with lower level committees and managers required to vie for support. Within summary discussions of the TS event (Stage 5.3) it seemed that everyone wanted to undertake specific projects but felt that the inevitable barrage of meetings and ensuing battles for resources would require too much time and effort outside of their already hectic work schedules.

This solidified the observation of a strong top-down management structure within OrgX, with the S5 of Level 0 having primary authority of system operations within all levels of recursion. S4 within Level 1 was primarily conducted by one academic department that specifically focused upon academic outreach within the local community surrounding OrgX. Some academics departments also contained specific job roles for community and business outreach, but it was seen that such engagement was generally embedded within the job description of academic personnel who pursue the task as a routine activity.

The greatest variety of activities appears within Academic E which contained four academic disciplines that had been amalgamated into one department shortly following the start of the research; excluding the newly developed Academic E control of Academic C. With regards to information flows between the academic departments of OrgX, Figure 5.37 demonstrates the coordinating function of the senior academic management team, internally to OrgX and to counterparts in OrgX(b).

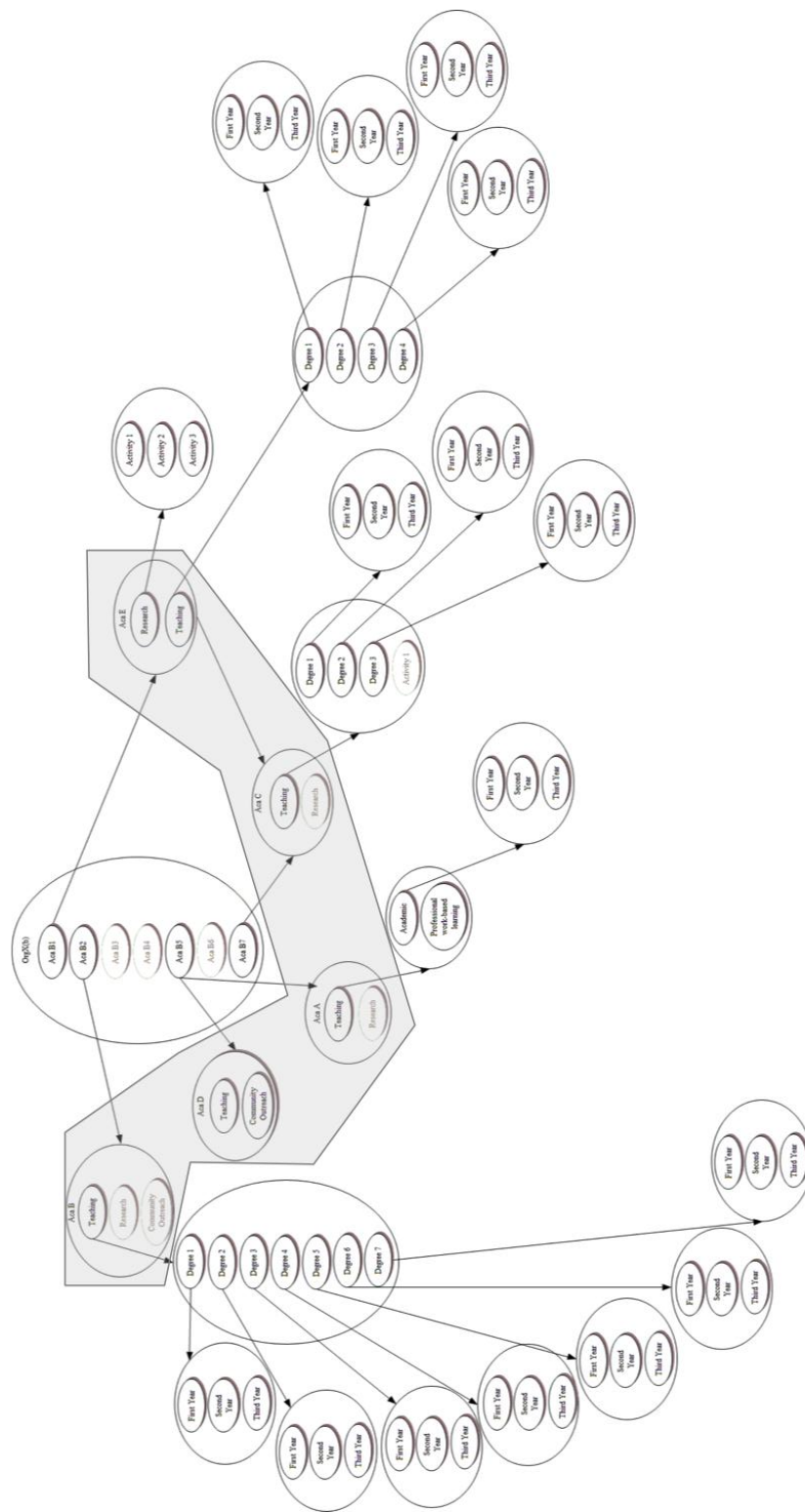
OrgX managers act as attenuation filters of individual department activities and also function as amplifiers of OrgX as a whole to OrgX(b); in reverse the same members also act as attenuation filters of OrgX(b) strategies that are then amplified back to OrgX management and departments. With regards to external environmental

considerations, Academic A is dependent upon other educational institutions to provide their students with work placement opportunities for practical applications and experience of learned skills.

Academic B pursues a large amount of international student recruitment and works with a range of businesses in both a consultancy and research capacity (Appendix E.1.7). Academic C relies upon maintaining and seeking out ties with international communities, so that they can conduct practical fieldwork excursions for student development (Appendix E.1.3 and E.1.4). Academic D operate their academic provision by accessing expertise within residents of the local area to provide short educational courses to both businesses and individuals.

Academic E has a broad target student group with its provision of four different academic disciplines (Appendix E.1.5). The broad outreach of these academic departments results in a strong internal focus upon effective marketing strategies that can be adapted to multiple target groups. It is essential for all of OrgX's departments to have an effective S3-S4 monitoring system (strategic management of internal and external environments (Schwaninger and Rios, 2008)), to ensure that perturbations within the environment do not affect their ability to provide existing and future students with a rigorous academic schedule.

The unfolding of complexity for all recursion levels has been depicted within Figure 5.38.



Shaded location represents Level 1. It is within Level 1 that Org X is identified as its own organisation, a subsidiary of OrgX(b) at Level 0.

Figure 5.38: Unfolding Complexity

This diagram shows how OrgX acts as a subsystem to four of the seven academic departments of OrgX(b). It is also evident that Academic B contains the greatest variety of primary activities within Level 2, and Academic C has the largest set of management reporting channels within Level 1. These two departments have been represented further within Figures 5.39 and 5.40; due to the similarity of the structure of each department it was seen as unnecessary to replicate a diagram for each department.

The core application of the VSM diagnosis was focused upon Level 0 through 2 as the environmental activities of lower levels of recursion can be summarised as ‘greening’ of the academic curriculum. OrgX is gradually gaining increased autonomy from OrgX(b), which could improve the potential for the organisation to pursue a more extensive range of environmental strategies that are focused to OrgX’s stakeholder interests. If OrgX were to become autonomous there would be a potential for the EWG to have a strong influence upon environmental activities.

5.5.3 VSM and SNA

The ability for the EWG to successfully integrate an environmental work ethic and activity set within OrgX is dependent upon the engagement of each level of recursion present within the system. Within Figure 5.41 the work and environmental SNA diagrams produced in Stage 5.2 have been mapped onto a basic representation of recursive levels within OrgX; Levels 1 to 3 are OrgX, with Level 0 being OrgX(b). Academic departments have retained their colour within the diagrams to show their core position within the recursive levels, whilst support based departments have been made ‘white’ to ensure focus remains upon primary activities.

Shaded lines represent those actors who perform the S2 function of the system, to enable a clear visual representation of those actors who are directly involved (full colour) in the delivery of primary activities at their respective recursion levels.

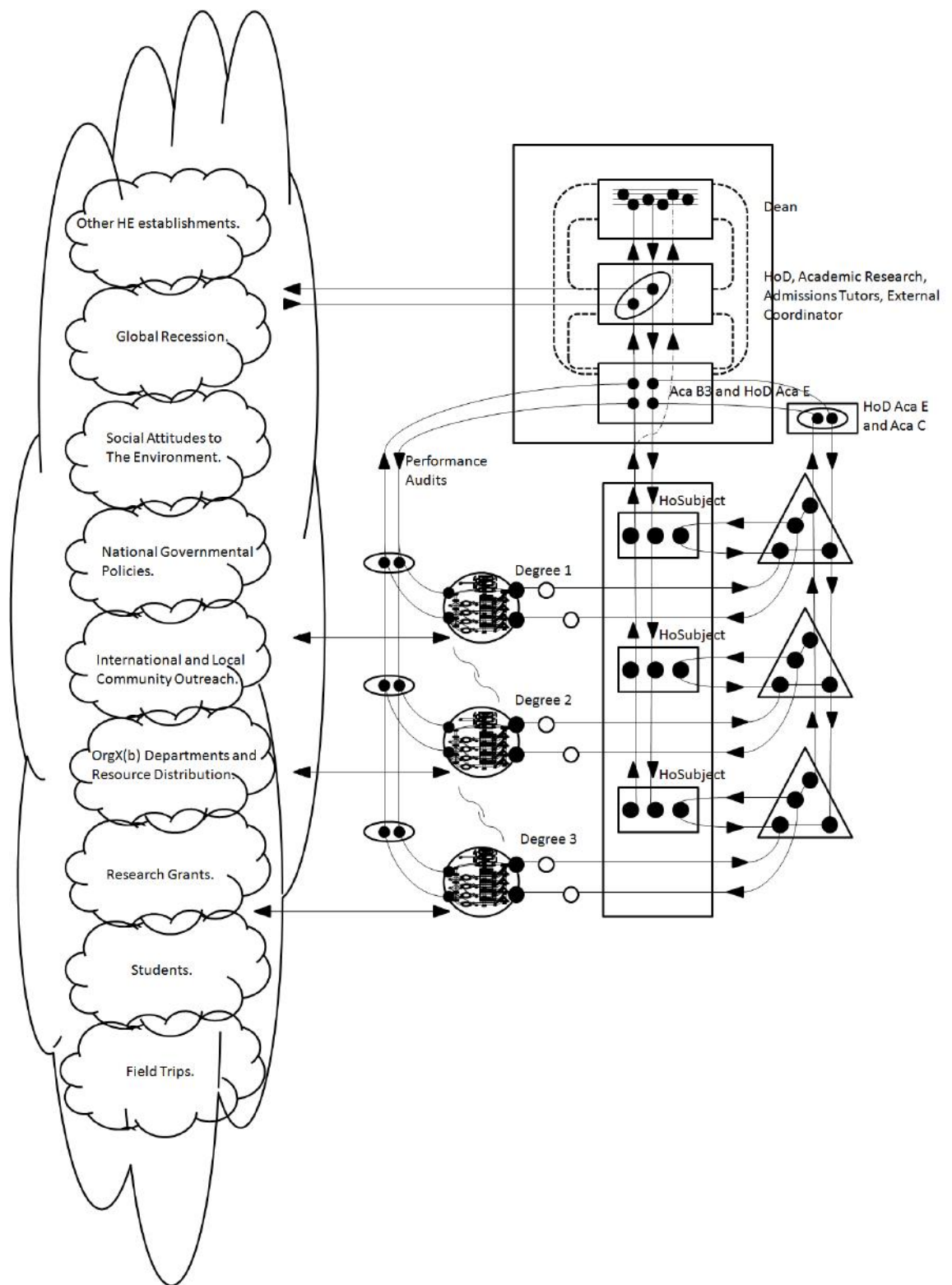


Figure 5.39: VSM Diagnosis Level 2 - Aca C.

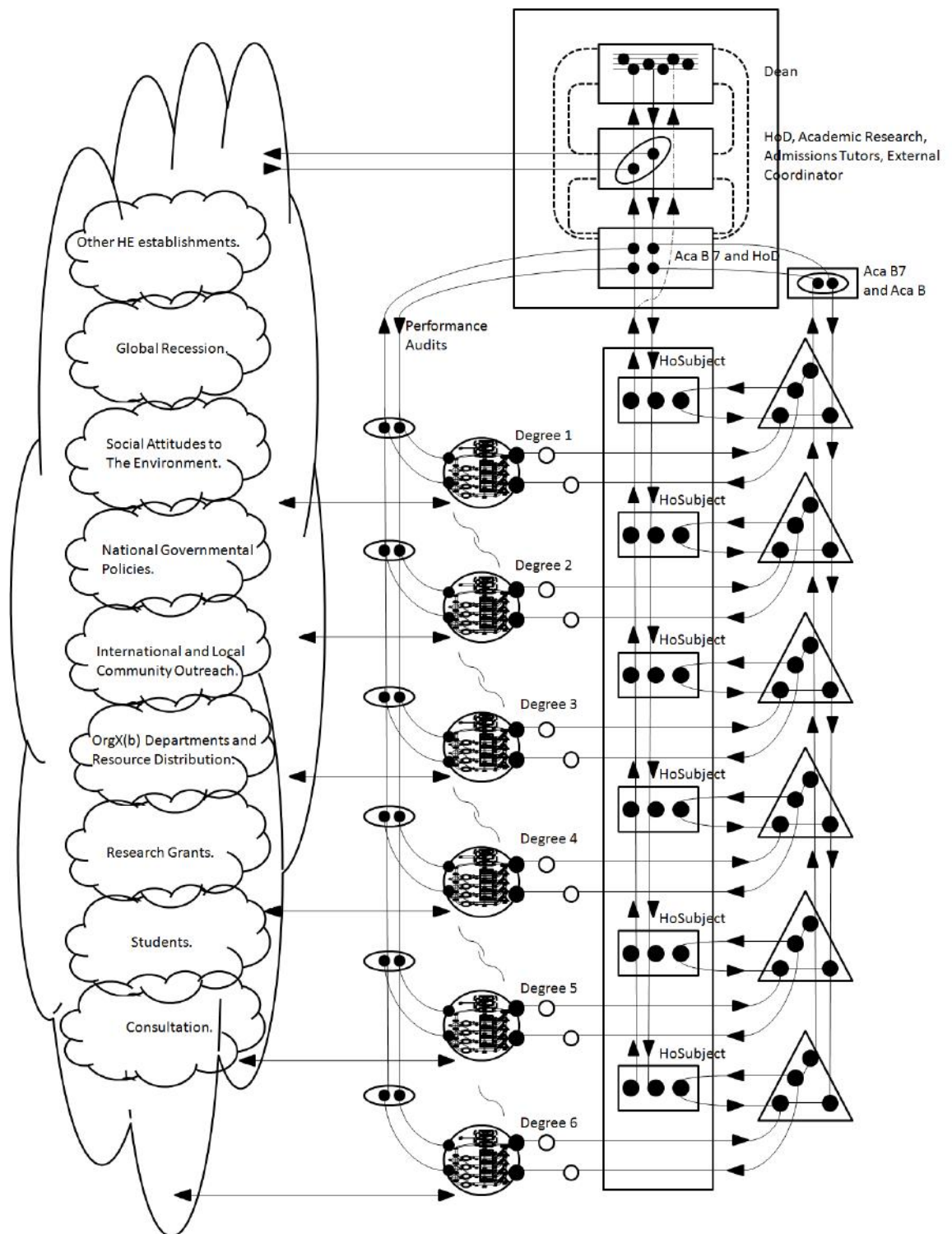


Figure 5.40: VSM Diagnosis Level 2 - Aca B.

It should be noted at this time that the SNA analyses used are those performed before the TS workshop (Stage 5.3) representing the initial communication structure of OrgX.

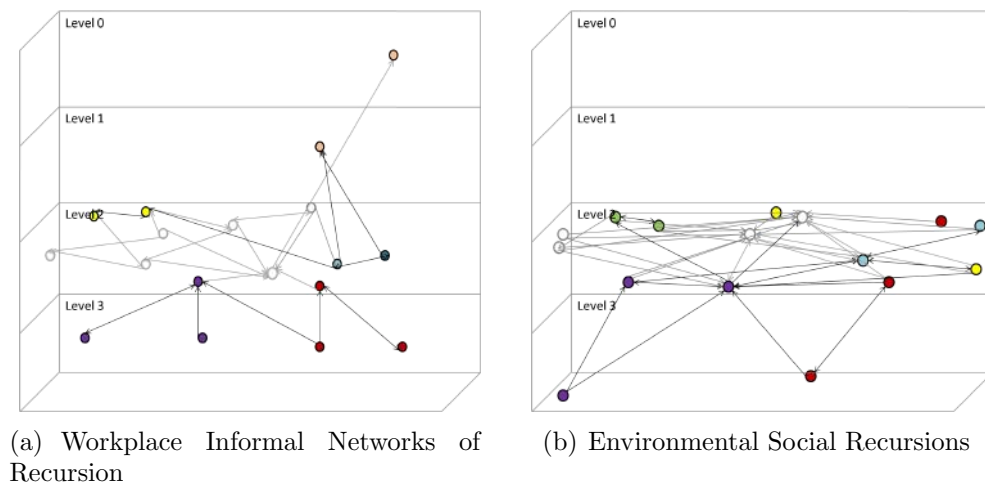


Figure 5.41: VSM and SNA Overlap of Work and Environmental Communications

Figure 5.41(a) shows that the core set of work-based communications within OrgX are contained within the Level 2 recursion. These nodes/departments are present within Level 1 as primary activities and Level 3 as the metasystem (S3-S5 (Beer, 1984)), which enables cross recursion information flows. Figure 5.41(b) has a more significant form, as it demonstrates that there is a significantly strong presence of a social environmental network contained within Level 2.

The environmental network had emerged as a self-organised social group that acted autonomously within the two lowest levels of recursion. However there is little outward communication towards the rest of the organisation, resulting in the containment of environmental norms to just two levels. This diagram provided additional evidence that the informal environmental network needed to expand its communication efforts to develop a more holistic outreach of its workplace ethics, especially within higher levels of recursion; this was achieved by actions taken within Stage 5.4.

Using the VSM diagnosis of OrgX and SNA overlap it was possible to determine the most appropriate position of an EMS within the current management structure; taking into account the present communication structure and position

of environmentally driven employees. Figure 5.37 contains a green box and corresponding lines that are seen to be the necessary position for a formalised EMS within OrgX. Figure 5.42 shows the structure of the formalised EWG following the TS event.

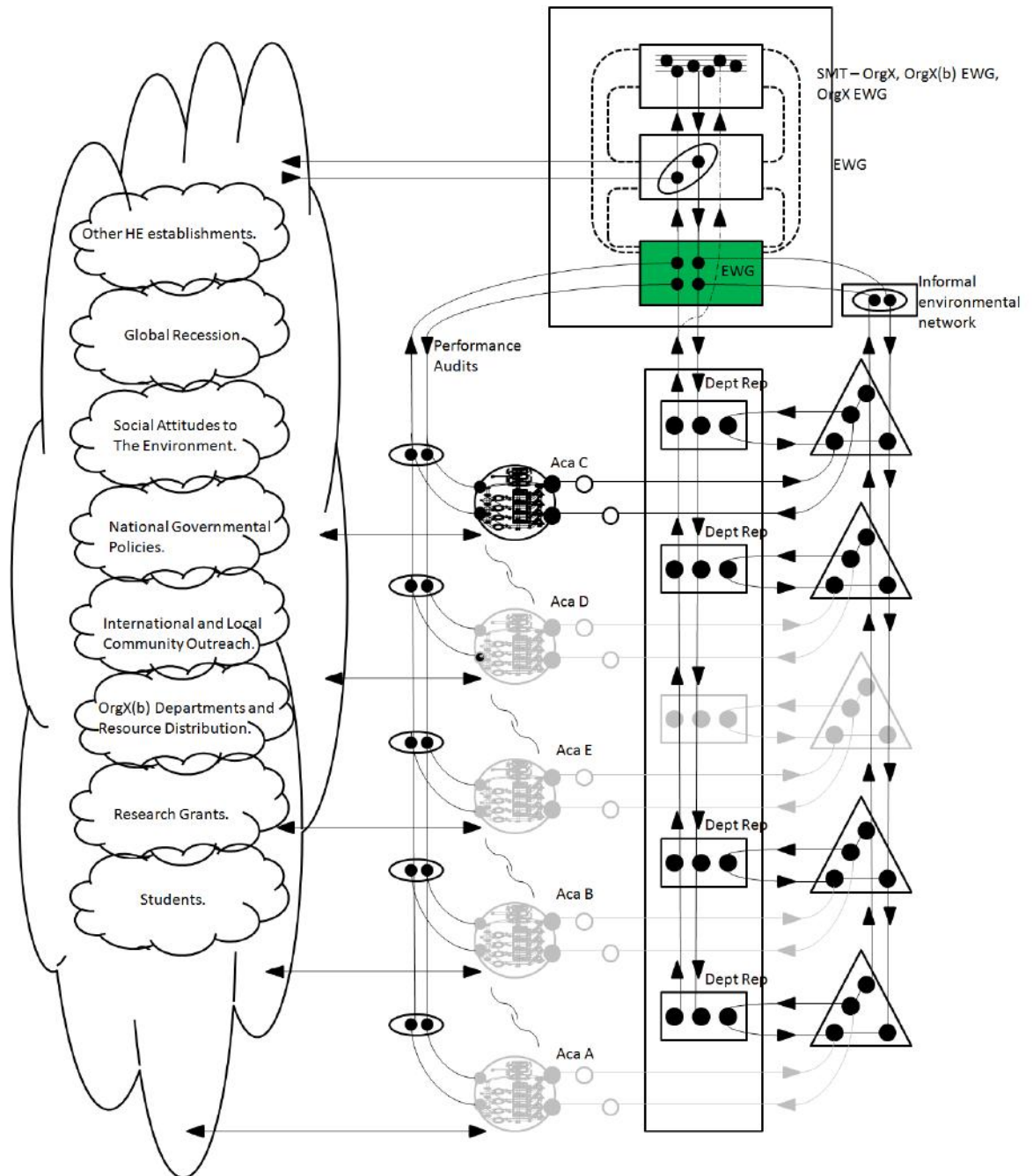


Figure 5.42: VSM Diagnosis of developed EMS.

The current employee EWG became integrated within OrgX's S3 management committee, where core strategic decisions were made for the whole organisation (Beer, 1979). This links to the first and third research questions of the research that suggested social values and environmental networks need to be supported alongside the established management structure, to develop practical environmental benefits (Research Questions 4.6.1 and 4.6.5). A positive reinforcement of this hypothesis was that the EWG and OrgX management chose this approach themselves (Stage 5.3).

The EWG also gained departmental representation for all but one of OrgX's primary activity providers and in some cases there were multiple volunteers to be involved within the group; this was as a direct result of the TS event where the achievements of the EWG impressed many employees. It was viewed as desirable to reach a balance between maintaining the current identity of EWG as a social movement for environmental awareness and that of group formalisation to attain added organisational support.

The researcher began to gradually withdraw from the EWG (over a one year period) to ensure that they became accustomed to conducting their own administrative and coordinative tasks. Following some discussions it was decided that a replacement was needed to fulfil the researcher's roles within the EWG. This was deemed to be essential as the organisation could not warrant the creation of an official job role for an environmental coordinator due to the UK recession; a position that would have greatly aided environmental developments (van Winsum, 2004).

A volunteer was quickly filled by an employee who was a member of environmental action groups outside of OrgX and had recently learnt of the EWG's activities (Appendix C.30). The continued development of the EWG was aided by the formal support of OrgX administrative personnel (S2) to record S1 activities that were fed directly to OrgX senior management (S3 and S5) and OrgX(b) senior management (S5).

The formalisation of the group greatly improved the outreach of the EWG to counterparts in OrgX(b) that resulted in added advertising and activity support, expanding the social network of environmental individuals across both organisations. However it also resulted in one member of the EWG slowly losing enthusiasm in the group as they felt that the formalisation had affected the social spirit of the activities.

Structural mechanisms that required adaptation to support the environmental network were identified using the Viable Systems Model (VSM) to diagnose the present state of the organisation (Beer, 1981). Rich picture modelling and VSM-focused interviews were conducted to develop a clear understanding of operational activities within OrgX. The addition of SNA diagrams to the VSM diagnosis provided an insight as to where an environmental management system would gain the most support in OrgX's management structure. The informal environmental network was shown to have strong links within OrgX but lacked presence within OrgX(b).

The EWG established a formalised reporting structure within OrgX and OrgX(b) that included representatives from most academic and service departments. The group continued to function primarily as an informal environmental network that had voluntary membership, self-organised activities and no budget; the formalisation essentially provided the group with official recognition of their work. The VSM diagnosis of the EMS identified that one academic department still requires representation within the EWG, to ensure all S1 activities are coordinated with environmental strategies. The following section explores the development of an Environmental Management System based upon the researchers work in OrgX.

5.6 Stage 6: Environmental Management System

In order to develop a more holistic Environmental Management System (EMS) than traditional environmental audits (Section 2.2.1), a new operational approach was required that could incorporate the local knowledge gained from Stage 5.1 through Stage 5.5. Throughout the case study research the role of social engagement and normative behaviour has been a pivotal aspect of environmental change and it is proposed that these aspects should be given a clear presence within an EMS.

A combination of research literature analysis and case study engagement of social norms, participative decision making and organisational diagnosis have contributed to the new EMS design. This section provides the new EMS design (Appendix G.1) that will be able to aid organisations to understand ‘how’ to enact practical operational changes. The EMS design duplicates most of the activities within the ISO 14000 (Section 2.2.1.1) and EMAS (Section 2.2.1.2) frameworks, using the generic headings of electricity, gas and water, etc.

Many environmental aspects could not be simply isolated into one specific category so there are some instances where activities overlap multiple aspects. For example, the presence of energy efficient domestic appliances can arguably have implications within each category of the new EMS. The necessity of certain activities to be present within multiple environmental aspects strengthens the need for a more holistic approach to EMS design (Section 2.3). Where possible the developed EMS makes clear indication to those activities where direct social involvement is necessary.

5.6.1 Score System Accreditation Levels

The developed EMS is primarily focused upon providing organisations with clear examples for environmental change, based upon a scoring system that will allow

external actors to effectively compare multiple organisations. The score system is based upon a rating of 'None, Partial, or Complete' accreditation levels for each core activity within the system; with the numerical values of 0, 1, 2 respectively, for each potential activity (Appendix G.1). The greatest score possible within the system is 262: 0-70 results in non accreditation, 71-140 is Level 1 (Good), 141-210 is Level 2 (Very Good) and 211+ is Level 3 (Excellent).

The idea of using a scoring system instead of a traditional EMS of pass or fail came from the researchers observations of change within the case study organization. It became evident that whilst OrgX was implementing activity changes there were clear restrictions on resources that would prevent certain activities from being adopted throughout the organization i.e. funds for movement sensitive lighting. It did not seem right that the organization should not gain some form of credit in the system for making improvements, just because it could not afford to make the changes throughout the site. Similarly the focus of socially-led activities within the new EMS lead the scoring system towards higher accreditation based upon social change rather than economic capabilities.

The multi-tiered accreditation system will allow for improved inter-business analysis of commitment; traditional comparisons are based upon whether an organisation has an EMS or not. The score system is intended to work by auditing an organisation on the environmental activities that have already been implemented and the degree at which they are pursued within the organisation as a whole. This focus upon practical activities differentiates the new EMS from traditional EMS that focus upon effective auditing and monitoring procedures (Section 2.2.1).

Auditing is still viewed as an essential part of the new EMS but it is considered to be a supportive aspect to practical action. Activity headings follow generic categories that were identified within ISO 14000 literature (Edwards, 2001), but differ in the addition of specific sub-activities that directly contribute to the overall EMS score (accreditation level). This approach provides a form of organisational

map of practical environmental changes to operational activities and provides clear indication of those activities that should be strengthened to achieve the desired score.

Sub-activities that are italicised within Appendix G.1 are used to determine the degree at which an activity has been implemented; for example movement sensitive lighting would score ‘0’ if not present, ‘1’ if they were present in corridors or bathrooms, and ‘2’ if implemented within both areas. The intention at this stage is to provide a set of clear activity options to an organisation, as there is no guarantee that there will be any specialist environmental knowledge or understanding contained within the system.

The example activities will need to be periodically assessed to ensure that the EMS provides up-to-date environmental developments. Some of the suggested activities may be replaced with better alternatives in the future; for example, the commercial expansion of aerogel as a viable insulation material (Fesmire and Sass, 2008), ethanol from sugar cane to fuel vehicles (D’Agosto and Ribeiro, 2009) and radiant heating systems (TCT, 2005). The degree and range of sub-activities adopted from the EMS will be dependent upon available resources and management commitment to support internal and/or external social values.

The following subsections describe the unique contributions that the developed EMS design provides to organisations with continuous reference to Appendix G.1. References to Appendix G.2 denote those activities that have been implemented within OrgX.

I. Electricity

Electricity-based activities are mostly generic and include meter installation, lighting and office equipment amongst others (Turner and Doty, 2007). Lighting is divided into movement sensitive lights, energy efficient bulbs, natural lighting

and timer switches and it is within this level of activity implementation that EMS scoring occurs; all implemented within OrgX (Appendix G.2). The education of system actors to adopt a more efficient routine e.g. turning off lights and computer equipment (Marans and Edelstein, 2010), was a consistent objective of the EWG. Energy consumption meters were increased onsite as and when building renovations occurred.

Most of the electrical activities can be established with robust computer systems that automate appliance use and monitoring, removing the need for regular human input (TCT, 2006b); meter monitoring systems were established between OrgX and OrgX(b) (Appendix G.2). The removal of regular human input contradicts prior arguments for social involvement, however it is suggested that if an activity can be automated social focus can be directed towards other EMS areas. The benefit of computer monitoring is that it can provide early alarm systems of operational failures, that can be quickly located when coupled with individual meters; potentially saving 5-10% of energy costs (TCT, 2003).

The majority of electrical activities are dependent upon the business' facilitation of energy efficient technologies. To aid social awareness training in the importance of turning off electrical equipment, it is possible to install an automatic computer shut-down procedure. According to UoLeeds (n.d.) this system has the potential to save £650,000 per year; figure relates to 12,000 computers. Within OrgX this system was implemented on computer terminals within all student areas, but was not applied to staff equipment (Appendix G.2).

The installation of a wind turbine onsite had been a debate within OrgX since the beginning of the project. Staff wanted the equipment installed but there was a continued need to consult with local residents about the project (Appendix C.28). Plans for a new building onsite were designed with an 'aesthetically pleasing' wind-turbine to reduce concerns from local community members.

II. Gas and Gas Oil

Gas and gas oil are typically found within heating and domestic appliances, industrial machines and in the case of a HE establishment some academic activities. Similarly to electricity, the majority of this section is focused upon meter installation and automated monitoring systems. Heating systems can be divided into master-controlled maximum temperature and timer settings, targeted heating and individual radiator thermostats; reducing the risk of sick building syndrome (Jaakkola et al., 1989). All of these activities were implemented within OrgX, with the exception of individual radiator thermostats that were restricted to specific locations (Appendix G.2).

Individual radiator thermostats allow social actors to alter the local environment to their own needs, whilst a centralised maximum temperature setting prevents excessive energy consumption. Additionally the use of timed and zoned heating systems (TCT, 2004) can be extremely beneficial to the organisation when it is not required to operate at full capacity for an extended period; this is performed within OrgX during weekends and end of academic year (Appendix G.2).

There is only one direct link to social awareness raising within this section, as the nature of this aspect is once again highly dependent upon business facilitation of environmentally-friendly alternatives. Social values will be most prevalent in the purchase of new appliances at which time decisions will be made between increased energy efficiency and financial outlays; Best Alternative Technologies (BAT) (DEFRA, 2009). The choice of BAT and the reduction of domestic appliances became a regular consideration within facilities departments of OrgX (Appendix G.2).

III. Water

Within OrgX water is typically required for domestic purposes that include heating systems, bathrooms and catering facilities. Again this environmental aspect is highly dependent upon meter installation to monitor usage and alert for any discrepancies in consumption levels. Similarly to the electricity and gas monitoring systems, water consumption statistics are automatically sent to OrgX(b) Energy Officer.

Water consumption has been reduced with the upgrade of cleaning facilities within the catering department. OrgX installed push taps and cistern ‘waterbricks’ within all site facilities to reduce water consumption onsite (Appendix G.2). Cold water tanks on top of the main site building provide a gravity flush of toilet systems (Appendix C.29). OrgX recently installed a mains (drinking) water supply that is easily accessible to both students and staff for drinking purposes, providing the opportunity to reduce the amount of bottled water and resultant waste onsite (CIWEM, 2005).

This facility needs to be coupled with social awareness training in choosing to use the mains which will also require a conscious effort to retain and reuse plastic bottles or other drink receptacles. The EWG made general attempts to promote this new water facility to colleagues. At the present time the organisation is researching the possibility of including a rain water collection facility at a new building being developed onsite. OrgX was donated pond equipment from an employee and there are plans for this to be installed at the main site (Appendix A).

IV. Effluent

The new EMS defaults to standard health and safety legislation in regards to effluent disposal; trade and domestic waste (OPSI, 1991). It is proposed that

the use of environmentally-friendly alternatives e.g. compost toilet (Hotta and Funamizu, 2009), would not be suitable for a higher education establishment that will have a large volume of waste. It is also proposed that within the UK many individuals would not be happy to use a compost toilet that simply stores effluent from numerous uses until it is emptied; similar to a portable toilet. OrgX uses a large septic tank onsite to store effluents. OrgX made no changes to effluent disposal facilities during the project, maintaining a 'reactionary' approach to monitoring procedures (Appendix C.28).

V. Waste

Waste disposal is regulated by the Local Authority (LA) in which OrgX is located. Within the area paper, cardboard, plastic, food and drink can recycling are available in both residential and business premises. The LA expanded its recycling facilities during the project timeframe to include designated areas for glass, batteries, electrical equipment, clothing, plastic bag, light-bulb and carton recycling. OrgX developed its recycling facilities to include white and coloured paper, cardboard, glass, cans and plastic within all departments. Battery recycling was also available, but required a member of staff to personally take the collected items to official LA collection points (Appendix C.29).

OrgX recycle old electric equipment by either refurbishing the items or disposing of them through the LA; in line with the WEEE directive (OPSI, 2009b). Social and environmental benefits can be developed if an organisation chooses to refurbish and auction old equipment, or donate items to local community projects and charities; as performed in OrgX in relation to computer equipment and furniture (Appendix G.2). The social decision to pursue these activities introduces a new form of recycling to the organisation and generates goodwill in the local community (Porter and Kramer, 2002).

Within academic activity organic and chemical waste can be generated in scientific experiments, and paper is an issue in all academic and service departments. Whilst these activities are essential to educational development, procedures can be implemented to reduce excessive use and improve disposal methods. Paper waste reduction initiatives were introduced within OrgX with the increase of online course materials and assignment submissions (Appendix G.2). To reduce heating waste the windows at OrgX are sealed during winter and unsealed during the summer months (Appendix C.29).

VI. Packaging Waste

Within OrgX packaging waste comes from external suppliers and the delivery of materials to students. Supplier packaging of office equipment and domestic appliances is recycled where possible within OrgX, depending upon packaging material. It is possible for an organisation to negotiate for the removal of excess packaging and collection of prior waste materials upon delivery (OPSI, 2008). This was not pursued within OrgX as there was a continued belief that the organisation could not alter such policies without direction from OrgX(b).

Marketing materials such as brochures, pens, clothing and other alumni merchandise fall into this category. The choice to use recyclable materials in product and service advertising comes from an internal perception of social goodwill that will be generated from displays of environmental responsibility. Some individuals within OrgX deliberately provide environmentally-friendly items in conference packs (Appendix C.16).

OrgX began to use biodegradable packaging in some of its advertising materials (Appendix G.2). The purchase of jute bags to distribute induction materials produces a beneficial advertising medium that can be used within multiple social

settings: shopping, university, leisure, etc (Section 5.4.3). OrgX purchased jute bags to distribute to students during the induction week (Appendix A).

VII. Housekeeping and Site Appearance

Housekeeping and site appearance can play a vital role in developing social drivers to maintain a clean working environment. These procedures can be improved by purchasing environmentally friendly paint, recycled toilet paper, reusable cloths, natural polishes, environmentally friendly detergents and the complete removal of aerosol form cleaning products; all pursued within OrgX (Appendix G.2). These activities depend upon the conscious effort to alter purchasing patterns and are highly dependent upon social actors looking for environmental alternatives to regular supplies.

OrgX also purchased energy-efficient floor cleaning equipment and hand-dryers to reduce paper towel waste. Similar to electronic equipment disposal, used furniture can be auctioned, donated to the local community or to charity (Appendix G.2). OrgX began to reupholster old furniture and use the items within secondary locations e.g. student housing. This alternative reduces the costs of waste disposal (skip hire) and the purchase of new items that may require assembly and the reorganisation of office space.

VIII. Fire

Fire procedures within the new EMS defer to standard health and safety regulations (HSE, 2006). Fire causes a significant degree of smoke pollution, requires strong cleaning materials and can quickly destroy both natural and man-made environments. This environmental aspect is primarily concerned with any form of fire prevention that produces a proactive system of risk minimisation. Standard features such as weekly alarm systems, fire doors, evacuation chairs and fire escapes

need to be installed to meet legislative requirements; all performed within OrgX (Appendix C.29).

The installation of gas meters and computer monitoring equipment can provide an alert system for discrepancies in pressure that could be the result of a leak; installed within OrgX (Appendix G.2). This aids fire management procedures by quickly alerting system users of a problem that can be localised to a specific meter location. There are no environmental alternatives to fire prevention systems so this aspect simply focuses upon the presence of an efficient fire management system.

IX. Paper Usage

For a HE establishment the greatest amount of waste is produced by academic and administrative requirements for paper-based documentation. Waste paper reduction requires changes to organisational procedures for academic submissions, to allow for online submission of work and the widespread default of automatic draft and double-sided printing; these activities are available within some areas of OrgX but are not a default setting (Appendix G.2). These features should be a standard that can be easily changed to allow for higher quality printing of official documentation and disability requirements. These activities were supported by social awareness training from the EWG to minimise the printing of meeting schedules, emails and handbooks for personal use.

Additional reductions can be made by installing computer systems that monitor departmental or individual usage of printing and photocopying facilities; this equipment is available in OrgX (Appendix G.2). Further awareness training should be included with the introduction of departmental competitions for minimal paper usage, where cost savings can then be used to fund either social or environmental events; this could be developed within OrgX's current monitoring system. Stern

(1999) shows that the combination of reward schemes and information, have a synergistic benefit upon socio-environmental behaviours.

X. Solvent Emissions

Within HE solvents are most likely to be used for scientific experiments or housekeeping requirements. This environmental aspect defaults to stringent health and safety legislation. The core focus to this aspect is the reduction of solvent use for both social and environmental benefits (e.g.air and water). Chemicals used in academic studies are unlikely to be substitutable due to the need for precise experiments, but responsible use can be promoted. The purchase of environmentally friendly solvents reduces the damage caused with use, but these should still be kept to a minimum.

XI. Traffic

Traffic to, between and from business premises is a large problem for OrgX. The surrounding region is quite rural, making it difficult to use public transport and ensure that work time schedules are maintained; unlike urban environments where public transport is far more reliable (Tanner, 1999). OrgX reduced traffic by reducing parking facilities, increasing charges for permits, introducing car pool incentives and reward schemes (Appendix G.2). OrgX established the site as a specific destination within local Park and Ride schemes (Appendix G.2).

The use of video-conferencing facilities also reduces the need for company cars, but there are currently no video-conference technologies that can provide the same social atmosphere as a face-to-face meeting. Whilst video-conferencing may not be suitable for new social or business connections, it is suggested that it can be adequate for discussions within well-established colleague networks (Rocco, 1998); availability of such facilities in OrgX is limited (Appendix G.2). The benefits of

video-conferencing are the reduction of air pollution from car usage, and the increase of staff productivity from reduced travel times.

XII. Legionellosis

Legionellosis activities again defer to standard health and safety regulations, to ensure that social health is not compromised (HSC, 2000). Legionellosis occurs through bacteria growth in stagnant water and are most prevalent in cooling towers, but it also can be present within air-conditioning and hot water tanks that supply bathroom facilities (HSE, 2003). This environmental aspect is focused upon prevention and regular monitoring procedures to ensure any problems are quickly identified; specialist contractors regularly monitor OrgX's water systems (Appendix C.29). Any form of plumbing maintenance or modernisation should ensure that there are no dead-end pipes or possibility of water back-flow; this was an immediate consideration when changes occurred to onsite facilities.

XIII. Company Cars

OrgX conducts annual services and MOTs of company cars, ensuring that vehicles are legally safe for human use and environmental pollution (Appendix G.2). The development of carbon offsetting initiatives can be used to produce an environmental benefit when business travel is necessary (Murray and Dey, 2009); adopted within OrgX and OrgX(b) (Appendix C.26). At the present time there is no intention within OrgX to replace its cars with more environmentally-friendly models.

OrgX had an agreement with a local bicycle shop to provide staff with items at a reduced fee. This needs to be coupled with increased cycling facilities onsite to provide secure storage areas during working hours. This has direct benefits to all areas of sustainable development by reducing vehicle purchase and usage

costs (economic), encourages exercise (social), and reduces carbon dioxide emissions (environment) (Pucher and Dijkstra, 2003).

XIV. Community

An employee environmental working group provides a beneficial source of information gathering and dissemination throughout an organisation (Viebahn, 2002). The EWG of OrgX contained a great deal of innovative ideas that produced practical environmental action in line with social values (Stage 5.3). Employees have the tacit knowledge (cognitive and technical (Nonaka, 1994)) that comes with the hands-on delivery of product development and services that can produce a richer understanding of operational functioning and real-world practicalities (Smith, 2001).

It should be remembered throughout the EMS design and implementation that it is the internal employee community that will be using the developed environmental activities. Therefore engaging with employees to design new environmental activities ensures that financial resources are directed towards activities that will be positively received and used by the employee group. OrgX developed a cross-community planting day that served to increase social goodwill and practical benefits to onsite biodiversity (Stage 5.4).

With the installation of individual energy consumption meters at OrgX it is possible to engage students within halls of residence in building efficiency competitions. The house that uses the least electricity can then be rewarded with a percentage of cost savings; this was successfully conducted within OrgX(b). Students are now engaged by the EWG during induction week and throughout the year with environmental competitions. Students within OrgX that pursue degrees within the natural sciences are scheduled to provide vital monitoring statistics of the wildlife pond that is being installed (Section 5.4.3).

XV. Life Cycle Assessment

Within a HE the prime product is student education which does not fall into the traditional Life Cycle Assessment (LCA) (Ross and Evans, 2002). In an abstract sense the education of students in environmental issues could be modelled within an LCA. Students enter OrgX with a set of opinions towards environmental issues (raw materials), that are then confronted by the normative behaviours within OrgX (transformation), and potentially ‘recycled’ into other social areas. Whilst this perspective is conceptually intriguing, it is proposed that social values are impractical for an LCA that holds its strength within the hard scientific data analysis of environmental impacts (de Haes et al., 1999).

5.6.2 OrgX EMS Score

Using the new EMS system OrgX was analysed as having a score of 150 out of 262, which places it within Level 2 (Very Good) of the accreditation tiers. The EMS focuses upon awarding points in relation to the amount of practical actions that have been implemented, which suggests that OrgX has incorporated a broad range of environmental action. Appendix G.2 rates OrgX activities and shows that the organisation has implemented strategies within each of the fifteen environmental aspects.

Many of the implemented activities are the result of permanent changes to onsite facilities that are independent of social choice; permanent changes are shaded within the table and represent 66 score points. If the organisation were not to maintain its social awareness raising it has the potential to lose 82 points from its present score; resulting in a 55% point loss and reduction to a Level 1 accreditation. This accreditation reduction due to social factors provides the greatest evidence of the difference between the developed EMS and the traditional approaches of ISO 14000 and EMAS (Section 2.2.1).

OrgX has the potential to increase its score by choosing suppliers who are EMS accredited and provide eco-friendly products. In order to improve its score the organisation needs to place equal value in those activities that have been ranked as 0-1 within the EMS audit (Appendix G.2). Some simple changes could include the public display of energy consumption figures, extension of automatic PC shutdown to all systems, and the establishment of departmental paper reduction competitions.

These activities do not require much, if any, resources and can be quickly developed with brief analyses of current computer monitoring systems. Changes to onsite facilities will require added resources and may cause disruption to site operations. Whilst there is potential to install wind turbines and rain water harvesting systems onsite, it is suggested that OrgX place initial focus upon extending its present facilities of video-conferencing, movement sensitive lighting, draft and double-sided printing, energy meters and recycling sites.

The developed EMS focuses upon assessing an organisation's environmental activity set whilst also acting as a guide as to 'how' to improve current procedures. Social engagement and awareness raising are vital contributors to an organisations score and accreditation level. Within the EMS an organisation may implement a new environmental activity (e.g. energy efficient kitchen appliances) but if this is not coupled with social awareness training about minimal usage, they cannot be awarded a score for this action. The purpose of this is to remove the possibility for management to provide new facilities and place responsibility upon social actors.

Instead the EMS aims to promote activities that engage with social actors whilst also adapting procedural requirements. For example, within OrgX the reduction of paper use requires a conscious social effort to change prior behaviours, but it must also be supported by administrative changes that allow for online coursework submissions. The EWG hold the necessary representation from academic and support departments, to identify and begin processes to alter such procedures. The

following section develops the six applied stages of SECS, Stages 5.1 to 5.6, into a cyclical learning process of self-regulation for sustainable development.

5.7 Stage 7: Development of self-regulatory mechanisms for critical issues for sustainability

SECS is intended to be a cyclical learning process with each of the Stages 5.1 through 5.6 supported by and strengthening one another. The framework for change has been designed in this way so that it is sufficiently flexible to respond to social and business adaptations. Self-regulation is achieved through the presence of homeostats (positive and negative feedback loops (Section 4.1.1)) that sense and adapt to changes within the system to maintain stability (Laszlo, 1971).

Positive feedback loops can be referred to as reward loops that focus upon the ‘autocatalytic’ growth of system activities (Ulanowicz, 1990). Negative feedback loops are goal-orientated, reacting to fluctuations within the external environmental and providing directions to “reduce the effect of the perturbation” (Engelberg and Boyarsky, 1979, p.319). For all stages of the SECS framework to continue to work effectively it is necessary to establish control mechanisms that are able to maintain a symbiosis between socio-environmental values and business operations.

5.7.1 Social self-regulation

Bates (1994) refers to cultural development as either segmentalist, integrative or adaptive. The methods used within the application of SECS are primarily adaptive and focus upon second order change, autonomy, collaboration and progression towards change; OrgX is naturally an integrative culture. Cultural integration of environmentally normative behaviour is dependent upon Stages 5.1 through 5.4,

that focus upon identifying present social values, the potential for change and support of social designs with practical actions.

For OrgX to progress towards an environmentally aware organisation it was necessary to establish if there was an active social group that could pioneer change (adaption) and overcome system tendencies to remain static (integrative). Stage 5.2 serves to engage social values of environmental action within an informal group and utilise this group as a mechanism to affect change. Within a social context an Environmental Working Group (EWG) can self-regulate the continued presence of drivers to change by amplifying their values into the organisation (Stage 5.3), attenuating system responses (Stage 5.4) and developing methods by which to create a symbiosis between ideals and reality.

Social self-regulation is achieved through the establishment of metanorms that act to punish individuals or groups who fail to follow standards of acceptable behaviour (Section 2.3.2). Within the SECS framework cultural norms are challenged within the Team Syntegrity workshop (Stage 5.3) and modified with supportive action (Stage 5.4). The new EMS (Stage 5.6) is highly dependent upon social self-regulation as many of the scoring activities are focused upon social awareness training and community events.

The social activities that are specifically included within the EMS (Stage 5.6) act as self-regulatory mechanisms of social commitment to maintain or gain higher levels of accreditation. Most of the social activities within the community section of the EMS were designed, funded and implemented by OrgX's EWG. The EWG at OrgX contains self-motivated individuals who are enthusiastic about environmental action and actively volunteer their own time and resources.

Self-organisation within businesses is most evident within informal networks (Stage 5.2) and it is these groups that contain common interests and social motivation of action; such as the EWG. It is proposed that if an organisation within the UK

chooses to pursue the SECS framework then there has already been a degree of social self-organisation and pressure to change. The use of SNA provides an analysis of an organisations informal network structure (Stage 5.2), with the potential to identify an informal environmental network.

Using the VSM as a diagnostic tool (Stage 5.5) in combination with SNA diagrams (Stage 5.2) the outreach of the self-organised EWG within OrgX's structure was established. This links to the second research question (see 4.6.7) that suggested that cybernetic principles (VSM) could aid the self-regulation of community learning (SNA of environmental outreach). Once this analysis identified the EWG positions within each recursive level and respective Systems 1 through 5 (Section 5.5.3), additional individuals who are interested in environmental issues were sought to fill missing areas of employee representation; for example, the shaded areas in Figure 5.42.

Accessing voluntary participants is ideal as they are likely to be more proactive in group activities (due to a personal and social self-identity), than someone who has been told to join the group by management (role identity) (Mannetti et al., 2004). OrgX began to provide the EWG with support activities (official reporting channels, administration) to help the EWG communicate their work to all system areas. Self-organised social groups within an organisation display an autonomous structure (Espejo, 2003a), in which the unique social properties of the group distinguish them from others, whilst they continue to function as a part of the organisation.

These unique properties occur through emergent properties of social interest and are the building blocks for modifications to normative behaviour. Whilst the organisation should support the EWG, ownership of the group should remain with the voluntary participants. Autonomy of the EWG is ideal but it must also be restrained to ensure that group activities do not jeopardise an organisations functions or status. According to Varela et al. (1974, p.188) autonomy can occur when system components "...generate and participate recursively in the same

network of reactions which produced them...”, and recognise their position as a contributor to the whole/unified system.

Therefore the EWG must be aware of the social and environmental values that brought the group together, continue to replicate these values within OrgX, whilst also being aware that they are a part of OrgX and must work in unity with other system components. Autonomy within the EWG for individual tasks was a natural tendency of the group, but needed to be monitored by the EWG as a whole through regular meetings (self-regulation). For example, OrgX’s EWG needed to prevent a member from entering the organisation into a national tree planting day, as the event was directly linked to one political party of the country. As OrgX is a public sector organisation it was determined that the group could not show any form of political support/bias, regardless of the any well intention behind the project.

Administrative support and official reporting channels for the group act to both amplify environmental values within the organisation (Appendix A), and also provide the necessary restraints to ensure EWG activities do not contradict organisational norms (control mechanism). A further reason to include EWG reports within management communications is to ensure that the social activities that gain scores for EMS accreditation are continually pursued. With regards to social self-regulations early response systems began to occur within OrgX through increased EWG meetings and email communications. Providing the EWG with a dedicated web-site, email and organisational representative, allows both internal and external social actors to assess group activities.

The EWG within OrgX should use their web-site to as a platform by which to establish customer opinions of current environmental actions and how they would like the organisation to proceed. Monthly meetings of the EWG can then be used to evaluate any problems, modify behaviours where possible, or seek additional resources from the organisation to enact change. Once environmental action becomes a normative behaviour within the organisation early responses systems

will be used to identify problems and establish punishments upon those who have ignored norms.

For example, individuals who vandalise natural wildlife areas onsite could be made to personally restore or fund the restoration of the area in order to remain a member of the organisation. Rewards are also an essential aspect of norm maintenance and departments who minimise their consumption levels (e.g. paper, electricity) should be awarded some of the financial savings to fund team interests; these could include a group dinner, environmental projects, or donation to charity.

External actors will perform a degree of regulation over OrgX's activities, as it is prospective students' demands that determine the future direction of the organisation. Within OrgX the EWG needs to access environmental groups within the student union to gather information about the values of current and prospective students. External social self-regulation will have a strong affect upon an HE once environmental issues become a metanorm within the UK and organisations are then required by law to incorporate an EMS within its management system.

As there is no legal demand for HE's to implement an EMS at the present time, organisations that have chosen to do so must be responding to the social demands of employees and students, otherwise there would be no motivation to do so.

5.7.2 Business self-regulation

At the present time EMS within the UK are dependent upon a business' identification with Corporate Social Responsibility, as there is relatively little requirement for organisations to monitor their environmental impacts (Section 2.2.1). Business self-regulation of environmental activities will be embedded with social self-regulation and maintenance of operational activities. The developed EMS

(Stage 5.6) acts as the key mechanism of business self-regulation, in which activities need to be monitored to maintain accreditation standards.

Environmental impact monitors were already present within OrgX's health and safety, and fire management systems. It is necessary that any activities that fall into two or more environmental aspects (e.g. fire, electricity) are easily communicable to respective managers, and have sufficient protocols to coordinate precautionary and reactive behaviours. This links to prior discussions for the need of holistic perspectives of EMS (Section 2.3), ensuring that organisational resources are not doubled upon the same activity from different departments.

The EMS needs to have a presence within core system regulators so that it can effectively monitor the actions of all system components. Beer (1981) identifies that the greatest regulator of autonomy lies within S3-S4 mechanisms of communication. Engagement with the S3-S4 homeostat provides a cohesion between external demands and internal policies (doing system) (Espejo and Garcia, 1984). S4 considerations include marketing, human resources and legal requirements (Badillo et al., 2008), and in relation to OrgX's EMS the S3 function is the employee EWG (Figure 5.42).

Therefore to increase autonomy the EWG should be aided by marketing personnel who are familiar with student and stakeholder demands and can assess external environmental values. Human resource personnel should provide the necessary environmental management training to employees. Company lawyers should make sure that any new environmental laws are respected within operational activities and update the EWG so that they can begin social awareness training.

The environmental activities of competitor organisations should be analysed by both the EWG and senior management, to seek out different approaches to environmental actions that could be beneficial to the organisation; such as those detailed by Abu-Ghazze (1999); Herremans and Allwright (2001); Holt (2003); Lozano (2006); TCT

(2006a). The formalised EWG within OrgX required that representatives from all organisational departments be within the group, so that meetings could be used to collectively discuss any internal environmental issues.

A diverse representation of organisational employees within OrgX's EWG resulted in innovative inter-department approaches to problems; often in the form of social awareness events. Social perception of the organisations approach to environmental issues needs to be analysed within the S3-S4 homeostat (Beer, 1979), to determine if the activities of the EWG are successfully assessing external demands and developing worthwhile group events in response.

Within OrgX a permanent environmental officer should be positioned as an S3-S4 regulator to provide the necessary coordination of internal and external system requirements. This employee should be included as a member of the EWG so that they can monitor the range of scoring activities that are being pursued socially. Whilst the EWG can sufficiently manage the social aspects of the EMS the addition of a specialist environmental role within the company shows a clear commitment by senior management to implement change; this position could be filled by an EWG member with sufficient knowledge and experience.

Whilst it is possible for an EWG member to pursue such activities on a voluntary basis, the motivation for an individual to input extra time and energy can lessen; Balzarova and Castka (2008) identify that such motivation can also be lost within ISO 14000 EMS implementation. OrgX needs to ensure that the EMS can continue to function outside of a voluntary basis as there is no guarantee that EWG members will be employees of the organisation indefinitely. The inclusion of a specific environmental officer provides the organisation with security that the EMS will continue to have a dedicated resource, regardless of employee retention.

The installation of electricity, gas and water meters per site building at OrgX were coupled with computer systems to alert OrgX(b)'s environmental officer of unusual

consumption levels. Operational procedures within the EMS should be automated wherever possible to enhance the self-regulation of activity without regular human input. Computer systems were installed at OrgX to maintain maximum hot water temperatures, timed heating, movement sensitive lighting, and legionellosis monitoring.

Each of these activities requires initial human input to setup the systems but requires little interaction beyond basic routine maintenance. Computer software should be able to conduct automatic comparisons of current and prior consumption levels and generate an email alert if the system is performing outside of preset parameters. Similarly early response systems should be installed within high consumption areas of the site e.g. printers, photocopiers.

These monitors can be used to automatically generate statistical comparisons of departmental usage and identify areas that require increased awareness training, and where necessary imposition of resource restrictions. For example, if a department uses more paper than it is analysed as needing it can have its funding reduced for other office materials, to cover the additional consumption expenses.

5.7.3 Environmental Self-regulation

It was identified previously in Section 2.1 that Lovelock refers to Gaia as the natural self-regulation that occurs within the Earth's atmosphere (Lovelock, 2000). Environmental self-regulation is quite difficult to monitor on a short-term scale and it can be argued that any environment with human input (business grounds) is not self-regulated. Within the EMS biodiversity projects are a feature of the local community partnerships activity. OrgX was able to pursue numerous biodiversity projects in relation to birds, bats, pond features and general adaptation of grounds maintenance to minimise disruption to wildlife (Stage 5.4).

Natural biodiversity differs between geographical locations (e.g. OrgX(b) and OrgX) and it is the responsibility of the organisation to ensure that any projects undertaken onsite support regional needs. For example, the business may be within a location where bats are naturally present in the environment, but if there is currently an over abundance of the animal in the area it is not productive to introduce nest boxes. OrgX's EWG developed numerous social projects to fund the regeneration of onsite biodiversity with indigenous flora and fauna.

OrgX also changed its site maintenance procedures to minimise disruption to local wildlife; for example, painting of buildings when birds are not nesting, allowing grass to grow naturally and local wildlife to settle in the area. It is inevitable that social actors and businesses will have an impact upon the surrounding environment, but it is possible to establish mechanisms to reduce negative interactions.

Within a HE such as OrgX it is possible to use the natural environment as a basis for academic study of the presence of wildlife populations and characteristics; science-based students at OrgX are to monitor the onsite wildlife pond as part of their studies. By incorporating the surrounding environment into course schedules a HE can benefit from on-site scientific data and academic development, whilst also utilising the gathered data to monitor the health of the ecosystem. Monitoring the surrounding ecosystem can identify any problems that are being caused by human or environmental fluctuations.

For example, the reduction of hedgehog populations on site could be an indication that grounds maintenance are disrupting grass borders (human) or that there has been an increase in predator activity within the area (environmental). This leads to the added consideration that whilst introducing wildlife habitats for animals is beneficial, the present ecosystem may have changed naturally to no longer support the targeted animal group.

Therefore a business should work alongside local authorities and national wildlife specialists to ensure that practical environmental activities that are undertaken are actually worthwhile. However, it should be considered that within most businesses the natural environment will only be allowed to self-regulate within the confines of organisational needs e.g. health and safety, 'appearance' and site expansions.

This section has provided a range of example self-regulatory mechanisms that should be embedded within social, business and environmental systems. The ability for an EMS to work effectively requires an autonomous EWG that are able to monitor internal and external social needs; social self-regulation. When the EWG consists of voluntary members there is likely to be a tendency towards social and environmental benefits. The establishment of an environmental officer position within the organisation will provide the necessary business perspective to ally social desires with real-world practicalities.

The installation of computer monitoring equipment within high consumption areas of the organisation allows for regular statistical reviews of operational efficiencies and environmental impacts; business self-regulation. Where possible a business should establish maintenance procedures that cause minimal disruption to onsite wildlife, to allow natural environmental self-regulation. The reintroduction of indigenous plants and wildlife should be attempted to improve the quality of onsite biodiversity.

Each of the economic, social and environmental aspects of an organisation place limits to growth upon the others (negative feedback loop); through operational, resource, stakeholder and customer demands. This develops into the holistic self-regulation of the whole organisation with economic, social and environmental systems performing their own internal growth and replication (positive feedback), whilst the two others act to restrict runaway growth (negative feedback loop).

5.8 Practical Recommendations for OrgX

1. OrgX should continue to support the employee EWG.
2. The EWG should continue to act as a voluntary committee within OrgX.
3. OrgX should attempt to become autonomous, with the ability to control its own purchasing policies and environmental monitoring systems.
4. The EWG should continue social engagement activities. Seasonal competitions should be continued, with funds raised from such events used for onsite wildlife restoration.
5. Funds that are raised by EWG competitions should be doubled with the donation of an equal amount of money from OrgX's central marketing funds.
6. OrgX should expand the implementation of movement sensitive lighting and timer switches throughout the site.
7. Natural lighting should be incorporated into new building designs. When this is not possible solar fibre optics should be considered.
8. Individual building energy and water consumptions meters should be increased.
9. Automatic PC-shutdown should be installed within all site computers.
10. All new computer equipment should have a high energy-efficiency rating.
11. All electronic equipment should have an individual on/off switch.
12. All new domestic equipment should have a high energy-efficiency rating.
13. Natural drying facilities should be made available within Halls of Residences.
14. Individual radiator thermostats should be installed throughout the site.
15. OrgX should continue current plans to install a wind turbine on the new building.

16. OrgX should include solar panel technology within new building designs.
17. A renewable energy supplier should be chosen.
18. A public display of energy and water consumption patterns should be available within all departments, the EWG website and centralised television systems.
19. The amount of heating appliances onsite that use gas should continue to be reduced and replaced with natural energy sourcing.
20. OrgX should reduce the availability of bottled water onsite to encourage the use of mains (drinking) water systems.
21. Rain water harvesting systems should be installed and collected water used for grounds maintenance.
22. The donated pond needs to be installed.
23. OrgX should monitor environmental initiatives available from its mains water supplier.
24. Effluent systems need to have weekly and monthly monitors.
25. Ink cartridge recycling needs to be performed by all departments.
26. Food should be composted onsite.
27. OrgX needs to ensure that employees are able to open windows to improve natural air-conditioning.
28. New buildings should have double-glazed windows. A feasibility study should be conducted into improving the window designs of the main site (listed building).
29. Cavity wall and ceiling insulation should be included within new buildings. A feasibility study should be conducted into insulation improvements of the main site (listed building).

30. The possibility of geothermal heating within new building designs should be assessed.
31. A green roof design should be incorporated into the new building design.
32. Organic waste from science experiments should be composted where possible.
33. Chemical use should continue to be reduced.
34. All packaging materials should be biodegradable.
35. All cardboard used in packaging materials should be recyclable.
36. OrgX should choose product suppliers who use recyclable or biodegradable packaging materials.
37. OrgX should insist that product suppliers remove packaging material from the site.
38. Energy-efficient floor cleaning equipment should be expanded.
39. All cleaning equipment should be reusable e.g. long-lasting cloths rather than disposable products.
40. Environmentally-friendly paint should be used at all times.
41. Suppliers of housekeeping equipment should be assessed for the presence and quality of an EMS.
42. Default double-sided printing should be established where such facilities exist.
43. Default draft printing should be established at all computer terminals.
44. Departmental competitions for paper reduction should be developed.
45. Suppliers of paper materials should be assessed for the presence and quality of an EMS.
46. Environmentally-friendly solvents should be used when such materials are necessary.

47. OrgX should source food from local providers.
48. Food and drink suppliers should be assessed for the presence and quality of an EMS.
49. Video-conferencing should be expanded so that each department has their own dedicated set of equipment.
50. An online car pool system should be developed to replace the current single-whiteboard system.
51. Parking spaces should continue to be reduced.
52. The organisation has the potential to make the site a car-free zone as it is a designated location on the local Park and Ride system. However the provision of disabled parking needs to be retained.
53. OrgX should reduce the amount of vehicles it owns.
54. Mileage records per use, should be kept for company car use.
55. Hybrid vehicles should be considered when replacing company cars.
56. Cycling should be further promoted with the increase of storage facilities onsite.
57. Carbon offsetting should be performed for long distance travel e.g. international flights.
58. Suppliers of company cars should be assessed for the presence and quality of an EMS.
59. Students should be given a clearer introduction to the EWG and environmental activities onsite during Induction week.
60. The Green Week suggested during the TS event should be implemented.
61. Social activities need to be continued to retain OrgX's score within Level 2 of the EMS.

62. OrgX should attempt to improve its activities so as to reach Level 3 of the EMS.
63. The EWG need to continue to advertise and coordinate activities with local community groups.
64. The student environmental action group should be supported with a permanent position in the Students Unions.
65. OrgX should analyse the Cradle-to-Grave impacts of university memorabilia and marketing materials.
66. OrgX should expand the use of virtual learning environments and online coursework submission.
67. Old books from the library should be sent to an appropriate recycling facility.
68. Paperless meetings should become a standard.

This chapter has provided a step-by-step account of the application of the SECS framework within the case study organisation. Cultural values, norms and informal social networks have been shown to contain a great deal of motivation and innovation that can be accessed for organisational change. The use of participatory discussion platforms provided the opportunity to allow internal social actors to design environmental activities that they wanted to pursue. This approach reduced resistance to change and provided a range of practical environmental benefits.

A VSM diagnosis was conducted and overlaid with the developed SNA to establish communication barriers within the organisation and EWG outreach activities. Social communication was established as a core focus to the EWG who decided that it was through such engagement that environmental actions could become an organisation norm. The developed EMS used a scoring system to establish an organisations accreditation level and placed significant weight upon the presence of social engagement activities. The following chapter concludes the research project and defines the statement of contribution that the work has produced.

Chapter 6

Conclusion

To conclude the thesis this chapter provides a critical analysis of the research techniques used and determines the effectiveness of the multimethodology approach used in the case study organisation. The developed research questions are analysed, recommendations for OrgX provided and a final statement of contribution given. The chapter closes with recommendations for future applications of the SECS framework.

6.1 Critical Analysis of Research Techniques

This thesis began with a broad study of literature related to environmental management from both a business and scientific background (Chapter 2). At the beginning of the research it was decided that the study would take the form of action research within a case study organisation (Chapter 3). A multimethodological approach to the research was used to combine both business and science-based analyses for improved social engagement practices (Chapter 4).

The aim of the research was to develop a holistic framework for environmental change. The Socio-Environmental Cohesion for Sustainability (SECS) framework

was developed in Chapter 4 and designed to incorporate employee values and cybernetic analyses to strengthen environmental management practices. The developed SECS framework was trialled within a higher education establishment over a three year period (Chapter 5).

The conducted research was built upon an interpretivist philosophy (Section 3.1.5), with focus upon the subjective analysis of social values and perspectives that shape an organisation. A social constructionist approach of ethnographic analysis was adopted to allow the test of research questions within a specific social group, for a set time period (Section 3.2.5). Action research within a case study organisation was pursued to establish if the SECS framework could develop practicable changes within a real-world organisation (Section 3.3.2); Objective 1 (Section 2.4).

The action research process was both enjoyable and difficult. The researcher was able to work alongside OrgX's Environmental Working Group to observe the development of informal networking as a driver to organisational change. The ability to work with a real social group provided a unique insight into the real-world practicalities of merging social values into an established business structure; the research had to be flexible to adapt to emergent social phenomenon (Checkland and Holwell, 1998). Whilst this could have been theorised through other forms of research approaches, the use of action research provided an in-depth understanding of positive and negative issues that can affect voluntary corporate social responsibility.

The establishment of the EWG as a formalised committee reporting to OrgX and OrgX(b), ensured that activities conducted by the group were recognised by the organisation. From an environmental perspective the research resulted in practical activities that benefited local wildlife. The organisation adopted numerous changes to its purchasing patterns and range of environmental facilities onsite. The research project was made more fulfilling by knowing that whilst there would be an academic result of the study, there was also a real-world social and environment benefit.

Difficulties were encountered with the action research approach as the project was highly dependent upon the continued cooperation of OrgX. Working with an established organisation resulted in the project having to be flexible and react to real-world barriers to change; unexpected environmental fluctuations, resource limitations, timeframes. There were times when the research had to ‘wait’ until the organisation established its level of commitment for each analytical tool; in the case of the environmental audit this took one year.

These periods of waiting were not ideal for the timeframe of the project but they were an essential aspect of social progression that the researcher could not interfere with as an observing participant (Section 3.3.2). It is suggested that the core focus of social engagement within the SECS framework attributed to the continued voluntary participation of OrgX and trust in the benefit of the multimethodological approach. This social dependence also proved to be a difficulty at times as there were individuals within the organisation who simply did not want to be involved in the research.

Despite these difficulties the researcher believes that the action research approach was the right choice for the application of SECS. The rich data collected from the organisation could not have been gathered without developing a close relationship with social actors within the system. Being an observing participant enabled the researcher to access employee opinions and observations over a long time period that would not necessarily be encapsulated within snapshot surveys of the organisation. The following sections review each of the methodologies used within the organisational engagement process.

6.1.1 Cultural Analysis

The cultural analysis of the organisation began in 2006 and continued until the end of the project; primarily through observation and the use of a questionnaire

in 2008. The cultural dynamics of the organisation dominated each stage of the research through employee social networks, expression of opinion, willingness to enact change and limits to organisational accessibility. The research techniques used for the cultural analyses included questionnaires, general meetings, and the researcher's observation of employees in both work and social environments.

Researcher observations formed the basis of the NAM analyses in regards to evidence of practical activities that demonstrated the development of social environmental norms; a different approach to traditional NAM that use generalised statements to identify an individuals' moral identification with such statements. For this thesis it was determined that the observation of changes in the environmental activity set of the organisation and employee group would be prime indicators that cultural engagement and capacity building stages within the SECS were successful.

The cultural analysis stage of SECS was the most subjective part of the study, as it relied primarily upon the researcher's observations to explain social interactions. These observations were then either supported or challenged by the results of other stages of the framework. The initial cultural analysis was combined with the SNA in one questionnaire to minimise disruption to employee work schedules. Upon reflection this was a highly beneficial combination as it enabled the researcher to develop a direct understanding as to whether individuals who were more environmentally aware choose to interact with other like-minded people.

Many OrgX employees were well aware of environmental issues but did not belong to the EWG (an informal environmental group), suggesting that those within the EWG had a heightened sense of personal responsibility to enact change. The baseline cultural audit using normative behaviour assessment, identified that at the start of the project there was little environmental expertise within the organisation and a high tendency to dismiss environmental issues as someone else's responsibility (Table 5.1).

A lack of specialist knowledge and acceptance of personal responsibility is not something unique to OrgX, but a general trait of many businesses and individuals within the West; as evidenced by the abundance of voluntary environmental standards (DEFRA, 2010a; Jurado and Falkenberg, 2010), rather than obligatory requirements. However, OrgX had experienced an internal social drive to improve its environmental performance by conducting postgraduate research on its activities. The table below summarises the developments of cultural change within the organisation during the research project:

Variable	Change
Awareness of Need	Formalisation of employee environmental action group, Environmental Audit, New Building Designs
Awareness of Consequence	Improved monitoring procedures of operating facilities.
Awareness of Responsibility	Formalisation of employee action group, Funding of onsite biodiversity projects, Installation of environmentally efficient equipment, Choice of Eco-friendly alternatives
Acceptance of Policy Initiatives	Formalisation of employee action group

Table 6.1: Norm Activation Model - Final Cultural Audit

The Awareness of Need (AN) to progress towards an environmentally responsible organisation was initiated by OrgX's management committee engaging the researcher to conduct the study; baseline audit. AN was developed during the research process when OrgX decided to formalise the EWG and allow the researcher to conduct an ISO audit (Section 5.4). AN was also improved within management

decision making processes, with the organisation choosing to include environmental technologies within new building designs.

The AN is directly related to the emergence of environmental issues as an aspect of social assessment of business ethics, and the resultant competitive advantages it can bring. The Awareness of Consequence (AC) developed within the organisation with the installation of computer monitoring systems, to provide regular statistical analyses of energy consumption. AC could be improved in the future with extended monitoring systems to calculate carbon emissions from employee travel, visual displays of departmental consumption patterns and volumes of waste.

Awareness of responsibility (AR) to conduct positive environmental activities was evidenced with organisational funding of natural boundary restoration and internal social funding of wildlife habitats. The development of individual choice to insist on video-conferencing (Appendix C), refusal of paper meeting schedules and purchase of environmentally friendly alternatives (Appendix E.1.6), also demonstrated a growth in personal responsibility. The formalisation of the EWG also falls within this category with regards to management acceptance of corporate social responsibility.

Acceptance of Policy (AP) was also seen to be the formalisation of the EWG, with the group given official reporting channels to both OrgX and OrgX(b) senior management committees. The organisation would be able to further its AP by designing strategies to implement the Green Week suggested during the TS workshop (Appendix D.3.3). This is an internal policy development that could also include a week long environmental curricula in all departments. With regards to external AP the organisation needs to ensure that its facilities departments continue to respond to updates in the UK legislative system.

There were numerous discussions within the EWG that a specific environmental officer be employed by the organisation. Funding for such a position was not

available during the project timeframe. This lack of funding can be attributed to both financial limitations and the cultural barrier of full organisational commitment to environmental issues. The researcher strongly believes that the organisation would benefit from a dedicated environmental officer to maintain EWG motivation, develop new social engagement activities, conduct environmental impact analyses and seek out more efficient operational procedures.

Whilst there has been an employee replacement of the researcher in the EWG, this person rightly places their contracted work commitments before EWG activities. The disadvantages of cultural analysis were identified earlier as requiring an objective analysis and dependence of OrgX community positively receiving the researcher. As the researcher was an observing participant within OrgX the ability to be objective could not be maintained.

The researcher acted as a facilitator of change, refraining from directing the organisation and EWG in their choice of environmental activity. This resulted in the organisation choosing to adopt activities that they wanted to pursue, that were not necessarily activities the researcher would have personally chosen. With regards to employees accepting the researcher into the organisation, the researcher's prior association with OrgX provided an initial entry into the employee group.

The distribution of the cultural questionnaire resulted in some initial concerns from service departments (Section 5.1). Upon reflection the researcher should have insisted upon speaking with each departmental manager to define the value of SNA to the research before distributing the questionnaire. Unfortunately at the time of distribution some managers were unable to be accessed for such discussions and questionnaires were still sent out to ensure that the whole employee group was equally represented.

Overall the cultural analysis provided a valuable insight into the management and employee culture towards environmental issues. Traditional questionnaire

analyses (Appendix B) provided an initial insight into the social values of OrgX and developments in these values were continually observed through EWG meetings, general observations and adoption of environmental activities (Appendix G). Whilst OrgX did not set environmental issues as a core aspect of its strategic focus, the integration of the EWG as an official management committee demonstrated the development of cultural acceptance of responsibility.

6.1.2 Social Network Analysis

Social Network Analysis (SNA) was used to identify the current business communication structure within OrgX, and the presence of any emergent informal environmental networks. Employees were asked to identify the three people they would choose to contact for both work and environmental issues. Whilst some of the identified environmental contacts had jobs that could be seen as environmentally-related roles, many of the perceived environmental contacts had no direct connection to such activities. This led to the realisation that many of the suggested environmental contacts were in fact natural eco-leaders, who had gained social recognition of their environmental values. This linked to the fourth research question:

Research Question 4: The identification and fostering of natural eco-leaders and informal networks, better the possibilities of breaking through established views and practices.

The SNA also identified that these environmental contacts had naturally formed a social network based upon environmental values; part of which later became the environmental working group (EWG). Work based interactions were shown to have three cutpoints within business communications that could lead to network disintegration (Figure 5.17). This provided a beneficial analysis of OrgX as it

demonstrated that the environmental network could not fully depend upon the formal communication structure (Stage 5.2).

The environmental network in OrgX was shown to span most departments, with a much greater range of communication channels than the formal business structure (Figure 5.23). The environmental network was built upon weak ties between departments and contained no cutpoints. This meant that whilst environmental communications were not heavily weighted (multiple actors within each node), the network was structured so that the removal of a node would not result in network collapse.

The presence of actors from multiple departments provided a diverse set of knowledge and skills to the EWG; adaptive comanagement (Olsson et al., 2004). By overlapping the work and environmental networks (Figure 5.24) it became evident that some communication channels were present in both networks. These dual-purpose channels provided a starting point for embedding environmental communications into the business structure. The SNA was able to identify a few nodes/departments of prestige that consistently acted as structural holes within both networks (Haythornthwaite, 1996); they received communications but did not reciprocate contact.

This development resulted in a clear drive within the EWG to develop sufficient communication amplifiers within the environmental network, to minimise such information barriers. The EWG contained members from prestige nodes and regular meetings were established to ensure that updates from all areas were regularly recorded. These updates were then supported by later stages of SECS (Section 5.4), when the EWG developed formalised reporting channels within OrgX and OrgX(b).

The disadvantages of SNA were viewed as the dependence upon respondents feeling comfortable in expressing their social connections, the need to link employees

to their questionnaire responses (non-anonymous) to develop the networks, the broad representation of employees and the lack of a user-friendly interface with the chosen software. As discussed in Section 5.2 there was concern within some service departments about the use of SNA and the type of information that would be generated from it.

These concerns were generally allayed with the researcher discussing the exact forms of analysis that come from the research; primarily through face-to-face meetings. In order for many employees to feel comfortable identifying their social networks, it was necessary to allow respondents to complete the forms anonymously. This problem was encountered in the employee group and resulted in the development of adapted SNA diagrams, to produce departmental connections rather than those of individual actors (Figure 5.24).

Using departmental groupings allowed for the production of reciprocated/dyadic communication networks, with all but one questionnaire returned with a departmental identification. The questionnaire response rate was 40% and therefore provided a narrowed perspective of the communication networks within the organisation (Section 5.1). This resulted in the development of SNA diagrams that did not represent the whole employee group, limiting the analyses to a restricted perspective of OrgX.

Whilst the analyses are restricted they provided a useful insight into the presence of prestige and network cutpoints within almost half of the employee group. The collected data also provided an interesting aspect to the cultural analysis as the majority of questionnaires were returned from academic departments, providing a beneficial indicator that service areas required the greatest focus of research engagement. SNA does not ask typical socio-demographic questions that people are most familiar with when completing a questionnaire.

Additionally employees who begin to complete a form that is titled an 'Environmental Questionnaire' may feel disconcerted when they are suddenly asked about their work and social networks; there is no explicit connection between the two. Ideally, a researcher should try and meet each employee in the organisation to ensure that all individuals are aware of the purpose of SNA and the types of information it can generate. Within future uses of SNA it is suggested that meetings with all managers be conducted in person.

Despite the difficulties experienced by using SNA within this project, it still provided a beneficial overview of work and environmental communications within the organisation. Whilst the diagrams were not able to show the interactions of individual actors they provided a useful representation of inter-departmental communications. The identification of one department as a structural hole of communication (non-dyadic node) resulted in the development of processes by which to ensure interactions became reciprocated.

This was difficult to accomplish as the department acted as a communication sink within both the environmental and work networks, resulting in a strong social tendency to limit outward communication flows. Without the SNA it would not have been possible to identify that one department was causing such a barrier in communication. As an observing participant the researcher had identified that one department seemed to have communication barriers, but without the SNA there would have been no proof bar conjecture.

The EWG had originally focused its attention upon engaging the rest of the employee group in developing environmental awareness. Following the SNA it was evident that whilst the EWG needed to access external employees it was also necessary to address its own internal structure. The self-organisation of the EWG made it appear to be an ideal natural network, but the SNA was able to determine that this was not the case. The SNA provided a clear indication of work and

environmental interactions within OrgX, and overlaps of the two communication networks.

6.1.3 Team Syntegrity

The use of the cybernetic model Team Syntegrity (TS) provided a participatory discussion platform for employees to design an environmental strategy for OrgX; satisfying Objectives 3 and 4 (Section 2.4). The event was seen by both the researcher and participants to provide a beneficial opportunity to mix environmental idealism with the practicalities of a real-world business. The workshop provided an opportunity for management to see the amount of employees who genuinely wanted to make a difference to the organisations environmental strategy.

The voluntary attendance of employees also demonstrated their commitment to environmental issues, as attendance required them to ‘catch-up’ on a full days work at their own expense. The logistics behind the TS protocol needed to be adapted to accommodate the small group size available within OrgX; Short-Form TS (Figure 5.27). Whilst these logistical adaptations were time consuming it was highly beneficial for the researcher to conduct them as it provided a deeper understanding of the communicative advantages (topic reverberations) of the model.

The adoption of member and critic roles by participants provided a novel approach to the meeting, that was enjoyable to all that attended. The two facilitators of the event did not have any difficulty in getting employees to follow the protocol, which demonstrated high motivation within the employee group to address environmental issues. It is possible that a less willing employee group could find the protocol difficult to maintain, but it suggested that it is the responsibility of the facilitator to reduce confusion and minimise disruptions.

The TS model is highly dependent upon the continued presence of a facilitator for each group who must be familiar with the requirements of the TS protocol i.e. member/critic roles (Espinosa and Harnden, 2007b). A facilitator also has to refrain from contributing to topic discussions, which can be quite difficult to do as the InfoSet may be developing an action plan that the facilitator disagrees with. For the TS event the researcher needed to change their status from an observing participant, to one of an observer. At some stages the researcher found that participants would ask their opinion of a topic or new idea, as they were seen as a specialist in environmental issues.

The second TS facilitator avoided this situation as most of the InfoSet were unfamiliar with them and instead saw themselves as the internal specialists of organisational procedures. This leads to a conundrum: is it better to have a facilitator the InfoSet know so as to promote trust in the protocol and risk participant dependence upon 'specialist' knowledge, or have an unfamiliar facilitator who will not hold as much trust but will be left to fulfil their role as intended.

The disadvantages of the TS approach were originally identified as the commitment of participants to follow the strict protocol, the likelihood that participants will not have used the TS model before, the dependence upon participant knowledge and skills, and the potential that the developed strategy would not be implemented. The InfoSet were extremely willing to follow the TS protocol as the process was viewed as new and fun (Section 5.3).

Whilst all but one member of the InfoSet had not used the TS model before, this did not cause any problems as participants were highly motivated to follow facilitator's instructions in order to develop a useful environmental strategy. The InfoSet group consisted of a range of academics and service personnel, spanning most of OrgX's departments. This brought a broad range of operational, social and environmental knowledge to the event. Fortunately OrgX responded well to the suggestion of the

TS event and understood the importance of a diverse set of employees within the InfoSet.

It was possible that the developed strategy would not be implemented by the organisation due to resource constraints or a lack of motivation. Within Section 5.4.4 it was identified that within eight months 56% of the TS strategies had been implemented, proving that this potential disadvantage did not occur within OrgX. This linked to the fourth research question that was initially addressed in Section 6.1.2. The environmental network identified by the SNA constituted the majority of participants in the TS and their social values maintained the commitment to follow the protocol and reach a consensus.

The implementation of over half of the TS strategies by OrgX in such a short timeframe indicates the presence of a strong driver to change. As environmental activities are primarily voluntary for businesses in the UK, this would suggest that the social drive of the EWG made a significant influence in ensuring the new environmental strategy was enacted. The EWG were the core drivers to environmental activity implementation following the TS workshop and their position within most departments of OrgX allowed for the combination of skills and resources to achieve their goals. The TS workshop was limited to one day at the request of OrgX management to minimise disruption to regular work routines.

This was seen as a disadvantage of using the TS model as the protocol works better with at least three days of application (Beer, 1994a), which was not possible in OrgX. The real-world practicalities of work schedules, resources and regular business operations do not easily provide an opportunity for a group of employees to simultaneously ‘stop working’ (Truss et al., n.d). Within the InfoSet there were generally one or two people from each department in attendance, all of whom had senior management support to attend the event.

The TS approach was a highly beneficial and innovative approach to the development of an environmental strategy for OrgX. This model developed the core design for practical change strategies and is viewed as an integral part of the SECS framework. Whilst other stages of SECS focused upon the researcher analysing the organisation and working in conjunction with the EWG, the TS approach was an employee-owned analysis and design of future strategies. This stage provided employees with the chance to have their say about what ‘could’ practically be changed (potential growth) whilst also limiting the activities to those that they would actually ‘want’ to do (normative limits).

6.1.4 Viable Systems Model

The Viable Systems Model (VSM) was used to understand OrgX’s organisational viability (Beer, 1981, 1979), and establish the most useful positioning of the EWG. This stage began before the TS event so as to determine the participants’ level of recursion and position within systems 1 to 5. This was done so as to allow the researcher to conduct social observations of how the participants contribute to the design and how their structural position affects their ability to personally implement changes. The VSM diagnosis was strengthened after the TS event by interviews with employees (Appendix E).

OrgX was shown to be contained within the primary activities (academic departments) of its sister organisation OrgX(b) (Appendix Figure 5.38). OrgX’s departments were seen to report directly to their OrgX(b) counterparts. Whilst academic departments held some autonomy within their choice of course delivery, service departments had little authority to alter operational activities from the standards set by OrgX(b). This lack of administrative autonomy within OrgX had the potential to delay environmental changes until OrgX(b) supported them.

OrgX itself was shown to centre upon a core management committee consisting of one Dean and five academic Heads of Departments, a Bursar and a representative of OrgX(b) Senior Management Team. Each department had an academic Head of Department (who filled S3, S4 and S5 functions), an admissions tutor or external coordinator of (S4) and primary activities consisting of academic courses, research and community outreach (S1). This was the general structure of each academic department.

This placed academic Heads of Departments as both a pivotal coordinator between Levels 1 (OrgX) and 2 (Academic department), and a core contributor to their departments functioning. This managerial structure was not viewed as an ideal system, as it resulted in OrgX being primarily controlled by six individuals: five Heads of Department and the Dean. However the management is positively structured so that academic personnel (primary activities) hold the most strategic authority.

In order to determine the outreach of the EWG within OrgX it was necessary to establish the structural position of group members, which led to the merger of the VSM and SNA. The SNA diagrams developed within Stage 2 (Section a5.2) were positioned within a basic representation of OrgX's levels of recursion (Figure 5.41); satisfying Objective 3 (Section 2.4). When work-based interactions were placed within the recursive levels it became apparent that communications between OrgX and OrgX(b) were primarily controlled by OrgX's core management committee; Level 1 (Figure 5.41(a)).

This led to the proposal that for the EWG to gain a significant presence within OrgX it would ideally have at least one member within the core management committee; the central authority of OrgX and cutpoint between the organisation and OrgX(b). Initially two members of the EWG sat within this committee which proved to be a vital position for incorporating environmental issues into strategic decision

making processes. One member of the EWG within this committee retired from the organisation as the research project was ending.

The loss of this EWG member was difficult for the group as this person had been the natural leader and coordinator of environmental activities since 2005. However it did present the real-world practicalities of employees moving on from an organisation, and the potential of being replaced by an individual who does not hold the same social values. The combination of the VSM and SNA analyses demonstrated that the environmental network in OrgX was primarily contained within one level of recursion (Figure 5.41(b)), identifying the need to expand the EWG outreach.

To ensure that environmental issues remained a consideration of the organisation regardless of employee flow, the formalisation of the EWG within the management structure was identified as a necessary development within the TS workshop (Section 5.3.3). The formalisation of a self-organised informal social group is not necessarily ideal as it can affect the spirit of members (Section 5.5.3). However the autocratic nature of OrgX (Appendix D.3.3) led EWG members to believe that formal recognition within the official management structure, was the only method to gain additional support.

It is necessary to state that whilst the EWG became a formalised management committee this status only provided the group with official reporting channels; all activities were still voluntary and no budget was provided to the group. A core focus of this research has been the perspective that the promotion of an informal environmental network has better possibilities of effectively designing and implementing an EMS. As discussed previously the implementation of 56

These activities were coordinated by the EWG and implemented by employees who had the necessary resources and operational knowledge to affect change; through informal contact. The position of EWG members within the structure of the organisation provided the some members of the group with the authority to make

changes within their own departments. Inter-department environmental activities were coordinated by the EWG and other employees through informal networking, with employees donating their own time and resources to EWG events.

The VSM and SNA analysis supported the first and third research questions:

Research Question 1: A holistic design of EMS requires social commitment and the establishment of environmental awareness/action as a normative behaviour.

Research Question 3: To manage the complex learning process tools are needed to support individuals and networks leading environmental policy and strategy, alongside current management practices.

By combining the two models it was possible to establish where EWG members were positioned within the traditional management structure. It was shown that whilst the EWG had members within most departments it was clustered within one level of recursion, restricting its communications to colleagues. This analysis allowed the researcher and EWG to tailor their efforts to increase the outreach of the group within the metasystem of each level of recursion; third research question.

This led to the EWG becoming embedded as an official management committee within OrgX that acted as a consultant of environmental issues within the organisation; first research question. The disadvantages of using the VSM were identified as the researcher having to perform the diagnosis rather than employees. The researcher conducted the VSM diagnosis and reported findings to the EWG, who were eager to learn of the research findings but not concerned with the technical aspects of the analysis.

This allowed the group to focus upon developing practical environmental change by targeting specific systems of the organisation based upon a summary of the analysis;

rather than becoming ‘lost’ within the terminology and conceptual background to the VSM. The VSM provided the diagnosis of OrgX’ structure to understand its efficacy, efficiency, effectiveness and adaptability (Jackson, 2003). The VSM diagnosis developed a clear representation of OrgX’s command and communication structure that were used to establish where the EWG should concentrate their efforts for recognition and resource attainment.

VSM-focused interviews were conducted with employees who provided the necessary information to diagnose OrgX, and rich picture interpretations of environmental action within the organisation (Appendix E). The added combination of the VSM with SNA served to establish the outreach of the informal environmental network within OrgX, overcoming the potential weakness of the VSM to ignore the role of social actors within the system.

The use of the VSM within SECS provided a beneficial overview of OrgX’s management structure and reporting channels. For this organisation the diagnosis was most beneficial when combined with the SNA. By placing the EWG into their respective positions in the VSM diagnosis it became evident that the group had formed a strong network within one level of recursion, but had not managed to successfully expand beyond this point. This provided clear direction for the EWG to gain a stronger presence within higher levels of recursion, so as to increase the possibility of resources being allocated to support the group’s activities.

6.1.5 Multimethodology

A multimethodology approach was used to engage the economic, social and environmental aspects of OrgX (Section 3.4); satisfying Objective 2 (Section 2.4). Traditional Environmental Management Systems (EMS) were shown to lack value in social needs and drivers to change (Section 2.2.1). This led to the suggestion that whilst an EMS should easily integrate into the established organisational structure,

the greatest environmental benefit would be sought by engaging with the internal social community.

It was proposed that working with the employee group to develop future strategies would most effectively identify hands-on environmental issues whilst also reducing resistance to change. SNA, Cultural Analysis and cybernetics were combined to address the social, personal and material world problems that govern environmental action. The assessment of the social dimension of OrgX was performed by the combination of SNA and Cultural Analysis, and SNA and VSM diagnosis (Table 3.1).

The SNA and Cultural Analysis provided an understanding of the amount of environmental awareness in OrgX and how this affected the informal networking of the organisation. By combining the two methods it was possible to establish that whilst many employees were aware of environmental issues only a small minority had formed an informal EWG. This provided the initial indication that environmental activities were not a normative behaviour in OrgX but a voluntary social movement.

Whilst the SNA and Cultural Analysis could have identified this by their individual use, the two methods used together formed stronger evidence of research interpretations. In isolation each research method could be subject to a degree of interpretive error, but the combination of the two serves to verify or disprove researcher interpretations of the data. The additional use of the SNA and VSM together provided a highly beneficial understanding of the EWG position within OrgX; as discussed in Section 6.1.4.

This combination led to a greater understanding of how informal networks can affect a business structure. Both the informal networks (SNA) and business operations (VSM) of an organisation have an integral part in the efficiency and viability of the system. The business structure ensures that organisational goals are met and the informal networks hold the capacity for innovative developments.

It is the combination of continued business operation and innovative ideas that allow an organisation to remain competitive within its niche environment. Cultural analyses, SNA, TS and SSM Rich Pictures were used to develop a combined perspective of the environmental actions group's 'personal world' dimension of the multimethodology. The Cultural Analyses and SNA used to analyse the social world provided the baseline interpretations of personal/individual choices of action. The application of these two methods within OrgX initiated a heightened awareness of OrgX's efforts to address environmental issues.

The TS event formed a social consensus of environmental action for OrgX that was formed by the individual beliefs and requirements of the participants. The development of OrgX's future environmental goals in this manner empowered participants, through the understanding that their own opinions had been thoroughly listened to by colleagues and incorporated into a practical change strategy. The TS workshop was quickly followed by VSM-focused interviews that closed with interviewees producing a rich picture of their perception of environmental activities within OrgX.

The combination of the VSM and rich picture modelling within these interviews was designed so as to reduce the need to meet with employees on multiple occasions, and not as an attempt to merge the two forms of analysis. Rich pictures provided a beneficial contribution to the four main research tools (VSM, TS, SNA and cultural analysis), but did not function as a standalone analysis. Some of the rich pictures provided an overview of the business structure and were used to support parts of the VSM diagnosis.

Other rich pictures were more abstract and provided a general indication of the social perceptions of OrgX. The rich pictures also fed into the appreciation of 'material world' issues affecting OrgX from the perceptions of employees e.g. resource limits. The core analysis of the material aspects of OrgX came from the combination of the VSM diagnosis and TS selection of the best strategies for change.

During the TS event it became evident that the ability to implement practical change within OrgX was held primarily by one individual within the academic management committee (Appendix D.3.3).

The VSM interviews contained questions specifically designed to analyse S1 through S5 of the interviewees department, and were used to strengthen the researcher's diagnosis of OrgX. The VSM diagnosis of OrgX identified that the EWG should aim to become embedded within the S3 function of Level 1 (Figure 5.37). Within the TS workshop employees also came to the conclusion that this was the most appropriate position for the EWG. Using these two models separately and reaching the same conclusion provides a united analysis of the organisation by the researcher and employees.

The successful combination of the two models to develop practical environmental developments within OrgX provided positive support for the second research question:

Research Question 2: The design of EMS should be developed with complexity management concepts, to heighten self-awareness and self-regulation, in order to facilitate community learning.

This was the last research question to support with the application of SECS. All four research questions were supported through the action research undertaken within OrgX. Each research question was supported by a combination of research analyses, which indicates that the multimethodology approach was essential for this project. The combination of multiple research tools served to produce sound academic (researcher questions) and real-world (OrgX activities) solutions to voluntary environmental management within a higher education establishment.

The main disadvantage of using the multimethodology approach is the potential that the different conceptual methodologies may not be compatible. The VSM

and TS models were both developed by Stafford Beer and were therefore already suited to one another. Cultural Analysis and SNA both held the same core principle of understanding social behaviour. Like the TS model, rich pictures aim to merge individual perceptions of an organisations activity and purpose into a social consensus.

The models used each provided the combination of cybernetic (structural (VSM and TS)) and soft (human anomalies (cultural analysis, SNA, TS and rich pictures)) approaches to organisational analysis (Torlak, 2001b). Using Zhu (1998) yin and yang metaphor it is suggested that the combination of cybernetic and soft systems analyses are two halves of the same system ; structural (yang) and human (yin) aspects of an organisation.

The chosen research models can be viewed as being on a scale of social through to business value, in the order of: Cultural Analysis, SNA, TS, rich picture modelling and VSM. Much of the collected data from each of these research tools became relevant to the others. There were occasions where the boundary between the different models became 'blurry' and it was impossible to place the data within one model of analysis. The data would have direct connotations to the interpretation of cultural and social analyses, whilst also providing explanations for the results of cybernetic analyses.

The application of a multimethodology approach within OrgX provided the necessary analysis of social, environmental and economic factors affecting the organisation. The research combined Cultural Analysis, SNA, TS and VSM to conduct a thorough analysis of OrgX current behaviour and desired future activities. There were multiple occasions where at least two of the models were used in direct conjunction with one another to satisfy an element of the multimethodology design (Table 3.1). The data gathered from each of the selected research tools aided the analysis of another, demonstrating a high compatibility between the models.

Each of the chosen research tools gathered employee perspectives of OrgX that were then analysed by the researcher. With the application of each research tool the researcher would automatically form theories as to why individual employees and the whole organisation were conducting certain behaviours. However the combination of multiple research tools reduced such interpretations, as employees would provide the necessary explanation of behaviour within a different research tool. Therefore the multimethodology approach provided the necessary tools to engage the social and business aspects of OrgX, whilst also ensuring that the researcher's interpretations followed the data and not personal opinion.

6.2 Recommendations for OrgX

OrgX has managed to implement a great deal of environmental changes to its operational procedures and social engagement strategies (Appendix G). The EWG have been a pivotal driver for change within the organisation and should be highly commended for their achievements. Whilst OrgX has improved its environmental activities it needs to ensure that these activities are sustained and further expanded.

OrgX should identify activities within the environmental audit that scored 0 or 1 (Appendix G.2), and use these as a guide to areas of development. The researcher has included a list of practical recommendations within Appendix 5.8. The remainder of this section provides a general strategy for OrgX to pursue to further improve its environmental activities.

OrgX should attempt to become autonomous from OrgX(b); within all areas of business activity not just environmental procedures. For OrgX to improve its environmental activities it needs to have the capacity to control its choice of suppliers and develop environmental monitoring systems in line with local needs; not those of OrgX(b) which is in a different geographic location. This will also

allow the EWG to develop strategies for OrgX that will suit the specific social and environmental needs of both the internal and external communities.

With regards to the primary activities of the organisation, all academic departments have the potential to 'green' their curricula. OrgX already houses an environmental academic department and has previously offered environmentally-focused courses within other disciplines. Environmental curricula can be integrated into all academic departments (individual lecture sessions to full degrees) to provide students from each discipline with an added understanding of real-world issues. For those departments where an environmental degree is not appropriate, there should be a drive to use online learning resources e.g. electronic module handbooks and lecture presentations.

The organisation needs to coordinate both academic and service departments to reduce the amount of paper waste. There needs to be a combined effort to reduce administrative requirements of paper-based coursework submission, and increase the use of electronic document reading. This can also be coupled with the introduction of paperless meetings as a standard procedure that can then lead to the development of paperless offices. It is essential that service personnel continue to update the EWG of changes to environmental activities onsite, so that they can be communicated to all employees.

The EWG has the capacity to coordinate environmental activities based upon the needs of both support and academic personnel. Whilst the EWG is based upon voluntary employee involvement, members should aim to ensure that all departments are equally represented in the group. The EWG needs to maintain its engagement with employees and students by continuing environmental competitions, with funds raised used to develop wildlife areas onsite. The EWG needs to maintain its official reporting channel to ensure that OrgX's academic management committee and counterparts within OrgX(b) are fully aware of group activities.

Such reports will serve to advertise the EWG's activities to management within OrgX and OrgX(b). The EWG needs to strengthen its marketing activities by making regular updates to the group's website. The group currently provides updates to the organisations internal newsletter, this activity should be replicated within external marketing publications. The EWG should develop stronger networks with local authority environmental services, to coordinate activities that will be most useful for the surrounding ecosystem. The EWG should also assess environmental developments at competitor universities for potential implementation within OrgX.

The primary identify of OrgX is that of a HE establishment within the UK that houses four different academic departments, that provide a range of undergraduate and postgraduate degree courses. OrgX as a whole needs to develop an environmental self-identity where responsibility, accountability and action are normative behaviours within both social and business networks. The EWG should review the organisations environmental action plan annually, to establish how well previous strategies have been implemented and potential opportunities for improvement in the future. The EWG should aim to keep a broad representation of departments within the group to conduct such assessments: facilities (economic), academic and support personnel (social), environmental specialists (environment).

The recommendations for OrgX require the holistic development of environmental activities within the organisation; the above strategy provides suggestions to address Systems 1 through 5 of the VSM diagnosis of OrgX (Figure 5.42). Ultimately it is the EWG that should determine which activities the organisation will pursue next. The EWG may look at the same activities discussed within Appendix 5.8 and come to different solutions than those presented by the researcher. Most importantly, these activities need to continue to be selected, designed and supported by the EWG to complement the normative behaviours of OrgX.

6.3 Statement of Contribution

Research	Contribution
Research Question 1 - That a holistic design of EMS requires social commitment and the establishment of environmental action as a normative behaviour	OrgX employees developed a self-organised employee Environmental Action Group that managed environmental projects onsite, actively securing funds for future developments and continuing to dedicate their own time to environmental issues throughout the project timeframe. OrgX recognition of the group as a formal management committee demonstrated a shift of normative behaviour in the management structure of the organisation

<p>Research Question 2 - That the design of EMS founded in cybernetic principles of management, will heighten self-awareness and self-regulation and this way it will facilitate community learning</p>	<p>The new EMS was designed using SNA to understand the outreach of the employee Environmental Action Group, and the VSM to establish that environmental employees were sufficiently placed within Systems 1, 2, 3, 4 and 5. This led to the informal environmental group developing feedback loops throughout Systems 1 through 5 in OrgX Levels 1 and 2, eventually gaining a more formal communication structure to OrgX(b) Level 0</p>
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<p>Research Question 3 - That the use of proper tools to manage the complexity of the learning process for an EMS implementation will facilitate the transformation and smooth the resistance to change</p>	<p>The merger of the SNA and VSM enabled the identification of areas of activity change that had little resistance, due to their being an active environmental employee already placed with the capacity to start change processes. The Team Syntegrity event allowed the employee Environmental Action Group to establish the practicalities of change within OrgX in regards to the needs and wants of the broader employee group</p>
<p>Research Question 4 - That identifying and fostering natural eco-leaders and informal networks there are better possibilities of breaking through established views and practices</p>	<p>Following the Team Syntegrity event the employee Environmental Action Group were able to implement 56% of the proposed strategies within eight months</p>

Research Aim - To develop a holistic framework for environmental change for businesses that will accommodate employee experiences and strategic preferences within the design process, whilst using cybernetic methodologies to facilitate the organisational change.	Development of SECs a seven stage methodology of organisational engagement to encourage environmental change within both the employee group and business procedures
Obj 1: To develop a holistic framework for environmental change that will be tested in a case study organisation	Development and application of SECs within OrgX
Obj 2: To develop a coherent framework of tools supporting individuals and networks prototyping and leading environmental policy, strategy and practice	Multimethodology application of Cultural Analysis, Social Network Analysis, Rich Pictures, Team Syntegrity and Viable Systems Model to facilitate environmental change
Obj 3: To use informal networking to determine environmental activity variations across the organisation, and use cybernetic methodologies to facilitate the development of environmental action as a normative behaviour	Integration of Social Network Analysis and the Viable Systems Model were used to engage the employee group and instigate bottom-up change

Obj 4: To provide a participatory platform for organisational members to contribute and self-regulate the change process	The self-organised employee Environmental Action Group were viewed as the core drivers to environmental change. The use of Team Syntegrity enabled the employee group to present their suggestions to a broader set of employees and develop a strategy to practically integrate environmental activities
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Table 6.2: Contribution to Knowledge

This research project has produced a framework for environmental change that uses social values and informal networks to alter business activities (e.g. community engagement, proactive environmental planning); as evidenced in the final environmental audit of OrgX (Appendix G). The multimethodology approach that has been designed focuses upon identifying the social environmental values contained within an organisation. The social characteristics of the organisation are then used to guide the implementation of environmental strategies, to increase the potential for any changes to be both acceptable and useful to the employee group.

The conceptual backing and arguments for a multimethodological approach to the SECS framework were provided in Chapters 3 and 4. From a technical assessment each of the models used within the multimethodology design were proven to develop valuable diagnoses of the organisation (Chapter 5). Each of the chosen research models used (Cultural Analysis, SNA, TS, VSM, rich picture modelling), have been shown to provide strength and new analytical perspectives; as discussed in Section 6.1.5.

From an ethical perspective the SECS framework focuses upon economic, social and environmental needs of an organisation; a holistic approach. SECS aims to provide stability between an organisation, social demands and environmental needs, with each perceived to have equal contribution to the overall system's performance; there are no winners or losers, but a trade-off from each, between own ideals and real-world practicalities. With regards to the pragmatic worth of SECS it is felt that the practical environmental developments that were voluntarily adopted by OrgX (Appendix G.2 and G), are proof of the frameworks ability to facilitate change within an organisation.

The research models used within SECS do not provide a preconceived design for environmental activities within the studied organisation. A new EMS design was produced that is intended to provide guidance to an organisation, as to the types of activities it can pursue. This allows an organisation to develop an environmental activity set that matches resource limits and social values. The purpose of SECS is to support the change strategies that emerge from the social environmental priorities of the employee group; developing localised solutions Ostrom (2007).

This increases the efficiency of developed strategies as employees hold the greatest awareness of the practical environmental impacts caused by their work routine. The SECS framework is highly removed from traditional Environmental Management Systems (EMS) that act to dictate a top-down management and reporting structure of generalised environmental activities (Section 2.2.1). SECS supports the informal environmental network and facilitates the equal combination of social, environmental and economic aspects of the organisation.

With regards to the general applicability of SECS the chosen tools for organisational engagement focus upon facilitating the bottom-up design of environmental activities by employees. It is proposed that the research models used to produce this engagement can be applied within any organisation that has both management and

social commitment to environmental change. This also leads to the main drawback of the developed framework.

Four of the five research tools used within the framework focus upon social conceptualisation of current organisational processes, and resultant design of future strategies. If an organisation did not contain an informal environmental network it would be necessary to promote the development of such a network, by analysing the socio-environmental values within the organisation and facilitating discussion forums based upon these values. The clear focus upon social design of environmental strategies could be considered as most suitable for a democratic organisation.

However the case study organisation used within this project was shown to have an autocratic management system (strict control), and the SECS was still able to produce practical business changes within a short time period (Section 5.4). Whilst the SECS framework worked well for OrgX there is no guarantee that other autocratic organisations will have the same positive results. The range of environmental activities adopted by an organisation is dependent upon the values and commitment of social actors to instigate change.

The SECS framework will need to be implemented within different organisations to fully demonstrate its general applicability. Whilst the SECS framework has proven to be a valuable method of organisational engagement and environmental activity developments, its results may not be sustainable. The organisation is subject to social change every year with the new influx of employees and students, that could serve to either strengthen or weaken the EWG activities. This social change cannot be avoided and may affect the scoring of an organisation within the 'Community' section of the new EMS (Appendix G.1). However the integration of permanent operational changes will retain a permanent baseline score, regardless of social flows.

In summary the project began with the identification that environmental issues within UK businesses are primarily a voluntary activity. It was determined

that for an organisation within the UK to adopt an Environmental Management System (EMS), it was necessary to engage with the social values contained within the employee group. This led the research towards an interpretivist study of social normative behaviour and how this can influence an organisation to pursue environmental activities.

An action research project was conducted within a Higher Education establishment that had indicated an interest in monitoring and improving its environmental impact. A multimethodology design was used to combine cybernetic models of organisational diagnosis with cultural analysis and social networking techniques. This combined research tools were structured into a seven stage framework for environmental change: Socio-Environmental Cohesion for Sustainability (SECS). The SECS framework was successfully used to engage the social and business dimensions of a case study organisation to produce a more holistic EMS.

The environmental strategy was developed through a participatory planning event with a broad representation of employees. The studied organisation voluntarily committed to support the informal environmental network and implemented numerous activities that altered internal operations and had a direct benefit to the local wildlife onsite.

With regards to a personal reflection, the researcher found the PhD project equally enjoyable and challenging. The PhD process required a great deal of self-motivation and belief that the developed framework for change could be a valuable contribution to both academia and business. There were times that the organisation designed new environmental strategies that were not necessarily in line with what the researcher felt 'should' be done.

These occasions provided unanticipated social decisions that tested both the framework and the researcher's ability to refrain from interfering with the natural self-organisation of environmental actors and their policy developments. The PhD

process improved the researcher's self-discipline with regards to conducting regular critical self-reflection upon one's own interpretations, strength of analyses and general worth of the developed framework for change. These reflections led to a stronger understanding of the research data and at times identified unexpected links between the different research tools.

Ultimately the researcher is pleased with the project as it produced social and environmental benefits within a real business. These benefits were the core purpose of the research and it is through the application of the researcher's SECS framework that they were achieved.

6.3.1 Summary Statement

This thesis has detailed the development of the SECS framework within a case study organisation. Based upon the principles of systems thinking, organisational viability, bottom-up management and informal networking, the framework was used to develop an environmental management system designed and monitored by voluntary employees. The SECS framework differs from traditional EMS as it produces an holistic strategy for change, with clear focus upon each aspect of the triple bottom line (social, economic and environmental factors). Most importantly the framework produced numerous practical environmental changes within the organisation that suited business needs, employee designs and local biodiversity.

Glossary of Terms

Term	Definition
AC	Awareness of Consequence
Action research	The study of an organisation or social group, where the researcher works in cooperation with community to achieve a specific goal.
Adaptive management	An organizations' ability to learn and improve from past experiences.
AHP	Analytic Hierarchy Process
Allometry	The affect of growth within a subsystem, upon the whole system.
Altruism	Performing actions to better others before oneself.
AN	Awareness of Need
ANP	Analytic Network Process
Anthropocentric	Humans are of prime importance to the Earth.
AP	Awareness of Policy Initiatives
AR	Awareness of Responsibility
ASI	Aggregated Statements of Importance

Term	Definition
Autopoietic	The notion that systems are autonomous and self-creating.
CSI	Composite Statements of Importance
CSR	Corporate Social Responsibility
Cybernetics	The study of communication and procedural activities in a given system.
EC	European Communities
Ecocentric	The natural environment is of prime importance to the Earth.
Ecology	The study of interactions within a natural system.
Environmental/Ecological footprint	The impact of humans and organisation upon the footprint surrounding natural environment.
Environmental management	Human organisation and monitoring of their surrounding habitats, to preserve/maintain the natural state of the ecosystem.
EMAS	Eco-Management Audit Scheme
EMS	Environmental Management System
Environment	Land, ocean and air habitats.
Ethnographic	The study of culture using inductive techniques.
EU	European Union
EWG	Environmental Working Group.
FSI	Final Statements of Importance
GHG	Greenhouse Gas Emissions

Term	Definition
Greenwash	The exaggeration of environmental activities within advertising.
HE	Higher Education
Homeostat	The mechanisms that control positive and negative feedback loops.
Inductive reasoning	The development of generalised statements based upon specific observations.
Interpretivism	Encourages the view of the role human behaviour has upon the research process.
ISO	International Organization for Standardization
ISO 14000	ISO Environmental Management System
Metanorms	A normative behaviour that incurs a punishment for defection or failure to punish a defection.
Multimethodology	The combination of multiple research models.
NAM	Norm Activation Model
NEPIs	New Environmental Policy Instruments
NGO	Non-Governmental Organisations
Normative behaviour	The established rules/behaviours of a society.
Observing participant	The researcher is seen to both observe and be a part of the research process.
OR	Outcome Resolve.

Term	Definition
Organisation	“the central relations which constitute a systems as a whole and which determine its type” Mingers (1991, 320).
OrgX	Case study organisation.
OrgX(b)	Sister company of OrgX.
Phenomenologism	Researchers personal values will be present throughout the research process.
PJ	Problem Jostle.
Pluralism	The ability to combine multiple cultures towards a common goal, without jeopardising traditional belief systems.
PSM	Problem Structuring Methods - Research models that can combine multiple actors, perspectives and system goals into one analysis.
Reductionism	To understand a specific phenomenon it is necessary to reduce it to its component parts.
S1	System One of the VSM - Primary activities.
S2	System Two of the VSM - Support activities.
S3	System Three of the VSM - Internal regulation and centre of cohesion.
S3	System Three Audit Channel of the VSM - Internal audit of S1 activities.

Term	Definition
S4	System Four of the VSM - External monitoring.
S5	System Five of the VSM - Identity.
SECS	Developed Holistic Framework for Environmental Change.
SD	Sustainable Development
SNA	Social Network Analysis - The informal connections of a network.
Social constructionism	The study of social interactions and how they model individual, community and organisational behaviour.
Sociometric choice	An individuals selection of people they would choose to interact with.
SSM	Soft Systems Methodology
Stigmergy	The by-products of activity leave traces within the environment for other agents to follow.
Sustainable development	The processes by which humans actively alter behaviour, to ensure that the natural environment is maintained for future generations.
Symbolic interaction theory	The role of visual information in determining social activities.
Symmorphosis	“The size of the parts must be matched to the overall functional demand” (Weibel, 2000, p.19).

Term	Definition
System	A set of interdependent groups interacting with one another.
Systems thinking	The study of dynamic systems, with the holistic perspective that each component of the system can be maintained in isolation.
TBL	Triple Bottom Line
TS	Team Syntegrity
UK	United Kingdom
VSM	Viable Systems Model

References

- Abu-Ghazze, T. M. (1999). Communicating behavioral research to campus design: Factors affecting the perception and use of outdoor spaces at the university of jordan, *Environment and Behavior* **31**: 764–804.
- Achterbergh, J. and Vriens, D. (2002). Managing viable knowledge, *Systems Research and Behavioral Science* **19**(3): 223–241.
- Ackoff, R. L. (1971). Towards a system of systems concepts, *Management Science* **17**: 661–671.
- Ackoff, R. L. (1999). Discipline, the two cultures, and the scianities, *Systems Research and Behavioral Science* **16**: 533.
- Ackoff, R. L. (2000). *Creating the Corporate Future*, Understanding Business: Environments, Routledge, London, chapter 22, pp. 217–227.
- Agger, B. (1991). Critical theory, poststructuralism, postmodernism: Their sociological relevance, *Annual Review of Sociology* **17**: 105–131.
- Ahmed, P. K. (1998). Culture and climate for innovation, *European Journal of Innovation Management* **1**(1): 30–43.
- Ajzen, I., . F. M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research, *Psychological Bulletin* **84**: 888–918.
- Ako, R., Obokoh, L. and Okonmah, P. (2009). Forging peaceful relationships between oil companies and host-communities in nigeria’s delta region. a stakeholder’s perspective to corporate social responsibility, *Jourbal of*

- Enterprising Communities: People and Places in the Global Economy* **3**(2): 205–216.
- AkzoNobel (2007). Iso certificates, *AkzoNobel Polymer Chemicals*, http://www.akzonobel.com/polymer/system/images/AkzoNobel_Deer_Park_ISO_14001_certificate_tcm96-13895.pdf, accessed 13/01/10.
- Alexander, C. and Smaje, C. (2008). Surplus retail food redistribution: An analysis of a third sector model, *Resources, Conservation and Recycling* **52**: 1290–1298.
- Ali, I., Rehman, U., K., Syed Irshad Ali, S. I., Jamil Yousaf, J. and Zia, M. (2010). Corporate social responsibility influences, employee commitment and organizational performance, *African Journal of Business Management* **4**(12): 2796–2801.
- Alison, P. D. (1992). The cultural evolution of beneficent norms, *Social Forces* **71**(2): 279–301.
- Altbach, P. G. (2004). Globalization and the university: Myths and realities in an unequal world, *Tertiary Education and Management* **10**: 3–25.
- Álvarez, I. G. (2008). Environmental information: Special reference to greenhouse gas emissions in Spain, *Social Responsibility Journal* **4**(3): 378–387.
- Amidon, S. R. (2005). Writing the learning organisation. a framework for teaching and research, *Business Communication Quarterly* **68**(4): 406–428.
- Ammenwerth, E., Iller, C. and Mansmann, U. (2003). Can evaluation studies benefit from triangulation? a case study, *International Journal of Medical Informatics* **70**: 237–248.
- An Inconvenient Truth (2006). Film, Paramount, Davis Guggenheim.
- Anderies, J. M., Janssen, M. A. and Ostrom, E. (2004). A framework to analyse the robustness of social-ecological systems from an institutional perspective, *Ecology and Society* **9**(1).

- Anderies, J. M., Rodriguez, A. A., Janssen, A. A. and Cifaldoz, O. (2007). Panaceas, uncertainty, and the robust control framework in sustainability science, *PNAS* **104**(39): 15194-15199.
- Anger, E. (2002). The history of hayek's theory of cultural evolution, *Studies in History and Philosophy of Biological and Biomedical Sciences* pp. 695–718.
- Anker, P. (2007). Buckminster fuller as captain of spaceship earth, *Minerva* **45**: 417–434.
- Aragón-Correa, J. A. and Rubio-Ópez, E. A. (2007). Proactive corporate environmental strategies: Myths and misunderstandings, *Long Range Planning* **40**: 357–381.
- Aras, G. and Crowther, D. (2007). What level of trust is needed for sustainability?, *Social Responsibility Journal* **3**(3): 60–68.
- Arnoldi, J. (2006). Autopoiesis, *Theory, Culture and Society* **23**: 116–117.
- Arshavsky, Y. (2009). Two functions of early language experiences, *Brain Research Reviews* **XX**: XXX–XXX.
- Ashby, W. R. (1957). *An Introduction to Cybernetics*, Chapman and Hall, London.
- Ashby, W. R. (n.d.). *Rhetoric*, Internet Classics Archive, <http://classics.mit.edu/Aristotle/rhetoric.mb.txt>.
- Axel, R. (2006). Anthropology and the new technologies of communication, *Cultural Anthropology* **21**(3): 354–384.
- Axelrod, R. (1986). An evolutionary approach to norms, *The American Political Science Review* **80**(4): 1095–1111.
- Ayoagi-Usui, M., Vinken, H. and Kuribayashi, A. (2003). Pro-environmental attitudes and behaviours: An international comparison, *Human Ecology Review* **10**(1): 23–31.

- BAB (2010). Iso 14001: Frequently asked questions, *British Assessment Bureau*, <http://www.british-assessment.co.uk/FAQs/list-of-iso-14001-registered-companies.htm>, accessed 14/01/2010.
- Babcock, E. C. (1997). The epa and environmentalism in chicago: Recommendations for a community based approach, *Technical report*, Society for Applied Anthropology/US Environmental Protection Agency.
- Bacon, F. (2006). *The Advancement of Learning*, Dodo Press, www.bookdepository.co.uk.
- Badillo, I., Tejeida, R. and Morales, O. (2008). A viable systems model approach to enterprise resources planning systems, *Proceedings of the 52nd Annual Meeting of the ISSS*.
- Baert, P. (1996). Realist philosophy of the social sciences and economics: A critique, *Cambridge Journal of Economics* **20**: 513–522.
- Bahaj, A. S., Myers, L. and James, P. A. B. (2007). Urban energy generation: Influence of micro-wind turbine output on electricity consumption in buildings, *Energy and Buildings* **39**: 154165.
- Ball, R. (2009). Climate change and sustainable futures, *Systems Practice Action Research* **22**: 139–148.
- Balzarova, M. A. and Castka, P. (2008). Underlying mechanisms in the maintenance of iso 4001 environmental management system, *Journal of Cleaner Production* **16**: 1949–1957.
- Bamberg, S. (2002). Effects of implementation intentions on the actual performance of new environmentally friendly behaviors - results of two field experiments, *Journal of Environmental Psychology* **22**: 399–411.
- Bansal, I. and Srivastava, J. (2008). Creating socially responsible systems for holistic development, *Social Responsibility Journal* **4**(4): 464–473.

- Barlow, C. and Volk, T. (1990). Open systems living in a closed biosphere: A new paradox for the gaia debate, *Biosystems* **23**: 371–384.
- Barnes, J. H. (1984). Cognitive biases and their impact on strategic planning, *Strategic Management Journal* **5**: 129–137.
- Barr, S. (2004). Are we all environmentalists now? rhetoric and reality in environmental action, *Geoforum* **35**: 231–249.
- Barrett, S. (1994). Self-enforcing international environmental agreements, *Oxford Economic Papers* **46**: 878–894.
- Barton, J., Stephens, J. and Haslett, T. (2009). Action research: Its foundations in open systems thinking and relationship to the scientific method, *Systems Practice and Action Research* **22**: 475–488.
- Batagelj, V. and Mrvar, A. (2007). Pajek. program for analysis and visualization of large networks, *Pajek Manual*, Google <http://vlado.fmf.uni-lj.si/pub/networks/pajek/doc/PajekMan.pdf>, accessed 30/06/07.
- Bates, P. (1994). *Strategies for Cultural Change*, Butterworth-Heinemann, Oxford.
- Bateson, G. (1972). Steps to an ecology of mind.
- Bateson, G. (2002). Mind and nature. a necessary unity.
- Bawden, R. (2005). Systemic development at hawkesbury: Some personal lessons from experience, *Systems Research and Behavioural Science* **22**: 151–164.
- BCC (n.d.). Fairtrade, *Bristol City Council*, <http://www.bristol.gov.uk/ccm/content/Environment-Planning/sustainability/fairtrade.en;jsessionid=9CEA75BE4C31DDAE10280EEB3ED4C1DE.tcwwwaplaws3>, accessed 11/01/10.
- Beer, S. (1970a). Managing modern complexity, *Futures* **2**(3): 245–257.
- Beer, S. (1970b). Managing modern complexity, *Futures* **2**(2): 114–122.

- Beer, S. (1974). Forum immanent forms of imminent crisis, *Infor* **12**(3): 318–330.
- Beer, S. (1979). *The Heart of the Enterprise*, John Wiley and Sons, Chichester.
- Beer, S. (1981). *Brain of the Firm*, 2nd edn, John Wiley and Sons, Chichester.
- Beer, S. (1983). The will of the people, *The Journal of the Operational Research Society* **34**(8): 797–810.
- Beer, S. (1984). The viable system model: Its provenance, development, methodology and pathology, *The Journal of the Operational Research Society* **35**(1): 7–25.
- Beer, S. (1989). The viable system model: Its provenance, development, methodology and pathology, *Technical report*, Cwarel Isaf Institute.
- Beer, S. (1994a). *Beyond Dispute: The Invention of Team Syntegrity*, John Wiley and Sons, Chichester.
- Beer, S. (1994b). May the whole earth be happy: Loka samastat sukhino bhavantu, *Interfaces* **24**(4): 83–93.
- Beer, S. (2004). World in torment. a time whose idea must come, *Kybernetes* **33**(3/4): 774–803.
- Berger, P. L. and Luckmann, T. (2002). *The Social Construction of Reality*, Contemporary Sociological Theory, Blackwell, Oxford.
- Berggen, B. and Silver, L. (2009). The effect of bridging networks on entrepreneurial activity. the rational-legal framework and embeddedness in local social capital networks, *Journal of Enterprising Communities: People and Places in the Global Economy* **3**(2): 125–137.
- Berkes, F. (2007). Community-based conservation in a globalized world, *PNAS* **104**(39): 15188–15193.

- Berkes, F. and Davidson-Hunt, I. J. (2007). Communities and social enterprises in the age of globalization, *Journal of Enterprising Communities: People and Places in the Global Economy* **1**(3): 209–221.
- Berkley, G. (2007). *A Treatise Concerning the Principles of Human Knowledge*, Dodo Press, www.bookdepository.co.uk.
- Berliner, M. S. (n.d.). The danger of environmentalism, *Ayn Rand Center*, http://www.aynrand.org/site/News2?page=NewsArticle\&id=8403\&news_iv_ctrl=1021, accessed 02/11/2009.
- Berlotti, E. (2009). Brokerage roles between cliques: a secondary clique analysis, *Methodological Innovations Online* **4**: 53–73.
- Bernard, H. R. (1995). *Research Methods in Anthropology. Qualitative and Quantitative Approaches*, 2nd edn, AltaMira, London.
- Bernard, H. R. (2009). *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, 4th edn, AltaMira, Oxford.
- Bernstein, P. M., Montgomery, W. D. and Tuladhar, S. D. (2006). Potential for reducing carbon emissions from non-annex b countries through changes in technology, *Energy Economics* **28**: 742–762.
- Bhaskar, R. (2005). *The Possibility of Naturalism: A Philosophical Critique of the Contemporary*, Taylor and Francis e-Library.
- Bhattacharyya, S. and Hodler, R. (2010). Natural resources, democracy and corruption, *European Economic Review* **54**: 608–621.
- Bhattacharyya, S. S., Sahay, A., Arora, A. P. and Chaturvedi, A. (2008). A toolkit for designing firm level strategic corporate social responsibility (csr) initiatives, *Social Responsibility Journal* **3**(3): 265–282.
- Billington, R. (1997). *Understanding Eastern Philosophy*, Routledge.
- Birch, D. (2004). Analysis of csr: principles and concepts. ten principles of corporate citizenship, *Social Responsibility Journal* **4**(1/2): 129–135.

- Bird, L., Wüstenhagen, R. and Aabakken, J. (2002). A review of international green power markets: Recent experience, trends, and market drivers, *Renewable and Sustainable Energy Reviews* **6**: 513-536.
- Blackmore, C. (2010). *Managing systemic change: future roles for social learning systems and communities of practice?*, Social Learning Systems and Communities of Practice, Open University, Springer, chapter 12, pp. 201–218.
- Blaikie, N. W. H. (1991). A critique of the use of triangulation in social research, *Quality and Quantity* **25**: 115–136.
- Blake, D. (2001). Contextual effects on environmental attitudes and behavior, *Environment and Behavior* **33**(5): 708–725.
- Blamey, R. (1997). The activation of environmental norms. extending schwartz’s model, *Environment and Behavior* **30**(5): 676–708.
- Blamey, R. (1998). Contingent valuation and the activation of environmental norms, *Ecological Economics* **24**: 47–72.
- Block, M. R. and Marash, I. R. (1999). *Integrating ISO 14001 Into a Quality Management System*, ASQ, Milwaukee.
- BN (2007). The truth about recycling, *Borough news*.
- Bodin, Ö., Crona, B. and Ernstson, H. (2006). Social networks in natural resource management: What is there to learn from a structural perspective?, *Ecology and Society* **11**(2): x.
- Bogatti, S. P. (2006). Identifying sets of key players in a social network, *Computational & Mathematical Organization Theory* **12**: 2134.
- Boisot, M. and Child, J. (1999). Organisations as adaptive systems in complex environments: The case of china, *Organization Science* **10**(3): 237–252.
- Bonabeau, E. (1998a). Social insect colonies as complex adaptive systems, *Ecosystems* **1**: 437–443.

- Bonabeau, E. (1998b). Social insect colonies as complex adaptive systems, *Ecosystems* **1**: 437-443.
- Borch, O. J., Førde, A., Ronning, L., Vestrum, I. K. and Alsos, G. A. (2008). Resource configuration and creative practices of community entrepreneurs, *Journal of Enterprising Communities: People and Places in the Global Economy* **2**(2): 100–123.
- Borrello, M. E. (2005). The rise, fall and resurrection of group selection, *Endeavour* **29**(1): 43–47.
- Börzel, T. A. (2005). *Pace-setting, Foot-dragging and Face-sitting: Member State Responses to Europeanization*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 10, pp. 162–180.
- Bosch, O. J. H., King, C. A., Herbohn, J. L. and Russell, I. W. and Smith, C. S. (2007). Getting the big picture in natural resource management systems thinking as ‘method for scientists, policy makers and other stakeholders’, *Systems Research and Behavioral Science* **24**: 217–232.
- Bossel, H. (2001). Assessing viability and sustainability: a systems-based approach for deriving comprehensive indicator sets, *Ecology and Society* **5**(2): 12.
- Boulding, K. E. (1973). The shadow of the stationary state, *Daedalus* **102**(4): 89–101.
- Boyle, G. (2004). *Renewable Energy. Power for a Sustainable Future*, 2nd edn, Oxford University Press, Oxford.
- Bradley, B. J. (1999). Levels of selection, altruism, and primate behavior, *The Quarterly Review of Biology* **74**(2): 171–194.
- Brand, P. (2007). Green subjection: The politics of neoliberal urban environmental management, *International Journal of Urban and Regional Research* **31**(3): 616–632.

- Brans, J. P. (2002). Or, ethics and decisions: the oath of prometheus, *European Journal of Operational Research* **140**: 191–196.
- Brass, D. J., Butterfield, K. D. and Skaggs, B. C. (1998). Relationships and unethical behavior: A social network perspective, *The Academy of Management Review* **23**(1): 14–31.
- Bratt, C. (1999). The impact of norms and assumed consequences on recycling behavior, *Environment and Behavior* **31**: 630–656.
- Bredemeier, H. C. (1955). The methodology of functionalism, *American Sociological Review* **20**(2): 173–180.
- Bremner, A. and Park, K. (2007). Public attitudes to the management of invasive non-native species in scotland, *Biological Conservation* **139**: 306–314.
- Bringle, R. G. and Hatcher, J. A. (2002). Campus-community partnerships: The terms of engagement, *Journal of Social Issues* **58**(3): 503–516.
- Brothers, K. J., Krantz, P. J. and McClannahan, L. E. (1994). Office paper recycling: A function of container proximity, *Jouranal of Applied Behavior Science* **27**: 153–160.
- Brown, K. W. and Kasser, T. (2005). Are psychological and ecological well-being compatible? the role of values, mindfulness, and lifestyle, *Social Indicators Research* **74**: 349–368.
- Browning, L. and Boudés, T. (2005). The use of narrative to understand and respond to complexity: A comparative analysis of the cynefin and weickian models, *E:CO* **7**(3-4): 32–39.
- Bru, L., Cabrera, S., Capra, C. M. and Gomex, R. (2003). A common pool resource game with sequential decisions and experimental evidence, *Experimental Economics* **6**: 91–114.

- BSI (2004a). Environmental management systems - general guidelines on principles, systems and support techniques, *International Standard 14004:2004*, British Standards Institute.
- BSI (2004b). Environmental management systems - requirements with guidance for use, *International Standard 14001:2004*, British Standards Institute.
- Buck, J. A. and Endenburg, G. (2006). The creative forces of self-organization, Sociocratish Centrum.
- Buckle, S. (2007). Descartes plato and the cave, *Philosophy* **82**(2): 301–337.
- Burns, R. B. and Burns, R. A. (2008). *Business Research Methods and Statistics Using SPSS*, Sage, London.
- Burt, R. S. (1995). *Structural Holes: The Social Structure of Competition*, Harvard, Massachusetts.
- Callicott, J. B. and Mumford, K. (1997). Ecological sustainability as a conservation concept, *Conservation Biology* **11**(1): 32–40.
- Calton, J. M. (2006). Social contracting in a pluralist process of moral sense making: A dialogic twist on the isct, *Journal of Business Ethics* **68**: 329–346.
- Cannibal, G. L. and Winnard, G. M. (2001). Managing the tragedy: an interdisciplinary model for managing the environment as interacting chaotic hierarchy, *Futures* **33**(2): 147–160.
- Cano, C. R., Sams, D. and Schwatz, J. (2008). Is socially responsible behavior good business? an investigation of tomorrows business leaders, *Social Responsibility Journal* **4**(4): 491–503.
- Capra, F. (1976). *The Tao of Physics*, Flamingo, Hammersmith.
- Capra, F. (1983). *The Turning Point*, Flamingo, Hammersmith.
- Capra, F. (1997). *Web of Life*, Flamingo, Hammersmith.

- Capra, F. (2003). *The Hidden Connections*, Flamingo, Hammersmith.
- Carroll, A. B. (1991). The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders, *Business Horizons* **July/August**: 39–48.
- Carson, R. (1962). *Silent Spring*, Penguin, London.
- Castaldo, S., Perrini, F., Misani, N. and Tencati, A. (2009). The missing link between corporate social responsibility and consumer trust: The case of fair trade products, *Journal of Business Ethics* **84**: 1–15.
- Castro, P. and Lima, M. L. (2001). Old and new ideas about the environment and science: An exploratory study, *Environment and Behavior* **33**: 400–423.
- Cavalier-Smith, T. (1980). r-and k-tactics in the evolution of protist developmental systems: Cell and genome size, phenotype diversifying selection and cell cycle patterns, *Biosystems* **12**: 43–59.
- CEC (2006). Communication from the commission to the council and the european parliament - external action - thematic programme for environment and sustainable management of natural resources including energy, *EUROPA*, http://eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0020en01.pdf, accessed 08/01/07.
- CF (2009). Green expectations. consumers understanding of green claims in advertising, *Technical report*, Consumer Focus.
- Chan, K. and Liebowitz, J. (2006). The synergy of social network analysis and knowledge mapping: A case study, *International Journal of Management and Decision Making* **7**(1): 19–35.
- Checkland, P. (1981). *Systems Thinking, Systems Practice*, Wiley, Chichester.
- Checkland, P. (1994). Systems theory and management thinking, *The American Behavioral* **38**(1): 75–91.

- Checkland, P. (2000). Soft systems methodology: a thirty year retrospective, *Systems Research and Behavioral Science* **17**: 11–58.
- Checkland, P. and Holwell, S. (1998). Action research: Its nature and validity, *Systemic Practice and Action Research* **11**(1): 9–21.
- Checkland, P. and Tsouvalis, C. (1997). Reflecting on ssm: The link between root definitions and conceptual models, *Systems Research and Behavioural Science* **14**(3): 153–168.
- Checkland, P. and Winter, M. (2006). Process and content: Two ways of using ssm, *Journal of the Operational Research Society* **57**(12): 1435–1441.
- Chen, Z. and Blaabjerg, F. (2009). Wind farma power source in future power systems, *Renewable and Sustainable Energy Reviews* **13**: 12881300.
- Child, J. and Rodrigues, S. (2004). Repairing the breach of trust in corporate governance, *Corporate Governance: An International Review* **12**(2): 143–152.
- Chilton, J. C., Maidment, G. G., Marriott, D., Francis, A. and Tobias, G. (1999). Case study of a rainwater recovery system in a commercial building with a large roof, *Urban Water* **1**: 345–354.
- Churchman, C. W. (1970). Operations research as a profession, *Management Science* **17**(2).
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment, *Current Directions in Psychological Science* **12**(4): 105–109.
- Cicin-Sain, B. (1996). Earth summit implementation: Progress since rio, *Marine Policy* **20**(2): 123–143.
- CITES (n.d.). Text of the convention, *Convention on International Trade in Endangered Species of Wild Flora and Fauna*, Available <http://www.cites.org/eng/disc/text.shtml>, accessed 19/01/2010.

- CIWEM (2005). Policies. bottled drinking water., *Chartered Institute of Water and Environmental Management*, http://www.ciwem.org/policy/policies/bottled_water.asp, accessed 09/05/10.
- Clarke, J. G. I. (2006). Transcending organisational autism in the un system response to hiv/aids in africa, *Kybernetes* **35**(1/2): 10–24.
- Clayton, S. and Brook, A. (2005). Can psychology help save the world? a model for conservation psychology, *Analysis of Social Issues and Public Policy* **5**(1): 87–102.
- Clemens, R. (2009). Environmental scanning and scenario planning: A 12 month perspective on applying the viable systems model to developing public sector foresight, *Systemic Practice and Action Research* **22**: 249–279.
- Coburn, J. (2003). Bringing local knowledge into environmental decision making improving urban planning for communities at risk, *Journal of Planning Education and Research* **22**: 420–433.
- Cockburn, T. (2007). Emotionally sustainable business and communities of commitment, *Social Responsibility Journal* **3**(4): 61–73.
- Connor, S. (2007). Global warming blamed for increase in hurricanes, *The Independent*.
- Cooter, R., Feldman, M. and Feldman, Y. (2008). The misperception of norms: The psychology of bias and the economics of equilibrium, *Review of Law Economics* **4**(3): 889–911.
- Corbett, J. B. (2005). Altruism, self-interest, and the reasonable person model of environmentally responsible behaviour, *Science Communication* **26**(4): 368–389.
- Corbin, J. and Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria, *Qualitative Sociology* **13**(1): 3–21.
- Cornwell, T. B., Pruitt, S. W. and Clark, J. M. (2005). The relationship between major-league sports' official sponsorship announcements and the stock prices of sponsoring firms, *Journal of the Academy of Marketing Science* **33**(4): 401–412.

- Corraliza, J. A. and Berenguer, J. (2000). Environmental values, beliefs and actions. a situational approach, *Environment and Behaviour* **32**(6): 832–848.
- Cortés-Aldana, F. A., García-Melón, M., Fernández-de Lucio, I., Aragonés-Beltrán, P. and Poveda-Bautista, R. (2009). University objectives and socioeconomic results: A multicriteria measuring of alignment, *European Journal of Operational Research* **199**: 811822.
- Cortese, A. D. (2003). The critical role of higher education in creating a sustainable future, *Planning for Higher Education* **31**(3): 1522.
- Couvillon, M. J., Robinson, E. J. H., Atkinson, B., Child, L., Dent, K. R. and Ratnieks, F. L. W. (2008). En garde: Rapid shifts in honeybee, *apis mellifera*, guarding behaviour are triggered by onslaught of conspecific intruders, *Animal Behaviour* **76**: 1653–1658.
- Crang, M. and Cook, I. (2007). *Doing Ethnographies*, Sage, London.
- Creighton, S. H. (1998). *Greening the Ivory Tower: Improving the Environmental Track Record of Universities, Colleges and Other Institutions*, MIT.
- Creppell, I. (1996). Locke on toleration, *Political Theory* **24**(2): 200–240.
- Crockett, C. (1950). The confusion over nominalism, *The Journal of Philosophy* **47**(25): 752–758.
- Crona, B. and Bodin, Ö. (2006). What you know is who you know? communication patterns among resource users as a prerequisite for co-management, *Ecology and Society* **11**(2).
- Crowther, D. and Martinez, E. O. (2007). No principals, no principles and nothing in reserve: Shell and the failure of agency theory, *Social Responsibility Journal* **3**(4): 4–14.
- Cruz, V. J. and Silva, O. M. (2001). Hydrogeologic framework of pico island, azores, portugal, *Hydrogeology Journal* **9**(2): 177–189.

- Cunliffe, A. L. (2008). Orientations to social constructionism: Relationally responsive social constructionism and its implications for knowledge and learning, *Management Learning* **39**(2): 123–139.
- Curry-Lindahl, K. (1972). *Conservation for Survival. An Ecological Strategy*, Victor Gollancz, London.
- D’Agosto, M. d. A. and Ribeiro, S. K. (2009). Assessing total and renewable energy in brazilian automotive fuels. a life cycle inventory (lci) approach, *Renewable and Sustainable Energy Reviews* **13**: 13261337.
- Dahle, M. and Neumayer, E. (2001). Overcoming campus greening. a survey among higher education institutions in london, ukcip, *International Journal of Sustainability in Higher Education* **2**(2): 139–160.
- Daily, G. C. and Ehrlich, P. (1996). Socioeconomic equity, sustainability, and earth’s carrying capacity, *Ecological Applications* **6**(4): 991–1001.
- DailyMail (2007). Greenhouse effect is a myth, says scientist, *Daily Mail*, <http://www.dailymail.co.uk/sciencetech/article-440049/Greenhouse-effect-myth-say-scientists.html>, accessed 12/01/10.
- DailyMail (2010). Another climate change blunder: First it’s melting glaciers, now natural disaster claim is debunked, *Daily Mail*, <http://www.dailymail.co.uk/sciencetech/article-1245695/UN-climate-change-panel-blunders-wrongly-linking-global-warming-rise-severe-floodings.html>, accessed 25/01/10.
- Daly, E. M. and Haahr, M. (2007). Social network analysis for routing in disconnected delay-tolerant manets, *International Symposium on Mobile Ad Hoc Networking & Computing. Proceedings of the 8th ACM International Symposium on Mobile ad hoc Networking and Computing*, pp. 32 – 40.
- Damro, C. and Mendez, P. (2005). *Emissions Trading at Kyoto: From EU Resistance to Union Innovation*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 14, pp. 253–278.

- Dana, L. P. (2007). A humility-based enterprising community: the amish people in lancaster party, *Journal of Enterprising Communities: People and Places in the Global Economy* **1**(2): 142–154.
- Danley, J. (2002). Balancing risks: Mosquitoes, malaria, morality, and ddt, *Business and Society Review* **107**(1): 145–170.
- Danton, G. H. (1943). Schiller and confucius, *The German Quarterly* **16**(4): 173–182.
- Darby, S. (2006). The effectiveness of feedback on energy consumption. a review for defra of the literature on metering, billing and direct displays, *Technical report*, Environmental Change Institute, University of Oxford.
- Datta, D. K., Guthrie, J. P., Basuil, D. and Pandey, A. (2010). Causes and effects of employee downsizing: A review and synthesis, *Journal of Management* **36**: 281–348.
- Davies, J. (2002). Models of governance - a viable systems perspective, *Australasian Journal of Information Systems* **9**(2): 57–66.
- Davies, L. J. (1989). Designing from ill-defined problems, *International Journal of Information Management* **9**: 199–208.
- Dawkins, R. (1976). *The Selfish Gene*, Oxford University Press, Oxford.
- de Haes, H. A. U., Joliet, O., Finnveden, G., Hauschild, M., W., K. and Müller-Wenk, R. (1999). Best available practice regarding impact categories and category indicators in life cycle impact assessment, *The International Journal of Life Cycle Assessment* **4**(2): 66–74.
- De Lange, R. and Linders, P. (2006). Public affairs as reality construction: An established paradigm with new implications, *Journal of Public Affairs* **6**(2): 131–146.
- de Nooy, W., Mrvar, A. and Batagelj, V. (2005). *Exploratory Social Network Analysis*, Cambridge University Press, Cambridge.

- de Vaus, D. A. (2002). *Surveys in Social Research*, 5th edn, Routledge, Abingdon.
- De Young, R. (1993). Changing behaviour and making it stick. the conceptualization and management of conservation behavior, *Environment and Behavior* **25**(4): 485–505.
- Debeljak, J. and Krkač, K. (2008). “me, myself & i”: Practical egoism, selfishness, self-interest and business ethics, *Social Responsibility Journal* **4**(1/2): 217–227.
- DEFRA (2008). Pitching green green labels and credentials: A guide to the options, *Technical report*, Department for Environment, Food and Rural Affairs.
- DEFRA (2009). Annex 4: Domestic central heating systems, *Technical report*, Department For Environment, Food and Rural Affairs.
- DEFRA (2010a). Draft updated guidance on green claims. how to make a good environmental claim, *Technical report*, Department for Environment, Food and Rural Affairs.
- DEFRA (2010b). Impact assessment of proposed updated guidance on green claims, *Technical report*, Department for Environment, Food and Rural Affairs.
- DeGroot, J. I. M. and Steg, L. (2009). Morality and prosocial behavior: The role of awareness, responsibility, and norms in the norm activation model, *The Journal of Social Psychology* **149**(4): 425–449.
- Deikmann, A. and Preisendörfer, P. (2003). Green and greenback: The behavioral effects of environmental attitudes in low-cost and high-cost situations, *Rationality and Society* **15**: 441–472.
- Delmas, M. A. (2002). The diffusion of environmental management standards in europe and in the united states: An institutional perspective, *Policy Sciences* **35**: 91–119.
- Delmas, M. and Toffel, M. W. (2004). Stakeholders and environmental management practices: An institutional framework, *Business Strategy and the Environment* **13**: 209–222.

- Dereck, J. (2006). Hunting behaviour of lions (*panthera leo*) on elephants (*loxodonta africana*) in the chobe national park, botswana, *African Journal of Ecology* **44**(2): 279.
- Descartes, R. (2003). *The Principles of Philosophy*, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext03/pnp-ph10.txt>.
- Detrain, C. and Deneubourg, J. (2006). Self-organized structures in a superorganism: do ants behave like molecules?, *Physics of Life Reviews* **3**: 162–187.
- Devine, S. (2005). The viable systems model applied to a national system of innovation to inform policy development, *Systemic Practice and Action Research* **18**(5): 491–517.
- Dewey, J. (1916). The pragmatism of peirce, *The Journal of Philosophy, Psychology and Scientific Methods* **13**(26): 709–715.
- Dewey, J. (1935). The future of liberalism, *The Journal of Philosophy* **32**(9): 225–230.
- Dickens, P. (2004). *Society & nature: changing our environment, changing ourselves*, Polity, Cambridge.
- Dietz, T., Ostrom, E. and Stern, P. C. (2003). The struggle to govern the commons, *Science* **302**: 485–505.
- Dobson, P. J. (2001). Longitudinal case research: A critical realist perspective, *Systemic Practice and Action Research* **14**(3): 283–296.
- Dresner, S. (2002). *The Principles of Sustainability*, Earthscan, London.
- Drysdale, J. (1996). How are social-scientific concepts formed? a reconstruction of max weber's theory of concept formation, *Sociological Theory* **14**(1): 71–88.
- D'Souza, C., Taghian, M., Lamb, P. and Peretiatko, R. (2007). Green decisions: Demographics and consumer understanding of environmental labels, *International Journal of Consumer Studies* **31**: 371–376.

- DU (2009). Fairtrade, *Durham University*, <http://www.dur.ac.uk/environment/fairtrade/>, accessed 11/01/10.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised nep scale, *Journal of Social Issues* **56**(3): 425–442.
- Dunnett, N., Nagase, A. and Hallam, A. (2008). The dynamics of planted and colonising species on a green roof over six growing seasons 20012006: Influence of substrate depth, *Urban Ecosyst* **11**: 373384.
- Durkheim, E. (2002). *Moral Education*, David and Charles, Devon.
- Earth Report 2008 (2008). Documentary, National Geographic, Madeline Carter.
- Ebreo, A., Vining, J. and Cristancho, S. (2002-2003). Responsibility for environmental problems and the consequences of waste reduction: A test of the norm-activation model, *Journal of Environmental Systems* **29**(3): 219–244.
- EC (2001a). Guidance on employee participation within the framework of emas, *EUROPA*, http://ec.europa.eu/environment/emas/pdf/guidance/guidance05_en.pdf, accessed 02/03/09.
- EC (2001b). Regulation (ec) no 761/2001 of the european parliament and of the council of 19 march 2001 allowing voluntary participation by organisations in a community eco-management and audit scheme (emas), *Regulation 761/2001*, European Commission.
- EC (2003). Commission recommendation of 10 july 2003 on guidance for the implementation of regulation (ec) no 761/2001 of the european parliament and of the council allowing voluntary participation by organisations in a community eco-management and audit scheme (emas) concerning the selection and use of environmental performance indicators, *Commission Recommendation 2003/532/EC*, European Commission.

- EC (2007a). Environmental policy review, *European Commission*, http://ec.europa.eu/environment/pdf/illust_epr.pdf, accessed 12/01/2008.
- EC (2007b). Measuring progress towards a more sustainable europe. 2007 monitoring report on the eu sustainable development strategy, *European Commission*, http://ec.europa.eu/sustainable/docs/estat_2007_sds_en.pdf, accessed 12/01/2010.
- EC (2008a). Emas factsheet, *European Commission*, http://ec.europa.eu/environment/emas/pdf/factsheet/fs_iso_en.pdf, accessed 13/01/2010.
- EC (2008b). Proposal for a regulation of the european parliament and of the council on the voluntary participation by organisations in a community eco-management and audit scheme (emas), *European Commission*, http://ec.europa.eu/environment/emas/pdf/com_2008_402_draft.pdf, accessed 12/01/2010.
- EC (2009). Who participates in emas?, *European Commission*, http://ec.europa.eu/environment/emas/about/participate/sites_en.htm, accessed 12/01/2010.
- Eckersley, R. (2006). Is modern western culture a health hazard?, *International Journal of Epidemiology* **35**: 252–258.
- Edwards, A. J. (2001). *ISO 14001. Environmental Certification. Step by Step*, Butterworth-Heinemann, Oxford.
- Ehrlich, P. R. (2002). Human natures, nature conservation and environmental ethics, *Bioscience* **52**(1): 31–43.
- Eichenberger, R. and Oberholzer-Gee, F. (1998). Rational moralists: The role of fairness in democratic economic politics, *Public Choice* **94**: 191210.
- Einav, R., Harussi, K. and Perry, D. (2002). The footprint of the desalination processes on the environment, *Desalination* **152**: 141–154.
- Eisenhardt, K. M. (1989). Building theories from case study research, *Academy of Management. The Academy of Management Review* **14**(4): 532–550.

- Elliot, R. and Jankel-Elliot, N. (2003). Using ethnography in strategic consumer research, *Qualitative Market Research: An International Journal* **6**(4): 215–223.
- Elster, J. (1989). Social norms and economic theory, *The Journal of Economic Perspectives* **3**(4): 99–117.
- Engelberg, J. and Boyarsky, L. L. (1979). The noncybernetic nature of ecosystems, *The American Naturalist* **114**(3): 317–324.
- EP (2003). Directive 2002/96/ec of the european parliament and of the council of 27 january 2003 on waste electrical and electronic equipment (weee), *Technical report*, Official Journal of the European Union.
- EP (2009). Regulation (ec) no 66/2010 of the european parliament and of the council of 25 november 2009 on the eu ecolabel, *Technical report*, Official Journal of the European Union.
- Epley, N., Waytz, A. and Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism, *Psychological Review* **114**(4): 864–886.
- EPO (2010). Environment in the eu27. 40% of municipal waste recycled or composted in 2008. half a tonne of waste generated per person, *Technical report*, Eurostat Press Office.
- Erden, z., von Krogh, G. and Nonaka, I. (2008). The quality of tacit group knowledge, *Strategic Information Systems* **17**: 4–18.
- ES (2010). Ethical superstore manifesto, *Ethical Superstore*, <http://www.ethicalsuperstore.com/manifesto/>, accessed 11/01/10.
- Espejo, R. (1999). Aspects of identity, cohesion, citizenship and performance in recursive organisations, *Kybernetes* **28**(6/7): 640–658.
- Espejo, R. (2000). Giving requisite variety to strategic and implementation processes: Theory and practice, *Syncho*, <http://www.syncho.com/pages/pdf/Giving\%20Requisite\%20Variety.pdf>, accessed 21/08/07.

- Espejo, R. (2002). Systems and the information society: Requisite organisations and problem solving, *Technical report*, University of Lincoln.
- Espejo, R. (2003a). *Social Systems and the Embodiment of Organisational Learning*, Complex Systems and Evolutionary Perspectives on Organisations. The Application of Complexity Theory to Organisations, Pergamon, Oxford.
- Espejo, R. (2003b). The viable system model a briefing about organisational structure, *Syncho*, <http://www.syncho.com/pages/pdf/INTRODUCTION\%20TO\%20THE\%20VIABLE\%20SYSTEM\%20MODEL3.pdf>, accessed 21/08/07.
- Espejo, R. (2008). Cyber-syn and the reconstruction of a holistic nature, *Technical report*, Syncho.
- Espejo, R., Bowling, D. and Hoverstadt, P. (1999). The viable system model and the viplan software, *Kybernetes* **28**(6/7): 661–678.
- Espejo, R. and Garcia, O. (1984). A tool for distributed planning, *Orwellian Symposium and International Conference on Systems Research Information and Cybernetics*, Baden-Baden, Germany.
- Espejo, R. and Gill, A. (n.d). The viable system model as a framework for understanding organizations, *Syncho*, <http://www.syncho.com>, accessed 21/08/2007.
- Espejo, R. and Howard, N. (1982). What is requisite variety? a re-examination of the foundation of stafford beer's method, *Technical report*, University of Aston Management Centre.
- Espejo, R. and Stewart, N. D. (1998). Systemic reflections on environmental sustainability, *Systems Research and Behavioural Science* **15**: 483–496.
- Espinosa, A. (2007). A cybernetic re-evaluation of socio-economic development programs, *Kybernetes* **35**(1/2): 30–44.

- Espinosa, A. and Harnden, R. (2007a). Complexity management, democracy and social conscious: Challenges for an evolutionary learning society, *Systemic Practice and Action Research* **20**: 401–412.
- Espinosa, A. and Harnden, R. (2007b). Team synteegrity and democratic group decision making: Theory and practice, *Journal of the Operational Research Society* **58**(8): 1056–1064.
- Espinosa, A., Harnden, R. and Walker, J. (2004). Cybernetics and participation: From theory to practice, *Systemic Practice and Action Research* **17**(6): 573–589.
- Espinosa, A., Harnden, R. and Walker, J. (2007). Beyond hierarchy: a complexity management perspective, *Kybernetes* **36**(3/4): 333–347.
- Espinosa, A., Harnden, R. and Walker, J. (2008). A complexity approach to sustainability - stafford beer revisited, *European Journal of Operational Research* **187**(2): 636–651.
- Espinosa, A. and Mejía, A. (2006). Team synteegrity as a learning process: Some considerations about its capacity to develop critical active learners, 47th Annual Meeting of the International Society for the Systems Science ISSS.
- Espinosa, A. and Umpleby, S. (2005). Reflections on the new agoras project: A report on a fuschl conversation, *Systems Research and Behavioural Science* **24**(1): 15–26.
- Esty, D. C. and Porter, M. E. (2005). National environmental performance: An empirical analysis of policy results and determinants, *Environment and Development Economics* **10**: 391434.
- EU (2003). Commission recommendation, *EUROPA*, http://ec.europa.eu/environment/emas/pdf/guidance/guidance08_en.pdf, accessed 02/03/09.
- EUROPA (2006). Sixth environment action programme. environment 2010: Our future, our choice, *EUROPA*, <http://europa.eu/scadplus/leg/en/lvb/l28027.htm>, accessed 25/09/07.

- EUROPA (2010a). Emas organisations and sites, *EUROPA*, http://ec.europa.eu/environment/emas/pictures/Stats/2010-04_EMAS_Quarterly_Graph.JPG, accessed 04/06/2010.
- EUROPA (2010b). Emas statistics. evolution of organisations and sites, *EUROPA*, http://ec.europa.eu/environment/emas/pictures/Stats/2010-04_EVOLUTION_Graph.JPG, accessed 04/06/2010.
- EUROPA (n.d). Total number of organisations and sites, *EUROPA*, http://www.emas-register.eu/statistic.php?view=all_sites, accessed 30/04/2010.
- Evangelinos, K. I. and Halkos, G. E. (2002). Implementation of environmental management systems standards: Important factors in corporate decision making, *Journal of Environmental Assessment Policy and Management* **4**: 311–328.
- Everett, M. and Borgatti, S. P. (2005). *Extending Centrality*, Models and Methods in Social Network Analysis, Cambridge University, New York, chapter 4, pp. 57–76.
- Express (2009). Climate change is natural: 100 reasons why, *Daily Express*, Available <http://www.dailyexpress.co.uk/posts/view/146138>, accessed 12/01/10.
- Fehr, E., Bernhard, H. and Rockenbach, B. (2008). Egalitarianism in young children, *Nature* **454**: 1079–1083.
- Fent, T., Groeber, P. and Schweitzer, F. (2007). Coexistence of social norms based on in- and out-group interactions, *Advances in Complex Systems* **10**(2): 271–286.
- Ferrin, D. L., Bligh, M. C. and Kohles, J. C. (2008). It takes two to tango: An interdependence analysis of the spiraling of perceived trustworthiness and cooperation in interpersonal and intergroup relationships, *Organizational Behavior and Human Decision Processes* **107**: 161178.
- Fesmire, J. E. and Sass, J. P. (2008). Aerogel insulation applications for liquid hydrogen launch vehicle tanks, *Cryogenics* **48**: 223231.

- FF (2010a). Fairtrade and other faiths, *Fairtrade Foundation*, http://www.fairtrade.org.uk/get_involved/campaigns/fairtrade_places_of_worship/fairtrade_and_other_faiths.aspx, accessed 11/01/10.
- FF (2010b). Fairtrade standards, *Fairtrade Foundation*, http://www.fairtrade.org.uk/what_is_fairtrade/fair-trade_certification_and_the_fairtrade_mark/fair-trade_standards.aspx, accessed 11/01/10.
- Flood, R. and Jackson, M. C. (1991). Total systems intervention: A practical face to critical systems thinking, *Systems Practice* **4**(3): 197–213.
- Flood, R. L. (1999). *Rethinking The fifth Discipline: Learning Within the Unknowable*, Routledge, London.
- Flood, R. L. (2001). *The Relationship of ‘Systems Thinking’ to Action Research*, Handbook of Action Research: Participative Inquiry and Practice, Sage, chapter 12, pp. 133–144.
- Flyvbjerg, B. (1998). Habermas and foucault: Thinkers for civil society, *The British Journal of Sociology* **49**(2): 210–233.
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., Walker, B., Bengtsson, J., Berkes, F., Colding, J., Danell, K., Falkenmark, M., Gordon, L., Kaspersen, R., Kautsky, N., Kinzig, A., Levin, S., Mäler, K., Moberg, F., Ohlsson, L., Olsson, P., Ostrom, E., Reid, W., Rockström, J., Savenije, H. and Svedin, U. (2002). Resilience and sustainable development: Building adaptive capacity in a world of transformations, *Scientific Background Paper on Resilience for the Process of The World Summit on Sustainable Development on Behalf of The Environmental Advisory Council to the Swedish Government*.
- Forrester, J. W. (1971-72). Counterintuitive behavior of social systems, *Technological Forecasting and Social Change* **3**: 1–22.
- Fowler, J. H. and Schreiber, D. (2008). Biology, politics, and the emerging science of human nature, *Science* **322**: 912–914.

- Fox, W. (2003). *Deep Ecology: A New Philosophy of Our Time?*, Environmental Ethics. An Anthology, CQ Blackwell, Oxford.
- Fraser, E. D. G., Andrew J. Dougill, A. J., Mabee, W. E., Reed, M. and McAlpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management, *Journal of Environmental Management* **78**: 114127.
- Frazer, S. J. G. (2003). *The Golden Bough: A Study of Magic and Religion*, 11 edn, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext03/bough11h.htm>.
- Freeman, L. C. (2000). Visualizing social networks, *Journal of Social Structure* **1**(1).
- Freeman, L. C. (2004). *The Development of Social Network Analysis: A Study in the Sociology of Science*, BookSurge.
- FSC (2009). Fsc reflected in scientific and professional literature. literature study on the outcomes and impacts of fsc certification, *Technical report*, Forest Stewardship Council.
- FT (n.d.). International fairtrade towns list, *Fairtrade Towns*, http://spreadsheets.google.com/pub?key=tpVc-rN3plsE_QoaOUpqRjw\&single=true\&gid=0\&output=html, accessed 11/01/10.
- Fuchs, C. (2006). The self-organization of social movements, *Practice and Action Research* **19**: 101–137.
- Fuchs, S. (1989). Second thoughts on emergent interaction orders, *Sociological Theory* **7**(1): 121–123.
- Fuchs, S. and Ward, S. (1994). What is deconstruction, and where and when does it take place? making facts in science, building cases in law, *American Sociological Review* **59**(4): 481–500.

- Fuenmayor, R. (1991a). The self-referential structure of an everyday-living situation: A phenomenological ontology for interpretive systemology, *Systems Practice* **4**(5): 449–472.
- Fuenmayor, R. (1991b). Truth and openness: An epistemology for interpretive systemology, *Systems Practice* **4**(5): 473–490.
- Fuenmayor, R. (2001). The oblivion of churchman’s plea for a systems approach to world problems. i. the inseparability of systems thinking and world issues in the modern epoch, *Systemic Practice and Action Research* **14**(1): 11–28.
- Fuller, B. (1971). *Operating Manual for Spaceship Earth*, Dutton, New York.
- Gardner, M. (1998). *Hempel’s Ravens*, Philosophy and Contemporary Issues, 5th edn, Macmillan, New York.
- Gärling, T., Fujii, S., Gärling, A. and Jakobsson, C. (2003). Moderating effects of social value orientation on determinants of proenvironmental behavior intention, *Journal of Environmental Psychology* **23**: 1–9.
- Gattiker, T. F. and Carter, C. R. (2010). Understanding project champions ability to gain intra-organizational commitment for environmental projects, *Journal of Operations Management* **28**(1): 72–85.
- GE (2005). The news on chocolate is bittersweet: No progress on child labor, but fair trade chocolate is on the rise, *Technical report*, Global Exchange.
- Geisler, W. S. and Diehl, R. L. (2003). A bayesian approach to the evolution of perceptual and cognitive systems, *Cognitive Science* **27**(3): 379–402.
- Gell-Mann, M. (1990). Visions of a sustainable worlds, *Santa Fe Institute* .
- Gharajedaghi, J. and Ackoff, R. L. (1984). Mechanisms, organisms and social systems, *Strategic Management Journal* **5**: 289–300.
- Gibbs, I. (2008a). The univeristy of hull scarborough campus - gas, *Technical report*, UoH.

- Gibbs, I. (2008b). The univeristy of hull scarborough campus - water, *Technical report*, UoH.
- Gibbs, I. (2008c). The university of hull scarborough campus - electricity, *Technical report*, UoH.
- Gibbs, J. P., Marquez, C. and Sterling, E. J. (2008). The role of endangered species reintroduction in ecosystem restoration: Tortoise-cactus interactions on espanola island, galapagos, *Restoration Ecology* **16**(1): 88–93.
- Gibson, D. (2008-2009). Awash in green: A critical perspective on environmental advertising, *Tulane Environmental Law Journal* **22**: 423–440.
- Gibson, M. (2001). The work of envirowise in driving forward uk industrial waste reduction, *Resources, Conservation and Recycling* **32**: 191202.
- Giddens, A. (1976). Classical social theory and the origins of modern sociology, *The American Journal of Sociology* **81**(4): 703–729.
- Giddens, A. (1979). Review: Schutz and parsons: Problems of meaning and subjectivity, *Contemporary Sociology* **8**(5): 682–685.
- Gildenhuys, P. (2003). The evolution of altruism: The sober/wilson model, *Philosophy of Science* **70**(1): 27–48.
- Gillogly, K. A. and Pinsker, E. C. (2000). Networks and fragmentation among community networks environmental groups of southeast chicago, *Technical report*, SfAA Environmental Anthropology Fellows.
- Gintis, H. (2008). Punishment and cooperation, *Science* **319**: 135–1346.
- Gioa, D. A. and Pitre, E. (2000). The paradigm is dead, the paradigm is dead... long live the paradigm: the legacy of burrell and morgan, *Omega* **28**: 249–268.
- Glaser, B. G. and Strauss, A. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Aldine de Gruyter, Hawthorne.

- Golafshani, N. (2003). Understanding reliability and validity in qualitative research, *The Qualitative Report* **8**(4): 597–607.
- Goles, G. and Hirschheim, R. (1990). Multiparadigm perspectives of theory building, *Academy of Management Review* **15**(4): 584–602.
- Gordon, I. J. (2007). Linking land to ocean: Feedbacks in the management of socio-ecological systems in the great barrier reef catchments, *Hydrobiologia* **591**: 25–33.
- Gorham, E. (1998). Acid deposition and its ecological effects: a brief history of research, *Environmental Science and Policy* **1**: 153–166.
- Grange, J. (1996). The disappearance of the public good: Confucius, dewey, rorty, *Philosophy East and West* **46**(3): 351–366.
- Granger, C. W. J. (1980). Testing for causality. a personal viewpoint, *Journal of Economic Dynamics and Control* **2**: 329–352.
- Granovetter, M. (1978). Threshold models of collective behaviour, *American Journal of Sociology* **83**(6): 1420–1443.
- Granovetter, M. (1983). The strength of weak ties: A network theory revisited, *Sociological Theory* **1**: 201–233.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness, *American Journal of Sociology* **91**(3): 481–510.
- Granovetter, M. (2005). The impact of social structure on economic outcomes, *Journal of Economic Perspectives* **19**(1): 33–50.
- Gregor, S. (2006). The nature of theory in information systems, *MIS Quarterly* **30**: 611–642.
- Gregory, A. J. and Jackson, M. C. (1992). Evaluating organisations: A systems and contingency approach, *Systems Practice* **5**(1): 37–60.
- Gregory, R., Lichtenstein, S. and Slovic, P. (1993). Valuing environmental resources: A constructive approach, *Journal of Risk and Uncertainty* **7**: 177–197.

- Groff, R. (2000). The truth of the matter: Roy bhaskar's critical realism and the concept of alethic truth, *Philosophy of the Social Sciences* **30**: 407–435.
- Grosjean, M., Nunez, L., Cartajena, I. and Messerli, B. (1997). Mid-holocene climate and culture change in the atacama desert, northern chile, *Quaternary Research* **48**: 239–246.
- Gross, N. (1997). Durkheim's pragmatism lectures: A contextual interpretation, *Sociological Theory* **15**(2): 126–149.
- Guibentif, P. (1996). *Approaching the Production of Law through Harbermas's Concept of Communicative Action*, Harbermas, Modernity and Law, Sage, Bohill Street.
- Guo, Z. and Sheffield, J. (2008). A paradigmatic and methodological examination of knowledge management research: 2000-2004, *Decision Support Systems* **44**: 673–688.
- Gutrich, J. J., VanGelder, E. and Loope, L. (2006). Potential economic impact of introduction and spread of the red imported fire ant, *solenopsis invicta*, in hawaii, *Environmental Science and Policy* **10**: 685–696.
- Habermas, J. (1976). Some distinctions in universal pragmatics: A working paper, *Theory and Society* **3**(2): 155–167.
- Habermas, J. (1991). *The Structural Transformation of the Public Sphere: an Inquiry into a Category of Bourgeois Society*, MIT Press.
- Habermas, J. and Rehg, W. (2001). Constitutional democracy: A paradoxical union of contradictory principles?, *Political Theory* **29**(6): 766–781.
- Haggerty, K. D. (2004). Ethics creep: Governing social science research in the name of ethics, *Qualitative Sociology* **27**(4): 391–414.
- Haigh, M. (2006). Social investment: Subjectivism, sublation and the moral elevation of success, *Critical Perspectives on Accounting* **17**(8): 989–1005.

- Hamilton, C. (2002). Dualism and sustainability, *Ecological Economics* **42**: 89–99.
- Hammer, M., Holmlund, C. M. and Almlov, M. A. (2003). Social-ecological feedback links for ecosystem management: A case study of fisheries in the central baltic sea archipelago, *Ocean and Coastal Management* **46**: 527–545.
- Hammersley, M. and Atkinson, P. (1995). *Ethnography. Principles in Practice*, second edn, Routledge, London.
- Handfield, R., Walton, S. V., Sroufe, R. and Melynk, S. A. (2002). Applying environmental criteria to supplier assessment: A study in the application of the analytical hierarchy process, *European Journal of Operational Research* **141**: 7087.
- Hannoura, A. P., Cothren, G. M. and Khairy, W. M. (2006). The development of a sustainable development model framework, *Energy* **31**(13): 2269–2275.
- Hardin, G. (1968). The tragedy of the commons, *Science* **162**: 1243–1248.
- Hare, B., Melis, M. P., Woods, V., Hastings, S. and Wrangham, R. (2007). Tolerance allows bonobos to outperform chimpanzees in cooperative task, *Current Biology* **17**(7): 619–623.
- Hares, A., Dickinson, J. and Wilkes, K. (2010). Climate change and the air travel decisions of uk tourists, *Journal of Transport Geography* **18**: 466–473.
- Harnden, R. J. (1990). The languaging of models:the understanding and communication of models with particular reference to stafford beer’s cybernetic model of organization structure, *Systems Practice* **3**(3): 289–302.
- Harrison, J. (2007). Significant international environmental law cases, *Journal of Environmental Law* **19**(3): 409–417.
- Hartley, T. W. (2003). *Environmental Justice: An Environmental Civil Rights Value Acceptable to All World Views*, Environmental Ethics. An Anthology, Blackwell, Oxford.

- Hauser, C., Tappeiner, G. and Walde, J. (2007). The learning region: The impact of social capital and weak ties on innovation, *Regional Studies* **41**(1): 75–88.
- Hayles, N. K. (1995). Making the cut: The interplay of narrative and system, or what systems theory can't see, *Cultural Critique* **30**(1): 71–100.
- Haythornthwaite, C. (1996). Social network analysis: An approach and technique for the study of information exchange, *Library and Information Science Research* **18**(4): 323–342.
- HCC (2009). Hcc is a fairtrade church, *Huntingdonshire Community Church*, http://www.hccuk.org/Articles/145148/Huntingdonshire_Community_Church/News_Reviews/HCC_a.Fairtrade.aspx, accessed 11/01/10.
- Helmfrid, H., Haden, A. and Ljung, M. (2008). The role of action research (ar) in environmental research: Learning from a local organic food and farming research project, *Systems Practice and Action Research* **21**: 105–131.
- Henriques, I. and Sadorsky, P. (1999). The relationship between environmental commitment and managerial perceptions of stakeholder importance, *The Academy of Management Journal* **42**(1): 87–99.
- Heron, J. (1996). *Co-Operative Inquiry. Research Into the Human Condition*, Sage.
- Heron, J. and Reason, P. (1997). A participatory inquiry paradigm, *Qualitative Inquiry* **3**(3): 274–294.
- Herremans, I. and Allwright, D. E. (2001). Environmental management systems at north american universities: What drives good performance?, *International Journal of Sustainability in Higher Education* **1**(2): 168 – 181.
- Heslin, P. A. and Ochoa, J. D. (2008). Understanding and developing strategic corporate social responsibility, *Organizational Dynamics* **37**(2): 125–144.
- Hess, C. and Olstrom, E. (2003). Ideas, artifacts and facilities: Information as a common-pool resource, *Law and Contemporary Problems* **66**: 111–145.

- Heylighen, F. and Joslyn, C. (2001). *Cybernetics and Second-Order Cybernetics*, Vol. 4 of *Encyclopedia of Physical Science and Technology*, 3rd edn, Academic Press, New York, pp. 155–170.
- Hezri, A. A. and Dovers, S. D. (2006). Sustainability indicators, policy and governance: Issues for ecological economics, *Ecological Economics* **60**: 86–99.
- Hildebrand, P. M. (2005). *The European Community's Environmental Policy, 1957 to '1992': From Incidental Measures to an International Regime?*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 2, pp. 19–43.
- Hill, L. E. (1999). Some random thoughts concerning the symbiotic relationship between social and institutional economics, *International Journal of Social Economics* **26**: 811–818.
- Hirzel, A. H., Posse, B., Oggier, P., Crettenand, Y., Glenz, C. and Arlettaz, R. (2004). Ecological requirements of reintroduced species and the implications for release policy: The case of the bearded vulture, *Journal of Applied Ecology* **41**: 1103–1116.
- Hobbes, T. (2002). *Leviathan*, Project Gutenberg EBook, <http://www.gutenberg.org/files/3207/3207.txt>.
- Hockerts, K. and Wüstenhagen, R. (2009). Greening goliaths versus emerging dauids - theorizing about the role of incumbents and new entrants in sustainable entrepreneurship, *Journal of Business Venturing* **Article in Press**.
- Hoebecke, L. (2006). Identity: The paradoxical nature of organisational closure, *Kybernetes* **35**(1/2): 65–75.
- Hoffman, C. (2007). Corporate social responsibility in the 1920s: an institutional perspective, *Journal of Management History* **13**(1): 55–73.
- Holland, J. H. and Miller, J. H. (1991). Artificial adaptive agents in economic theory, *Sant* pp. 365–370.

- Holmberg, S. C. (1997). Team syntegrity assessment, *Systems Practice* **10**(3): 241–254.
- Holt, D. (2003). The role and impact of the business school curriculum in shaping environmental education at middlesex university, *International Journal of Sustainability in Higher Education* **4**(4): 324–343.
- Holwell, S. (2000). Soft systems methodology: Other voices, *Systemic Practice and Action Research* **13**(6): 773–797.
- Hopper, J. R. and McCarl Nielson, J. (1991). Recycling as altruistic behaviour. normative and behavioural strategies to expand participation in a community recycling proram, *Environ* **23**(2): 195–220.
- Hotta, S. and Funamizu, N. (2009). Simulation of accumulated mmatter from human feces in the sawdust matrix of the composting toilet, *Bioresource Technology* **10**: 13101314.
- Houston, S. (2006). The nature of theory in information systems, *MIS Quarterly* **30**: 611–642.
- Hoverstadt, P. (2010). *The Viable Systems Model*, Systems Approaches to Managing Change: A Practical Guide, Springer, London, chapter 3, pp. 87–134.
- Hoverstadt, P. and Bowling, D. (2005). Organisational viability as a factor in sustainable development of technology, *International Journal of Technology Management and Sustainable Development* **4**: 131146.
- How Green is Your High Street? (2007). Documentary, BBC, Elliot Choueka.
- Howlett, M. and Ramesh, M. (2003). *Studying Public Policy. Policy cycles and Policy Subsystems*, 2nd edn, Oxford University Press, Oxford.
- HSBC (2010). Our support for uk enterprise, *HSBC*, <http://www.hsbc.co.uk/1/2/business/enterprise/diversity;jsessionid=0000fnAwlLYJDAYcqyJkY90qG4R:14etg662g>, accessed 11/01/10.

- HSC (2000). *Legionnaires' Disease. The Control of Legionella Bacteria in Water Systems. Approved Code of Practice and Guidance.*, 8th edn, HSE books.
- HSE (2003). *Legionnaires' Disease. Essential Information for Providers of Residential Accommodation.*, HSE books.
- HSE (2006). *Fire Safety Risk Assessment: Educational Premises*, HSE books.
- Hughes, C. (1997). Same-kind coincidence and the ship of theseus, *Mind* **106**(421): 53–67.
- Hughes, J. and Sharrock, W. (1997). *The Philosophy of Social Research*, 3rd edn, Addison Wesley, Harlow.
- Hughes, K. A. and Convey, P. (2010). The protection of antarctic terrestrial ecosystems from inter- and intra-continental transfer of non-indigenous species by human activities: A review of current systems and practices, *Global Environmental Change* **20**: 96–112.
- Hulme, M., Barrow, E. M., Arnell, N. W., Harrison, P. A., Johns, T. C. and Downing, T. E. (1999). Relative impacts of human-induced climate change and natural climate variability, *Nature* **397**: 688–691.
- Human Footprint (2007). Documentary, Touch Productions, Nick Watts.
- Hume, D. (1896). *A Treatise of Human Nature*, Clarendon Press, Oxford.
- Hume, D. (2006). *An Enquiry Concerning Human Understanding*, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext06/7echu10.txt>.
- Hunt, T. L. (2007). Rethinking easter island's ecological catastrophe, *Journal of Archaeological Science* **34**(3): 485–502.
- Hutchings, J. and Casaar, M. (2006). A soft system framework for the conservation management of material cultural heritage, *Systems Practice and Action Research* **19**: 201216.

- IBM (2009). Ibm's global iso 14001 certificate and appendix, *International Business Machines Corporation*, http://www.ibm.com/ibm/environment/iso14001/IBMGlobalCert_Oct2009.pdf, accessed 13/01/10.
- IEMA (2009). Environmental management systems, *Institute for Environmental Management Assessment*, http://www.iema.net/readingroom/all_documents?aid=283, accessed 29/01/2010.
- IISS (1997). Politics of climate change: the kyoto summit. another divisive global issue, *Strategic Comments* **3**(9).
- INCPEN (n.d.a). Excessive packaging, *The Industry Council for Packaging and the Environment*, http://www.incpen.org/test_page.asp?page=70, accessed 10/05/2010.
- INCPEN (n.d.b). Legislation - packaging and environment, *The Industry Council for Packaging and the Environment*, http://www.incpen.org/test_page.asp?page=71, accessed 10/05/2010.
- INCPEN (n.d.c). Producer responsibility, *The Industry Council for Packaging and the Environment*, <http://www.incpen.org/page.asp?page=75>, accessed 10/05/2010.
- Independent (2008). The green league table: How environmentally friendly is your university?, *The Independent*, <http://www.independent.co.uk/news/education/higher/the-green-league-table-how-environmentally-friendly-is-your-university-863534.html>, accessed 20/08/2008.
- IPPC (2005). Carbon dioxide capture and storage, *Technical report*, Working Group III of the Intergovernmental Panel on Climate Change.
- IPPC (2007). Climate change 2007: The physical science basis, *Technical report*. [Online], *Sky News 'Humans are to Blame'*, Intergovernmental Panel on Climate Change http://www1.sky.com/news/IPCC_Climate_Report.pdf, accessed 03/02/07.

- Iraldo, F., Testa, F. and Frey, M. (2009). Is an environmental management system able to influence environmental and competitive performance? the case of the eco-management and audit scheme (emas) in the european union, *Journal of Cleaner Production* **17**: 1444-1452.
- Ishihara, H. and Pascual, U. (2009). Social capital in community level environmental governance: A critique, *Ecological Economics* **68**: 1549-1562.
- ISO (2002a). Benefits of the iso 14000 family of international standards, *Technical report*, International Organization for Standardization. [Online], *The ISO 14000 Family of International Standards*, International Organization for Standardization <http://www.iso.org/iso/en/prods-services/otherpubs/iso14000/benefits.pdf>, accessed 04/07/07.
- ISO (2002b). Business benefits of iso 14001, *Technical report*, International Organization for Standardization. [Online], *The ISO 14000 Family of International Standards*, International Organization for Standardization <http://www.iso.org/iso/en/prods-services/otherpubs/iso14000/businessbenefits.pdf>, accessed 04/07/07.
- ISO (2002c). The iso 14000 model, *Technical report*, International Organisation for Standardization. [Online], *The ISO 14000 Family of International Standards*, International Organization for Standardization <http://www.iso.org/iso/en/prods-services/otherpubs/iso14000/model.pdf>, accessed 04/07/07.
- ISO (2007). A decade of iso 14001, *International Organization for Standardization*, http://www.iso.org/iso/14001_decade_ims3_07.pdf, accessed 13/01/2010.
- Jaakkola, J. J. K., Heinonen, O. P. and Seppänen, O. (1989). Sick building syndrome, sensation of dryness and thermal comfort in relation to room temperature in an office building: Need for individual control of temperature, *Environmental International* **15**: 163–168.
- Jack, S. L. (2005). The role, use and activation of strong and weak network ties: A qualitative analysis, *Journal of Management Studies* **42**(6): 1233–1259.

- Jackson, M. C. (1991). *Systems Methodology for the Management Sciences*, Plenum Press, London.
- Jackson, M. C. (2000). *Systems Approaches to Management*, Kluwer Academic and Plenum, London.
- Jackson, M. C. (2003). *Systems Thinking: Creative Holism for Managers*, John Wiley and Sons, Chichester.
- Jackson, T. and Marks, N. (1999). Consumption, sustainable welfare and human needs - with reference to uk expenditure patterns between 1954 and 1994, *Ecological Economics* **28**: 421–441.
- Jacobs, B. (2004). Using soft systems methodology for performance improvement and organisational change in the english national health service, *Journal of Contingencies and Crisis Management* **12**(4): 138–149.
- Jacobson, S. K., McDuff, M. D. and Monroe, M. C. (2007). Promoting conservation through the arts: Outreach for hearts and minds, *Conservation Biology* **21**(1): 7–10.
- James, W. (1905). The essence of humanism, *The Journal of Philosophy, Psychology and Scientific Methods* **2**(5): 113–118.
- James, W. (2004). *Pragmatism. A New Name for Some Old Ways of Thinking*, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext04/prgmt10.txt>.
- Janoo, A. (2005). Discovery of isolated dodo bones [raphus cucullatus (l.), aves, columbiformes] from mauritius cave shelters highlights human predation, with a comment on the status of the family raphidaewetmore, 1930, *Annales de Palontologie* **91**: 167–180.
- Janssen, M. A. and Anderies, J. M. (2007). Robustness trade-offs in social-ecological systems, *International Journal of Commons* **1**(1): 43–65.
- Jerrell, T. D. (1997). A history of legally required employee benefits: 1900-1950, *Journal of Management History* **3**(2): 193.

- Jo, S. and Shim, S. W. (2005). Paradigm shift of employee communication: The effect of management communication on trusting relationships, *Public Relations Review* **31**: 277-280.
- Johannisson, B. (2007). Enacting local economic development - theoretical and methodological challenges, *Journal of Enterprising Communities: People and Places in the Global Economy* **1**: 7-26.
- Johnson, A. W. (1978). *Research Methods in Social Anthropology*, Edward Arnold, London.
- Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm?, *Educational Technology Research and Development* **39**(3): 5-14.
- Jones, A., Seville, D. and Meadows, D. (2002). Resource sustainability in commodity systems: the sawmill industry in the northern forest, *Systems Dynamics Review* **18**(2): 171-204.
- JoPPSM (1911). Continental critics of pragmatism, *The Journal of Philosophy, Psychology and Scientific Methods* **8**(9): 225-232.
- Jordan, A., Wurzel, R., Zito, A. R. and Bruckner, L. (2005). *European Governance and the Transfer of 'New' Environmental Policy Instruments (NEPIs) in the European Union*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 17, pp. 317-335.
- JS (2010). Our social impact, *Sainsburys*, <http://www.jsainsbury.co.uk/cr/index.asp?pageid=49>, accessed 11/01/2010.
- Jurado, C. G. and Falkenberg, K. (2010). Expression of willingness to be associated with the copenhagen accord and submission of the quantified economy-wide emissions reduction targets by 2020, *UNFCCC*, <http://unfccc.int/files/meetings/application/pdf/europeanunioncphaccord.app1.pdf>, accessed 21/04/10.

- Kadushin, C. (2005). Who benefits from network analysis: Ethics of social network research, *Social Networks* **27**: 139–153.
- Kagan, R. A., Gunningham, N. and Thornton, D. (2003). Explaining corporate environmental performance: How does regulation matter?, *Law and Society Review* **37**(1): 51–90.
- Kaihla, P. (2007). The village could save the planet, *Business 2.0* **8**(9): 84–90.
- Kandori, M. (1992). Social norms and community enforcement, *The Review of Economic Studies* **59**(1): 63–80.
- Kangas, A., Laukkanen, S. and Kangas, J. (2006). Social choice theory and its applications in sustainable forest management - a review, *Forest Policy and Economics* **9**(1): 77–92.
- Kant, E. (2003). *The Critique of Pure Reason*, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext03/cprn10.txt>.
- Kant, E. (2005). *Fundamental Principles of the Metaphysics of Morals*, Dodo Press EBook, www.bookdepository.co.uk.
- Kärnä, J., Hansen, E. and Juslin, H. (2003). Social responsibility in environmental marketing planning, *European Journal of Marketing* **37**: 848–871.
- Katz, E. (2003). *The Big Lie: Human Restoration of Nature*, Environmental Ethics. An Anthology, CQ Blackwell, Oxford.
- Kauffman, S. A. (n.d.). The sciences of complexity and "origins of order".
- Kawalek, P. and Wastell, D. G. (2002). *A Case Study Evaluation of the use of the Viable Systems Model in Information Systems Development*, Information Systems Evaluation Management, IRM, London, chapter 2, pp. 17–34.
- Kay, R., Alder, J., Brown, D. and Houghton, P. (2003). Management cybernetics: a new institutional framework for coastal management, *Coast Management* **31**: 213–227.

- Kelley, H. J. (1969). Entropy of knowledge, *Philosophy of Science* **36**(2): 178–196.
- Kelly, K. L. (1998). A systems approach to identifying decisive information for sustainable development, *European Journal of Operational Research* **109**: 452–464.
- Kennet, D. A. (1980). Altruism and economic behavior, i: Developments in the theory of public and private redistribution, *American Journal of Economics and Sociology* **39**(2): 183–198.
- Keohane, N. O. (1977). The radical humanism of etienne de la boetie, *Journal of the History of Ideas* **38**(1): 119–130.
- Kerr, N. L., Rumble, A. C., Park, E. S., Ouwerkerk, J. W., Parks, C. D., Gallucci, M. and van Lange, P. A. M. (2009). “how many bad apples does it take to spoil the whole barrel?”: Social exclusion and toleration for bad apples, *Journal of Experimental Social Psychology* **XX**: XXX–XXX.
- Kilbourne, W. and Pickett, G. (2008). How materialism affects environmental beliefs, concern, and environmentally responsible behaviour, *Journal of Business Research* **61**(2): 885–893.
- Kim, H. K. (2008). Locke and the mind-body problem: Interpretation of his agnosticism, *Philosophy* **83**: 439–458.
- Kirchner, J. W. (2002). The gaia hypothesis : Fact, theory, and wishful thinking, *Climate Change* **52**: 391–408.
- Kirk, J. and Miller, M. L. (1986). *Reliability and Validity in Qualitative Research*, Sage.
- Kitcher, P. (1993). The evolution of human altruism, *The Journal of Philosophy* **90**(10): 497–516.
- Knowles, K. (2010). *An Holistic Framework for Environmental Change to Enhance Organisational Sustainability*, Business and Organisational Survival

- and Sustainability. Paper from the Northern Leadership Academy Fellows 2009 Conference, Leeds University, Leeds, chapter 3, pp. 31–54.
- Knowles, K. and Espinosa, A. (2009). Towards an holistic framework for environmental change: The role of normative behaviour and informal networking to enhance sustainable business practices, *Systems Practice and Action Research* **22**: 275–291.
- Kollmuss, A. and Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior?, *Environmental Education Research* **8**(3): 239–260.
- Koopmans, R. and Rebers, S. (2009). Collective action in culturally similar and dissimilar groups: An experiment on parochialism, conditional cooperation, and their linkages, *Evolution and Human Behaviour* **XX**: XXX–XXX.
- Kortenkamp, K. V. and Moore, C. F. (2000). Ecocentrism and anthropocentrism: Moral reasoning about ecological commons dilemmas, *Journal of Environmental Psychology* **21**.
- Krosnick, J. A. (1999). Survey research, *Annual Review of Psychology* **50**: 537–567.
- Kutsukake, N. and Hasegawa, T. (2005). Dominance turnover between an alpha and a beta male and dynamics of social relationships in japanese macaques, *International Journal of Primatology* **26**(4): 775–800.
- la Cour, A. (2006). The concept of environment in systems theory, *Cybernetics and Human Knowing* **13**(2): 41–55.
- Laan, B. v. d. and Nentjes, A. (2001). Competitive distortions in eu environmental legislation: Inefficiency versus inequity, *European Journal of Law and Economics* **11**(2): 131–152.
- Lafleur, L. J. (1941). Epistemological functionalism, *The Philosophical Review* **50**(5): 471–482.

- Lamont, C. (1998). *Freedom of Choice and Human Responsibility*, Philosophy and Contemporary Issues, 5th edn, Macmillan, New York.
- Lancet (2009). Managing the health effects of climate change, *Technical report*, The Lancet Commissions.
- Lane, D. C. and Oliva, R. (1998). The greater whole: Towards a synthesis of system dynamics and soft systems methodology, *European Journal of Operational Research* **107**: 214–235.
- Lapenis, A. G. (2002). Directed evolution of the biosphere: Biogeochemical selection or gaia?, *The Professional Geographer* **53**(3): 379–391.
- Laszlo, A., Laszlo, K. C. and Dunsky, H. (2009). Redefining success: Designing systemic sustainable strategies, *Systems Research and Behavioral Science*.
- Laszlo, E. (1971). Systems and structures toward bio-social anthropology, *Theory and Decision* **2**(2): 174–192.
- Laszlo, K. C. (2001). The evolution of business: Learning, innovation and sustainability in the 21st century, *45th Annual Conference of The International Society for the Systems Sciences (ISSS)*.
- Laufer, W. S. (2003). Social accountability and corporate greenwashing, *Journal of Business Ethics* **43**: 253–261.
- le Galliard, J.-F., Ferrière, R. and Dieckmann, U. (2003). The adaptive dynamics of altruism in spatially heterogeneous populations, *Evolution* **57**(1): 1–17.
- Le Treut, H., Somerville, R., Cubasch, U., Ding, Y., Mauritzen, C., Mokssit, A., T., P. and Prather, M. (2007). Historical overview of climate change, in S. Solomon, D. Q. M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University.

- Lebra, T. S. (1975). An alternative approach to reciprocity, *American Anthropologist* **77**(3): 550–565.
- Lee, D. R. (2005a). Agricultural sustainability and technology adoption: Issues and policies for developing countries, *American Journal of Agricultural Economics* **87**: 1325–1334.
- Lee, K. N. (2005b). *Appraising Adaptive Management*, Debating the Earth. The Environmental Politics Reader, 2 edn, Oxford University, Oxford, chapter 8, pp. 104–115.
- Lenton, T. M. (1998). Gaia and natural selection, *Nature* **394**: 439–447.
- Lenton, T. M. and Lovelock, J. E. (2001). Daisyworld revisited: Quantifying biological effects on planetary self-regulation, *Tellus* **53B**: 288–305.
- Lenton, T. M. and van Oijen, M. (2002). Gaia as a complex adaptive system, *Philosophical Transactions of the Royal Society London* **357**: 683–695.
- Leonard, A. (1992). Making alphabet soup: Blending vsm, sts and tqm, *Kybernetes* **21**(4): 33–42.
- Leonard, A. (1996). Team syntegrity: A new methodology for group work, *European Management Journal* **14**(4): 407–413.
- Leonard, A. (2000). The viable system model and knowledge management, *Kybernetes* **29**(5/6): 710–715.
- Leonard, A. (2004). Coming concepts: The cybernetic glossary for new management, *Technical report*, Australian National University, http://i2s.anu.edu.au/sites/default/files/unified-systems/cybernetic_glossary.pdf.
- Leonard, A. (2008). Integrating sustainability practices using the viable system model, *Systems Research and Behavioral Science* **25**: 643–654.
- Leonard, A. (n.d.a). To change ourselves: a personal vsm application, *Allenna Leonard*, <http://www.allennaleonard.com/PersVSM.html>, accessed 16/04/09.

- Leonard, A. (n.d.b). Walking the line: Making and dissolving distinctions with the viable system model and team synteegrity, *Allenna Leonard*, <http://www.allennaleonard.com/walking.html\#TS>, accessed 17/03/10.
- Leonard, A. and Beer, S. (1994). The systems perspective: Methods and models for the future, *Technical report*, Future Research Methodology.
- Leonard, A. and Bradshaw, W. (1993). Assessing management control, *CMA Magazine* **67**: 3.
- Leopold, A. (1977). *A Sand County Almanac: And Sketches Here and There*, Oxford University, Oxford.
- Leopold, A. C. (2004). Living with the land ethic, *Biology* **54**(2): 149–154.
- Lesser, A. (1935). Functionalism in social anthropology, *American Anthropologist* **37**(3): 386–393.
- Letnic, M., Webb, J. K. and Shi, R. (2008). Invasive cane toads (*bufo marinus*) cause mass mortality of freshwater crocodiles (*crocodylus johnstoni*) in tropical australia, *Biological Conservation* **141**: 1773–1782.
- Levin, D. Z. and Cross, R. (2004). The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer, *Management Science* **50**(11): 1477–1490.
- Levine, L. (1993). Gaia: Goddess and idea, *Biosystems* **31**: 85–92.
- Lewin, K. (1944). A research approach to leadership problems, *Journal of Educational Sociology* **17**(7): 392–398.
- Lewin, K. (1945). The research center for group dynamics at massachusetts institute of technology, *Sociometry* **8**(2): 126–136.
- Lewis, H. S. (1998). The misinterpretation of anthropology and its consequences, *American Anthropologist* **100**(3): 716–731.

- Liebl, F. (2002). The anatomy of complex social problems and its implications for or, *Journal of the Operational Research Society* **53**: 161–184.
- Light, A. (2003). *Ecological Restoration and the Culture of Nature: A Pragmatic Perspective*, Environmental Ethics. An Anthology, CQ Blackwell, Oxford.
- Lightfoot, S. and Burchell, J. (2004). Green hope or greenwash? the actions of the european union at the world summit on sustainable development, *Global Environmental Change* **14**: 337–344.
- Livesay, J. (1985). Normative grounding and praxis: Habermas, giddens, and a contradiction within critical theory, *Sociological Theory* **3**(2): 66–76.
- Locke, J. (2004). *An Essay Concerning Human Understanding*, Project Gutenberg EBook, <http://www.gutenberg.org/files/10615/10615.txt>.
- Longhurst, R. (2003). *Semi-Structured Interviews and Focus Groups*, Key Methods in Geography, Sage, London, chapter 8, pp. 117–132.
- Lovelock, J. (1995). *The Ages of Gaia. A Biography of Our Living Earth*, 2nd edn, Oxford University, Oxford.
- Lovelock, J. (2000). *Gaia: a New Look at Life on Earth*, 3rd edn, Oxford.
- Lovelock, J. (2006). *The Revenge of Gaia*, Penguin, London.
- Lovelock, J. E. (2003). Commentary. gaia and emergence. a response to kirchner and volk, *Climate Change* **57**: 1–3.
- Lovelock, J. E. and Margulis, L. (1974). Atmospheric homeostasis by and for the biosphere: The gaia hypothesis, *Tellus* **26**: 2–10.
- Lowe, E. A. and Tinker, A. M. (1976). The architecture of requisit variety: An empirical application of managerial cybernetics to the organization of socio-economic enterprises and their information-for-control systems, *Kybernetes* **5**: 145–154.

- Lozano, M. and Vallés, J. (2007). An analysis of the implementation of an environmental management system in a local public administration, *Journal of Environmental Management* **82**: 495–511.
- Lozano, R. (2006). Incorporation and institutionalization of sd into universities: Breaking through barriers to change, *Journal of Cleaner Production* **14**: 787–796.
- Luhmann, N. (1995). The paradox of observing systems, *Cultural Critique* **31**: 37–55.
- Luhmann, N. and Fuchs, S. (1988). Tautology and paradox in the self-descriptions of modern society, *Sociological Theory* **6**(1): 21–37.
- Luhmann, T. M. (1990). Our master, our brother: Levi-strauss's debt to rousseau, *Cultural Anthro* **5**(4): 396–413.
- Lund, H. (2006). The kyoto mechanisms and technological innovation, *Energy* **31**(13): 2325–2332.
- Lush (n.d.). Lush's efforts to reduce waste, *Lush* https://www.lush.co.uk/index.php?option=com_content\&id=16989\&catid=\&view=article, accessed 11/01/2010.
- Mackay, D. J. C. (2009). *Sustainable Energy without the hot air*, UIT Cambridge.
- MacKerron, G. J., Egerton, C., Gaskell, C., Parpia, A. and Mourato, S. (2009). Willingness to pay for carbon offset certification and co-benefits among (high-)flying young adults in the uk, *Energy Policy* **37**: 1372–1381.
- Macnaghten, P. and Jacobs, M. (1997). Public identification with sustainable development. investigating cultural barriers to participation, *Global Environmental Change* **7**: 5–24.
- Madura, J. (2007). *Introduction to Business*, Thomson, Mason.
- Malinowski, B. (1932). *Argonauts of the Western Pacific*, Routledge, london.

- Maloney, R. S. (1998). Using anthropology to address environmental and sustainable development issues in rural areas: The case of *pfisteria piscicida* on marylands lower eastern shore, *Technical report*, Society for Applied Anthropology (SfAA) and the Environmental Protection Agency's (EPA) Office of Sustainable Ecosystems and Communities (OSEC).
- Maloni, M. J. and Benton, W. C. (1997). Supply chain partnerships: Opportunities for operations research, *European Journal of Operational Research* **101**: 419–219.
- Malpass, A., Cloke, P., Barnett, C. and Clarke, N. (2007). Fairtrade urbanism? the politics of place beyond place in the bristol fairtrade city campaign, *International Journal of Urban and Regional Research* **31**(3): 633–45.
- Malthus, T. R. (1798). *An Essay on the Principle of Population, vol.1*, J.M.Dent, London.
- Mangen, J. (2004). Combining quantitative and qualitative methodologies in logistics research, *International Journal of Physical Distribution & Logistics Management* **34**(7): 565–578.
- Mannetti, L., Pierro, A. and Livi, S. (2004). Recycling: Planned and self-expressive behaviour, *Journal of Environmental Psychology* **24**: 227–236.
- Mansfield, B. E. (1968). Erasmus in the nineteenth century: The liberal tradition, *Studies in the Renaissance* **15**: 193–219.
- Marans, R. W. and Edelstein, J. Y. (2010). The human dimension of energy conservation and sustainability. a case study of the university of michigan's energy conservation program, *International Journal of Sustainability in Higher Education* **11**(1): 6–18.
- Maronick, T. J. and Andrews, J. C. (1999). The role of qualifying language on consumer perceptions of environmental claims, *Journal of Consumer Affairs* **33**(2): 297–320.

- Marsden, P. (1999). A strategy for memetics: Memes as strategies, *Journal of Memetics - Evolutionary Models of Information Transmission* **3**(1).
- Marshall, G. R. (2008). Nesting, subsidiarity, and community-based environmental governance beyond the local level, *International Journal of the Commons* **2**(1): 75–97.
- Martin, M. (1993). Geertz and the interpretive approach to anthropology, *Synthese* **97**: 269–286.
- Martinich, A. P. (1983). A pragmatic solution to the liar paradox, *Philosophical Studies* **43**(1): 63–67.
- Maru, Y. T. and Woodford, K. (2001). Enhancing emancipatory systems methodologies for sustainable development, *Systemic Practice and Action Research* **14**(1): 61–77.
- Marx, K. and Engels, F. (1848). Manifesto of the communist party, *Marxist* <http://www.marxists.org/archive/marx/works/download/manifest.pdf>, accessed 30/08/2009.
- Maslow, A. H. (1943). A theory of human motivation, *Psychological Review* **50**: 370–396.
- Mason (2005). *The New Accountability. Environmental Responsibility Across Borders*, Earthscan.
- Maturana, H. R. and Varela, H. J. (1987). *The Tree of Knowledge. The Biological Roots of Human Understanding*, Shambala, Boston.
- Maturana, H. and Varela, F. (1980). *Autopoiesis and Cognition: the Realization of the Living*, Reidel, Dordrecht.
- Max-Neef, M. (1995). Economic growth and quality of life: A threshold hypothesis, *Ecological Economics* **15**(2): 115–118.
- Maxwell, J. A. (2002). *Understanding the Validity in Qualitative Research*, The Qualitative Researcher's Companion, Sage, chapter 2, pp. 37–64.

- Mazey, S. and Richardson, J. (2005). *Environmental Groups the European Community: Challenges and Opportunities*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 7, pp. 106–121.
- McCarthy, M. (2010). Climategate scientist 'hid flaws in data', say sceptics, *Independentl*, <http://www.independent.co.uk/environment/climate-change/climategate-scientist-hid-flaws-in-data-say-sceptics-1886487.html>, accessed 28/04/10.
- McClanahan, T. R., Castilla, J. C., White, A. T. and Defeo, O. (2009). Healing small-scale fisheries by facilitating complex soico-ecological systems, *Reviews in Fish Biology and Fisheries* **19**: 33–47.
- McCormick, J. (2002). *Environmental Policy in Britain*, Environmental Politics and Policy in Industrialized Countries, Massachusetts Institute of Technology, London.
- McDonach, K. and Yaneske, P. P. (2002). Environmental management systems and sustainable development, *The Environmentalist* **22**: 217226.
- McGovern, P. (2003). Rational choice theory, the 'new economic sociology' and functionalism, *Work Employment Society* **17**: 747–756.
- McGregor, P. K. and Peake, T. M. (2000). Communication networks: Social environments for receiving and signalling behaviour, *Acta Ethol* **2**: 71–81.
- McIntyre, J. (2002). Critical systemic praxis for social and environmental justice: A case study of management, governance, and policy, *Systemic Practice and Action Research* **15**(1): 3–35.
- McIntyre, J. (2004). Facilitating critical systemic praxis (csp) by means of experiential learning and conceptual tools, *Systems Research and Behavioral Science* **21**: 37–61.

- McLaughlin, . (2002). How to manage meetings effectively, *The Pharmaceutical Journal* **268**: 766–767.
- McMillan, E. (2002). *Complexity, Management and the Dynamics of Change*, Routledge, Suffolk.
- Meadows, D. (1989). Systems dynamics meets the press, *Systems Dynamics Review* **5**(1): 69–80.
- Meadows, D. (2007). The history and conclusions of the limits to growth, *Systems Dynamics Review* **23**(2/3): 191–197.
- Meadows, D. H. (1996). *Envisioning a Sustainable World*, Getting Down to Earth, Practical Applications of Ecological Economics, Island Press, Washington.
- Meadows, D. H. (1999). *Leverage Points Places to Intervene in a System*, Sustainability Institute, Hartland.
- Meadows, D. H. (2001). Dancing with systems, *Sustainability Institute*, <http://www.sustainer.org/pubs/Dancing.html>, accessed 28/01/2010.
- Meadows, D. H., Meados, D. L., Randers, J. and Behrens III, W. H. (2005). *The Nature of Exponential Growth*, Debating the Earth. The Environmental Politics Reader, 2 edn, Oxford University, chapter 1, pp. 11–24.
- Meadows, D. H., Meadows, D. L., Randers, J. and Behrens III, W. (1972). Short version of the limits to growth, *Club of Rome*, www.clubofrome.org/docs/limits.rtf, accessed 28/01/2010.
- Meadows, D. H. and Robinson, J. M. (2002). The electronic oracle: Computer models and social decisions, *Systems Dynamics Review* **18**(2): 271–308.
- Means, D. M. (1879). Nominalism, *Mind* **4**(16): 541–550.
- Mech, L. D. (1992). Who's afraid of the big bad wolf?, *Audubon* **2**: 82–85.

- Melnyk, S. A., Sroufe, R. P. and Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance, *Journal of Operations Management* **21**: 329–351.
- Michalski, J. H. (2003). Financial altruism or unilateral resource exchanges? toward a pure sociology of welfare, *Sociological Theory* **21**(4): 341–358.
- Midgley, G. (1997). Dealing with coercion: Critical systems heuristics and beyond, *Systems Practice* **10**(1): 37–57.
- Midgley, G. (2000). *Systemic Intervention: Philosophy, Methodology, and Practice. Contemporary Systems Thinking*, Kluwer Academic/Plenum, New York.
- Midgley, G. and Reynolds, M. (2001). *Operational Research and Environmental Management: A New Agenda*, Operational Research Society, Birmingham.
- Milfont, T. L., Duckitt, J. and Cameron, L. D. (2006). A cross-cultural study of environmental motive concerns and their implications for proenvironmental behavior, *Environment and Behavior* **38**: 745–767.
- Miller, K. I. and Monge, P. R. (1986). Participation, satisfaction, and productivity: A meta-analytic review, *The Academy of Management Journal* **29**(4): 727–753.
- Milton, K. (1996). *Environmentalism and Cultural Theory. Exploring the Role of Anthropology in Environmental Discourse*, Routledge, London.
- Mingers, J. (1991). The cognitive theories of maturana and varela, *Systems Practice* **4**(4): 319–338.
- Mingers, J. (1992). Recent developments in critical management science, *The Journal of the Operational Research Society* **43**(1): 1–10.
- Mingers, J. (2000). Variety is the spice of life: Combining soft and hard or/ms methods, *International Transactions in Operational Research* **7**(6): 673–691.
- Mingers, J. (2006). *Realising Systems Thinking. Knowledge and Action in Management Science*, Springer, New York.

- Mingers, J. and Rosenhead, J. (2004). Problem structuring methods in action, *European Journal of Operational Research* **152**: 530-554.
- Mingers, J. and White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science, *European Journal of Operational System* **in press**.
- Missens, R., Dana, L. P. and Anderson, R. (2007). Aboriginal partnerships in Canada: Focus on the Diavik diamond mine, *Journal of Enterprising Communities: People and Places in the Global Economy* **1**(1): 54-76.
- Moberg, D. J. (2001). Diagnosing system states: Beyond Senge's archetypes, *Emergence* **3**(2): 19-36.
- Molineaux, C. F., Fentiman, C. H. and Gange, A. C. (2009). Characterising alternative recycled waste materials for use as green roof growing media in the U.K., *Ecological Engineering* **35**: 1507-1513.
- Moneva, J. M., Archel, P. and Correa, C. (2006). GRI and the camouflaging of corporate unsustainability, *Accounting Forum* **30**: 121-137.
- Monroe, K. R. (1994). A fat lady in a corset: Altruism and social theory, *American Journal of Political Science* **38**(4): 861-893.
- Morgan, G. (1980). Paradigms, metaphors, and puzzle solving in organizational theory, *Administrative Science Quarterly* **25**(4): 605-622.
- Morgan, G. (2006). *Images of Organization*, Sage.
- Morlidge, S. (2009). Money, time and variety engineering: The application of cybernetics to the diagnosis and design of financial performance management systems, *Systems Practice and Action Research* **22**(4): 235-247.
- Morrow, D. and Rondinelli, D. (2002). Adopting corporate environmental management systems: Motivations and results of ISO 14001 and EMAS certifications, *European Management Journal* **20**(2): 159-171.

- Motro, R. (2003). *Tensegrity: Structural Systems for the Future*, Kogan Page, London.
- Mouzelis, N. (2000). The subjectivist-objectivist divide: Against transcendence, *Sociology* **34**(4): 741–762.
- MS (2010). Groundwork, *Marks and Spencer*, <http://plana.marksandspencer.com/about/partnerships/groundwork>, accessed 11/01/10.
- Mulej, M., Potocan, V., Zenko, Z., Kajzer, S., Ursic, D. and Knez-Riedl, J. (2004). How to restore bertalanffian systems thinking, *Kybernetes* **33**(1): 48–61.
- Muller, D. B., Tjallingii, S. P. and Canters, K. J. (2005). A transdisciplinary learning approach to foster convergence of design, science and deliberation in urban and regional planning, *Sociology* **22**: 193–208.
- Munday, P. L. (2004). Habitat loss, resource specialization, and extinction on coral reefs, *Global Change Biology* **10**: 1642–1647.
- Murray, J. and Dey, C. (2009). The carbon neutral free for all, *International Journal of Greenhouse Gas Control* **3**(2): 237–248.
- Myers, N. (1997). Consumption in relation to population, environment and development, *The Environmentalist* **17**: 33–44.
- Naess, A. (1977). Spinoza and ecology, *Philosophia* **7**(1): 45–51.
- Naess, A. (2003). *The Deep Ecological Movement: Some Philosophical Aspects*, Environmental Ethics. An Anthology, CQ Blackwell, Oxford.
- Najam, A. and Cleveland, C. J. (2003). Energy and sustainable development at global environmental summits: An evolving agenda, *Environment, Development and Sustainability* **5**: 11713.
- Naroll, R. and von Bertalanffy, L. (1973). The principle of allometry in biology and the social sciences, *Ekistics* **36**: 244–252.

- NCC (n.d.). Newcastle - fairtrade city, *Newcastle City Council*, Available <http://www.newcastle.gov.uk/core.nsf/a/fairtradecity>, accessed 11/01/10.
- Nelson, G. C., Bennett, E., Berhe, A. A., Cassman, K., DeFries, R., Dietz, T., Dobermann, A., Dobson, A., Janetos, A., Levy, M., Marco, D., Nakicenovic, N., O'Neill, B., Norgaard, R., Petschel-Held, G., Ojima, D., Pingali, P., Watson, R. and Zurek, M. (2006). Anthropogenic drivers of ecosystem change: an overview, *Ecology and Society* **11**(2): 29.
- NetRegs (2010). English environmental legislation, *NetRegs*, <http://www.netregs.gov.uk/netregs/legislation/current/63594.aspx>, accessed 08/06/2010.
- Neves, L. M. P., Matrtins, A. G., Antunes, A. H. and Dias, L. C. (2004). Using ssm to rethink the analysis of energy efficiency initiatives, *Journal of the Operational Research Society* **55**: 968975.
- Newman, E. I. (2000). *Applied Ecology and Environmental Management*, Blackwell Science, London.
- Newman, M. E. J. (2005). A measure of betweenness centrality based on random walks, *Social Networks* **27**: 3954.
- NG (2011). Prehistoric time line, *National Geographic*, <http://science.nationalgeographic.com/science/prehistoric-world/prehistoric-time-line.html>, accessed 22/01/2011.
- Nidumolu, U. B., de Bie, C., van Keulen, H., Skidmore, A. K. and Karl Harmsen, K. (2006). Review of a land use planning programme through the soft systems methodology, *Land Use Policy* **23**: 187203.
- Nijland, G. O. (2002). The tetrahedron of knowledge acquisition: A meta-model of the relations among observation, conceptualization, evaluation and action in the research on socio-ecological systems, *Systems Research and Behavioral Science* **19**: 211–221.

- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation, *Organization Science* **5**(1): 14–37.
- Norgaard, R. B. (1992). Environmental science as a social process, *Environmental Monitoring and Assessment* **20**: 95–110.
- Nowak, M. A. (2006). Five rules for the evolution of cooperation, *Science* **314**: 1560–1563.
- Nowak, M. A. and Sigmund, K. (2006). Evolution of indirect reciprocity, *Nature* **437**: 1291–1298.
- NYTimes (2007). 65m to help tackle waste. pfi funding bid wins backing, *North Yorkshire Times*.
- O'Brien, M. (2005). *Goal: Replace Risk Assessment with Alternatives Assessment*, Debating the Earth. The Environmental Politics Reader, 2 edn, Oxford University, chapter 10, pp. 135–146.
- Ohtsuki, H., Hauert, C., Lieberman, E. and Nowak, M. A. (2006). A simple rule for the evolution of cooperation on graphs and social networks, *Nature* **441**: 502–505.
- Olli, E., Grendstad, G. and Wollebaek, D. (2001). Correlates of environmental behaviors: Bringing back social context, *Environment and Behavior* **33**: 181–208.
- Olsson, P., Folke, C. and Berkes, F. (2004). Adaptive comanagement for building resilience in socialecological systems, *Environmental Management* **34**(1): 75–90.
- Omer, A. M. (2007). Green energy saving mechanisms, *Renewable and Sustainable Energy Reviews* **In Press Corrected Proof**.
- Onwuegbuzie, A. J. and Johnson, R. B. (2006). The validity issue in mixed research, *Research in the Schools* **13**(1): 48–63.
- OPSI (1991). Water industry act 1991, *Office of Public Sector Information*, http://www.opsi.gov.uk/acts/acts1991/Ukpga_19910056_en_1.htm?lang=_e, 09/05/2010.

- OPSI (1999). Explanatory notes to pollution prevention and control act 1999 1999 chapter 24, *Office of Public Sector Information*, <http://www.opsi.gov.uk/acts/en1999/1999en24.htm>, 23/10/06.
- OPSI (2002). The wildlife and countryside (sites of special scientific interest, appeals) (wales) regulations 2002, *Office of Public Sector Information*, <http://www.opsi.gov.uk/legislation/wales/wsi2002/20021772e.htm>, accessed 28/04/10.
- OPSI (2003). Water environment and water services (scotland) act 2003. 2003 asp 3, *Office of Public Sector Information*, <http://www.opsi.gov.uk/legislation/scotland/acts2003/20030003.htm>, 23/10/06.
- OPSI (2006). Explanatory notes to natural environment and rural communities act 2006 2006 chapter 16, *Office of Public Sector Information*, <http://www.opsi.gov.uk/acts/en2006/2006en16.htm>, 23/10/06.
- OPSI (2007). Statutory instruments 2007 no. 871 environmental protection. the producer responsibility obligations (packaging waste) regulations 2007, *Office of Public Sector Information*, http://www.opsi.gov.uk/si/si2007/uksi_20070871_en_1, accessed 10/05/2010.
- OPSI (2008). Explanatory memorandum to the producer responsibility obligations (packaging waste) amendment no.2) regulations 2008. 2008 no. 1941., *Office of Public Sector Information*, http://www.opsi.gov.uk/si/si2008/em/uksiem_20081941_en.pdf, accessed 09/05/2010.
- OPSI (2009a). Explanatory memorandum to the control of trade in endangered species (fees) regulations 2009. 2009 n. 496, *Office of Public Sector Information*, http://www.opsi.gov.uk/si/si2009/em/uksiem_20090496_en.pdf, 19/01/10.
- OPSI (2009b). Statutory instruments 2009 no. 3126. environmental protection. the waste electrical and electronic equipment (amendment)(no.2) regulations 2009, *Office of Public Sector Information*, http://www.england-legislation.hmso.gov.uk/si/si2009/uksi_20093216_en_1, 09/05/2010.

- Ormerod, R. (2006). The history and ideas of pragmatism, *The Journal of the Operational Research Society* **57**(8): 892–909.
- Ostrom, E. (2000). Collective action and the evolution of social norms, *Journal of Economic Perspectives* **14**(3): 137–158.
- Ostrom, E. (2003). *Toward A Behavioral Linking Theory, Trust and Reciprocity. Interdisciplinary Lessons From Experimental Research*, Russell Sage Foundation, chapter 2, pp. 19–79.
- Ostrom, E. (2007). A diagnostic approach for going beyond panaceas, *PNAS* **104**(39): 15181–15187.
- Ostrom, E., Burger, J., Field, C. B., Norgaard, R. B. and Policansky, D. (1999). Revisiting the commons: Local lessons, global challenges, *Science* **284**: 278–282.
- Ostrom, E., Gardner, R. and Walker, J. (1994). *Rules, Games and Common-Pool Resources*, University of Michigan, Michigan.
- Ostrom, E., Janssen, M. A. and Anderies, J. M. (2007). Going beyond panaceas, *PNAS* **104**(39): 15176–15178.
- PA (2008). Iso 14001: 2004, *Portsmouth Aviation*, <http://www.portsmouth-aviation.co.uk/Downloads/ISO14001-2004.pdf>, accessed 13/01/10.
- Pala, Ö., Vennix, J. A. M. and van Mullekom, T. (2003). Validity in ssm: Neglected areas, *Journal of Operational Research Society* **54**: 706–712.
- Panagiotidis, P. and Edwards, J. S. (2001). Organisational learning a critical systems thinking discipline, *European Journal of Information Systems* **10**: 135–146.
- Parry, G. D. (1981). The meanings of r- and k-selection, *Oecologia* **48**: 260–264.
- Pask, G. (1996). Heinz von foerster's self-organisation, the progenitor of conversation and interaction theories, *Systems Research* **13**(3): 349–362.
- Pattberg, P. (2007). Conquest, domination and control: Europes mastery of nature in historic perspective, *Journal of Political Ecology* **14**: 1–9.

- Patterson, L. A. and Josling, T. (2005). *Regulation Biotechnology: Comparing EU and US Approaches*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 11, pp. 183–200.
- Paucar-Caceres, A. (2009a). Measuring the performance of a research strategic plan system using the soft systems methodology's three 'es' and the viable system model's indices of achievement, *Systems Practice Action Research* **22**: 445–462.
- Paucar-Caceres, A. (2009b). Surveying the use of management science methodologies in environmental management and sustainable development, *Brighton, BAM Conference*.
- Paucar-Caceres, A. (2010). Mapping the changes in management science: A review of soft or/ms articles published in omega (19732008), *Omega* **38**(1-2): 46–56.
- Paucar-Caceres, A. and Rodriguez-Ulloa, A. (2007). An application of soft systems dynamics methodology (ssdm), *Journal of the Operational Research Society* **58**: 701–713.
- Pearce, F. (2010). Leaked climate change emails scientist 'hid' data flaws, *Guardian*, <http://www.guardian.co.uk/environment/2010/feb/01/leaked-emails-climate-jones-chinese>, accessed 28/04/10.
- Pelling, M. and High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity?, *Global Environmental Change* **15**: 308–319.
- Penn, D. J. (2003). The evolutionary roots of our environmental problems: Toward a darwinian ecology, *The Quarterly Review of Biology* **78**(3): 275–301.
- Perry-Smith, J. E. and Shalley, C. S. (2003). The social side of creativity: A static and dynamic social network perspective, *The Academy of Management Review* **28**(1): 89–106.
- Pickering, A. (2002). Cybernetics and the mangle: Ashby, beer and pask, *Social Studies of Science* **32**(3): 413–437.

- Pinchot, G. (1910). The fight for conservation, *The Fight for Conservation by Gifford Pinchot* <http://www.gutenberg.org/etext/11238>, accessed 30/08/2009.
- Pinto, M. A., Rubink, W. L., Coulson, R. N., Patton, J. C. and Johnston, J. S. (2005). Temporal pattern of africanization in a feral honeybee population from texas inferred from mitochondrial dna, *Evolution* **58**(5): 1047–1055.
- Pojman, L. P. (1999). *The Theory of Knowledge*, 2nd edn, International Thomson, London.
- Poncelet, E. C. (2001). “a kiss here and a kiss there”: Conflict and collaboration in environmental partnerships, *Environmental Management* **27**(1): 13–25.
- Porter, M. E. and Kramer, M. R. (2002). The competitive advantage of corporate philanthropy, *Harvard Business Review* pp. 1–15.
- Porter, M. E. and Kramer, M. R. (2006). Strategy and society: The link between competitive advantage and corporate social responsibility, *Harvard Business Review* pp. 78–92.
- Porter, T. (2008). Managerial applications of corporate social responsibility and systemsthinking for achieving sustainability outcomes, *Systems Research and Behavioral Science* **25**(3): 397–411.
- Posner, B. G. (2009). One ceo’s trip from dismissive to convinced, *MIT Sloan Management Review* **51**(1): 47–51.
- Post, J. E. (1994). Managing the environmental change process: Barriers and opportunities, *Journal of Organizational Change Management* **7**(4): 64–81.
- Potocan, V. and Mulej, M. (2000). The interdependence of management, sustainable development and anticipatory systems thinking, *University of Cambridge*, <http://www.econ.cam.ac.uk/cjeconf/delegates/potocan.pdf>, 29/10/2006.
- Potocan, V. and Mulej, M. (2007). Ethics of a sustainable enterprise-and the need for it, *Systemic Practice and Action Research* **21**: 127–140.

- Potoski, M. and Prakash, A. (2005). Covenants with weak swords: Iso 14001 and facilities environmental performance, *Journal of Policy Analysis and Management* **24**(4): 745-769.
- Prigogine, I. (1997). Non-linear science and the laws of nature, *Journal of the Franklin Institute* **334B**(5/6): 745-758.
- Prybutok, V. R. and Ramasesh, R. (2005). An action-research based instrument for monitoring continuous quality improvement, *European Journal of Operational Research* **166**(2): 293-309.
- Pryde, P. R. (1986). Strategies and problems of wildlife preservation in the ussr, *Biological Conservation* **36**: 351-374.
- Pucher, J. and Dijkstra, L. (2003). Promoting safe walking and cycling to improve public health: Lessons from the netherlands and germany, *American Journal of Public Health* **93**(9): 1509-1516.
- Puller, S. L. (2006). The strategic use of innovation to influence regulatory standards, *Journal of Environmental Economics and Management* **52**: 690-706.
- Rabinovitch, J. (1992). Curitiba: Towards sustainable urban development, *Environment and Urbanization* **4**(2): 62-73.
- Ramus, C. (2002a). Encouraging innovative environmental actions: What companies and managers must do, *Journal of World Business* **37**: 151-164.
- Ramus, C. A. (1998). How environmental communication supports employee participation: A case study of emi music, *Employee Awareness* **5**(4): 69-74.
- Ramus, C. A. (2002b). Encouraging innovative environmental actions: What companies and managers should do, *Journal of World Business* **37**: 151-164.
- Rand, A. (1964). *The Virtue of Selfishness. A New Concept of Egoism*, Penguin, London.
- Rank, O. N. (2008). Formal structures and informal networks: Structural analysis in organizations, *Scandinavian Journal of Management* **24**: 145-161.

- Rankin, D. J., Bargum, K. and Kokko, H. (2007). The tragedy of the commons in evolutionary biology, *Trends in Ecology and Evolution* **22**(12): 643–651.
- Rao, P. and Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance?, *International Journal of Operations & Production Management* **9**: 898–916.
- Rapoport, A. and Chammah, A. M. (1965). *Prisoner's Dilemma. A Study in Conflict and Cooperation*, University of Michigan Press, Toronto.
- Raskin, P., Banuri, T., Gallopin, G., Gutman, P., Hammond, A., Kates, R. and Swart, R. (2002). Great transition. the promise and lure of the times ahead, *Technical report*, Global Scenario Group. Stockholm Environment Institute.
- Raskin, R. G. and Pan, M. J. (2005). Knowledge representation in the semantic web for earth and environmental terminology (sweet), *Computers and Geosciences* **31**: 1119–1125.
- Rastogi, N. (2010). Role of social disorder-related environmental cues as signals in modulating social learning, norm non-compliance and collective decisions in human societies, *Current Science* **99**(8): 1046–1050.
- Ravetz, J. (2000). Integrated assessment for sustainability appraisal in cities and regions, *Environmental Impact Assessment Review* **20**: 31–64.
- Rawls, A. W. (1997). Durkheim and pragmatism: An old twist on a contemporary debate, *Sociological Theory* **15**(1): 5–29.
- Reason (1988). *Human Inquiry in Actions: Developments in new Paradigm Research*, SAGE, London.
- Reason, P. (2006). Choice and quality in action research practice, *Journal of Management Inquiry* **15**(2): 187–203.
- Regan, H. M., Clyvan, M. and Markovchick-Nicholls, L. (2006). A formal model for consensus and negotiation in environmental management, *Journal of Environmental Management* **80**: 167–176.

- Rege, M. and Telle, K. (2004). The impact of social approval and framing on cooperation in public good situations, *Journal of Public Economics* **88**: 1625–1644.
- Reuveny, R. and Decker, C. S. (2000). Easter island: Historical anecdote or warning for the future?, *Ecological Economics* **35**: 271–287.
- Reyes, A. (2001). Second-order auditing practices, *Systemic Practice and Action Research* **14**(2): 157–180.
- Reynolds, E. (2002). The deep structure of communication and control, *ASC 2002 Conference*, <http://www.asc-cybernetics.org/2002/reynolds.htm>, accessed 03/03/09.
- Riedman, M. L. (1982). The evolution of alloparental care and adoption in mammals and birds, *The Quarterly Review of Biology* **57**(4): 405–435.
- Rocco, E. (1998). Trust breaks down in electronic contexts but can be repaired by some initial face-to-face contact, *Proceedings of the SIGCHI conference on Human factors in computing systems, Los Angeles*, pp. 496–502.
- Rochberg-Halton, E. (1987). Why pragmatism now?, *Sociological Theory* **5**(2): 194–200.
- Roddick, J. (1997). Earth summit north and south. building a safe house in the winds of change, *Global Environmental Change* **7**(2): 147–165.
- Rondinelli, D. and Vustag, G. (2000). Panacea, common sense, or just a label? the value of iso 14001 environmental management systems, *European Management Journal* **18**(5): 499–510.
- Rooney, N., McCann, K., Gellner, G. and Moore, J. C. (2006). Structural asymmetry and the stability of diverse food webs, *Nature* **442**: 265–269.
- Rooy, A. V. (1997). The frontiers of influence: Ngo lobbying at the 1974 world food conference, the 1992 earth summit and beyond, *World Development* **25**(1): 93–114.

- Rorty, R. (1961). Pragmatism, categories, and language, *The Philosophical Review* **70**(2): 197–223.
- Roseland, M. (2000). Sustainable community development: Integrating environmental, economic, and social objectives, *Progress in Planning* **54**: 73132.
- Rosenhead, J. (2006). Past, present and future of problem structuring methods, *The Journal of the Operational Research Society* **57**(7): 759–765.
- Ross, A. (2008). Why legislate for sustainable development? an examination of sustainable development provisions in the uk and scottish statutes, *Journal of Environmental Law* **20**: 35–68.
- Ross-Gillespie, A. and Griffin, A. S. (2007). Meerkats, *Current Biology* **17**(2): R442–R443.
- Ross, S. and Evans, D. (2002). Use of life cycle assessment in environmental management, *Environmental Management* **29**(1): 131–142.
- Rossi, I. (1973). The unconscious in the anthropology of claud Lvi-strauss, *American Anthropologist* **75**(1): 20–48.
- Rousseau, J. (2004a). *A Discourse Upon The Origin And The Foundation Of The Inequality Among Mankind*, Project Gutenberg EBook, <http://www.gutenberg.org/etext/11136>.
- Rousseau, J. (2004b). *Emile*, Project Gutenberg EBook, <http://www.gutenberg.org/dirs/etext04/emile10.txt>.
- Rowe, J. H. (1965). The renaissance foundations of anthropology, *American Anthropologist* **67**: 1–20.
- Roy, R., Potter, S., Yarrow, K. and smith, M. (2002). Factor 10 visions project: Higher education sector. towards sustainable higher education: Environmental impacts of conventional campus, print-based and electronic distance/open learning systems, *Technical report*, Design Innovation Group, the Open University.

- Rubin, A. and Babbie, E. R. (2010). *Essential Research Methods for Social Work*, 2nd edn, Brooks/Cole, Belmont.
- Ruef, M. (2002). Strong ties, weak ties and islands: Structural and cultural predictors of organisational innovation, *Industrial and Corporate Change* **11**(3): 427–449.
- Ruttan, L. M. (2004). The effect of heterogeneity on institutional success and conservation outcomes, *International Association for the Study of Common Property meetings*.
- Saaty, T. L. (2004). Fundamentals of the analytic network process - dependence and feedback in decision-making with a single network, *Journal of Systems Sciences and Systems Engineering* **13**(2): 129–157.
- Saida, D. (2009). Contribution on the analysis of the environmental disclosure: a comparative study of american and european multinationals, *Social Responsibility Journal* **5**(1): 83–93.
- Sammalisto, K. and Brorson, T. (2006). Training and communication in the implementation of environmental management systems (iso 14001): A case study at the univeristy of gavle, sweden, *Journal of Cleaner Production* .
- Santos, R., Antunes, P., Baptista, G., Mateus, P. and Madruga, L. (2006). Stakeholder participation in the design of environmental policy mixes, *Ecological Economics* **60**(1): 100–110.
- Sarksis, J. (1998). Evaluating environmentally conscious business practices, *European Journal of Operational Research* **107**: 159–174.
- Saunders (2003). The emerging field of conservation psychology, *Human Ecology Review* **10**(2): 137–149.
- Saunders, M. and Lewis, P. and Thornhill, A. (2009). *Research Methods for Business Students*, fifth edn, Pearson Education, Harlow.

- SBC (2009). Prosperity without growth. the transition to a sustainable economy, *Technical report*, Sustainable Development Commission.
- Schaeffer, R., Szklo, A. S., Cima, F. M. and Machado, G. (2005). Indicators for sustainable energy development: Brazil's case study, *Natural Resources Forum* **29**: 284–297.
- Schultz, M. and Hatch, M. J. (1996). Living with multiple paradigms: The case of paradigm interplay in organizational culture studies, *The Academy of Management Review* **21**(2): 529–557.
- Schultz, P. W., Zelezley, L. and Dalrymple, N. J. (2000). A multinational perspective on the relation between judeo-christian religious beliefs and attitudes of environmental concern, *Environmental Behavior* **32**: 576–591.
- Schwaninger, M. (1987). A practical approach to strategy development, *Long Range Planning* **20**(5): 74–87.
- Schwaninger, M. (1997a). Integrative systems methodology: Heuristic for requisite variety, *International Transactions in Operational Research* **4**(4): 109–123.
- Schwaninger, M. (1997b). The team synteegrity model an architecture for organizations of the future, *International Society for the Systems Sciences*, <http://www.iss.org/teamsyn.html>, accessed 17/03/10.
- Schwaninger, M. (2000). Managing complexity - the path toward intelligent organizations, *Systemic Practice and Action Research* **13**(2): 207–241.
- Schwaninger, M. (2001). Intelligent organizations: An integrative framework, *Systems Research and Behavioral Science* **18**: 137–158.
- Schwaninger, M. (2003). A cybernetic model to enhance organizational intelligence, *Systems Analysis Modelling Simulation* **43**(1): 5365.
- Schwaninger, M. (2004a). Methodologies in conflict: Achieving synergies between system dynamics and organizational cybernetics, *Systems Research and Behavioral Science* **21**: 411–431.

- Schwaninger, M. (2004b). What can cybernetics contribute to the conscious evolution of organizations and society?, *SystemsResearchandBehavioralScience* **21**: 515–527.
- Schwaninger, M. (2006a). The evolution of organisational cybernetics, *Scientiae Mathematicae Japonicae* **64**(2): 405–420.
- Schwaninger, M. (2006b). *Intelligent Organizations. Powerful Models for Systemic Management*, Springer, Berlin.
- Schwaninger, M. (2006c). Theories of viability: a comparison, *Systems Research and Behavioral Science* **23**: 337–347.
- Schwaninger, M. (2007). Optimal structures for social systems, *Kybernetes* **36**(3/4): 307–318.
- Schwaninger, M. and Leonard, A. (2004). A dialogue on the future of iss: Team syntegrity sessions at the crete conference, *Systems Research and Behavioral Science* **21**: 529–537.
- Schwaninger, M. and Rìos, J. P. (2008). System dynamics and cybernetics: A synergetic pair, *System Dynamics Review* **24**(2): 145–174.
- Scott, B. (2008). The role of sociocybernetics in understanding world futures, *International Conference of Sociocybernetics. Complex Systems, Interdisciplinarity and World Futures*.
- Scott, K. (2009). Scottish villagers stun developers by demanding extra turbine, *Guardian*, <http://www.guardian.co.uk/environment/2009/may/10/windpower-energy>, accessed 21/04/10.
- Seip, K. and Strand, J. (1992). Willingness to pay for environmental goods in norway: A contingent valuation study with real payment, *Environmental and Resource Economics* **2**: 91–106.
- Seixas, C. S. and Davy, B. (2008). Self-organisation in integrated conservation and development initiatives, *International Journal of the Commons* **2**(1): 99–125.

- Senge, P. M. and Carstedt, G. (2001). Innovating our way to the next industrial revolution, *MIT Sloan Management Review* **42**: 24–38.
- Senge, P. M. and Fulmer, R. M. (1993). Simulations, systems thinking and anticipatory learning, *The Journal of Management Development* **12**: 21–33.
- Seville, D., Jones, A. and Meadows, D. H. (2001). *Exploring the Dynamics of Economic and Ecological Sustainability in the Northern Forest*, Sustainability Institute, Hartland.
- Seyfang, G. and Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda, *Environmental Politics* **16**(4): 584–603.
- Shalin, D. N. (1986). Pragmatism and social interactionism, *American Sociological Review* **51**(1): 9–29.
- Sharp, L. (2002). Green campuses: the road from little victories to systemic transformation, *International Journal of Sustainability in Higher Education* **3**(2): 128–145.
- Sheard, S. (2006). Complexity theory and continental philosophy 2: A hermeneutical theory of complexity, *E:CO* **8**: 50–66.
- Shen, C. Y. and Midgley, G. (2007). Toward a buddhist systems methodology 3: An application in a taiwanese non-governmental organization, *Systems Practice Action Research* **20**: 211–244.
- Sierra Club (1999). John muir: A brief biography, *Sierra Club* http://www.sierraclub.org/john_muir_exhibit/frameindex.html?http://www.sierraclub.org/john_muir_exhibit/life/muir_biography.html, accessed 30/08/2009.
- Sigfusson, T. I. (2007). Hydrogen island: the story and motivations behind the icelandic hydrogen society experiment, *Mitigation and Adaptation Strategies for Global Change* **12**: 407–418.

- Sigmund, K. (1998). Complex adaptive systems and the evolution of reciprocation, *Ecosystems* **1**: 444–448.
- Simkins, G. and Nolan, A. (2004). Environmental management systems in universities, *Technical report*, Occasional Paper for the Environmental Association for Universities and Colleges.
- Simmel, G. (1898). The persistence of social groups. ii, *The American Journal of Sociology* **3**(6): 829–836.
- Simmel, G. (1904). The sociology of conflict. i, *The American Journal of Sociology* **9**(4): 490–525.
- Simon, S. (2006). Systemic educational approaches to environmental issues: The contribution of ecological art, *Systemic Practices and Action Research* **19**: 143–157.
- Simpson, B. (1996). Sustainability and environmental assessment: The increasing prominence of the natural environment in economic decisions, *Geography* **352**: 205–215.
- Singh, P. and Bernstein, B. (2006). Research in the innovation management area: Lessons for quality management, *Problems and Perspectives in Management* **4**: 136–143.
- Sinha-Khetriwal, D., Kraeuchi, P. and Schwaninger, M. (2005). A comparison of electronic waste recycling in switzerland and in india, *Environmental Impact Assessment Review* **25**: 492504.
- Smith, E. (2001). The role of tacit and explicit knowledge in the workplace, *Journal of Knowledge Management* **5**(4): 311–321.
- Smith, M. A. and Stacey, R. (1997). Governance and cooperative networks: An adaptive systems perspective, *Technological Forecasting and Social Change* **54**: 79–94.

- Smith, M. A. and Stacey, R. (2003). Constructivist and ecological rationality in economics, *The American Economic Review* **93**(3): 465–508.
- Smith, R. (2007). Aristotle's logic, *Stanford Encyclopedia of Philosophy*, <http://plato.stanford.edu/entries/aristotle-logic/>, accessed 27/01/10.
- Smyth, A. and Holian, R. (2008). *Credibility Issues in Research From Within Organisations*, Researching Education from the Inside: Investigations from Within, Routledge, Abingdon, chapter 3, pp. 33–48.
- Snowden, D. (2002). Being efficient does not always mean being effective. a new perspective on cultural issues in organisations, *Cognitive Edge*, <http://www.cognitive-edge.com/articles.php>, accessed 28/03/07.
- Spagnolo, G. (1999). Social relations and cooperation in organizations, *Journal of Economic Behavior and Organization* **38**: 1–25.
- Spinoza, B. (2003). *The Ethics*, Project Gutenberg EBook, <http://www.gutenberg.org/files/3800/3800-8.txt>.
- Spruill, N., Kenney, C. and Kaplan, L. (2001). Community development and systems thinking: Theory and practice, *National Civic Review* **90**(1): 105–116.
- Stapleton, P. J., Cooney, A. M. and Hix, W. M. (1996). Environmental management systems: An implementation guide for small and medium-sized organizations, *Technical report*, U.S. Environmental Protection Agency's Office of Wastewater Management and Office of Compliance.
- Stephens, C. (1996). Modelling reciprocal altruism, *The British Journal for the Philosophy of Science* **47**(4): 533–551.
- Sterling, S. (2003). *Whole Systems Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, PhD thesis, University of Bath.
- Stern, P. C. (1999). Information, incentives, and proenvironmental consumer behavior, *Journal of Consumer Policy* **22**: 461–478.

- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A. and Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism, *Human* **6**(2): 81–97.
- Stern, P. C., Dietz, T. and Balck, J. S. (1985-6). Support for environmental protection: The role of moral norms, *Population and Environment* **8**(3-4): 204–222.
- Stern, P. C., Dietz, T. and Kalof, L. (2005). *Value Orientations, Gender and Encvironmental Concern*, The Earthscan Reader in Environmental Values, Earthscan, chapter 12, pp. 188–206.
- Stevenson, J. (2005). *The Complete Idiot's Guide to Philosophy*, Penguin, London.
- Stewart, J. (2000). *Evolution's Arrow. The Direction of Evolution and the Future of Humanity*, Chapman Press, Canberra.
- Stewart, J. and Ayres, R. (2001). Systems theory and policy practice: An exploration, *Policy Sciences* **34**: 79–94.
- Stewart, N. and Lewis, G. (1997). *Sustainability and Viability*, Systems for Sustainability: People, Organizations, and Environments, Plenum Press, New York, chapter 17, pp. 97–102.
- Stokes, P. A. (2006). Identitify: Articulating cybernetics and sociology, *Kybernetes* **35**(1/2): 124–147.
- Stokes, P. A. (2009). *The Viability of Societies. Governance and Complexity Today*, VDM.
- Stone, J. V. (2000). Public participation in great lakes environmental management: Seeking “participatory equity” through ethnographic enquiry, *Technical report*, Great Lakes Fellowship Program.
- Strachan, P. A., Sinclair, I. K. and Lal, D. (2003). Managing iso 14001 implementation in the united kingdom continental shelf (ukcs), *Corporate Social Responsibility and Environmental Management* **10**: 5063.

- Stringer, L. C., Dougill, A. J., Fraser, E., Hubacek, K., Prell, C. and Reed, M. S. (2006). Unpacking “participation” in the adaptive management of socialecological systems: a critical review, *Ecology and S* **11**(2).
- Sugawar, K. (2010). Intergenerational transfers and fertility: Trade-off between human capital and child labour, *Journal of Macroeconomics* **32**: 584593.
- Susi, T. and Ziemke, T. (2001). Social cognition, artefacts, and stigmergy: A comparative analysis of theoretical frameworks for the understanding of artefact-mediated collaborative activity, *Journal of Cognitive Systems Research* **2**: 273290.
- Swann, C. (2002). Action research and the practice of design, *Design Issues* **18**: 49–61.
- Swedberg, R. (1999). Max weber as an economist and as a sociologist: Towards a fuller understanding of weber’s view of economics, *American Journal of Economics and Sociology* **58**(4): 561–582.
- Tanner, C. (1999). Constraints on environmental behaviour, *Journal of Environmental Psychology* **19**: 145–157.
- TCT (2003). Effective monitoring and targeting at rhi refractories uk ltd, clydebank, *The Carbon Trust*, http://www.carbontrust.co.uk/energy/whysaveenergy/case_studies.htm, accessed 02/05/07.
- TCT (2004). Good practice guide. better business guide to energy saving, *Technical report*, The Carbon Trust.
- TCT (2005). Radiant heating at howden compressors, glasgow, *The Carbon Trust*, http://www.carbontrust.co.uk/energy/whysaveenergy/case_studies.htm, accessed 02/05/07.
- TCT (2006a). Case study - applied research - university of birmingham, *The Carbon Trust*, http://www.carbontrust.co.uk/energy/whysaveenergy/public_sector.htm, accessed 02/05/07.

- TCT (2006b). Energy efficient lighting and controls at north lanarkshire council, *The Carbon Trust*, http://www.carbontrust.co.uk/energy/whysaveenergy/public_sector.htm, accessed 02/05/07.
- TCT (2008). Carbon trust helping over half of uk universities save cash and cut carbon, *The Carbon Trust*, http://www.carbontrust.co.uk/news/news/archive/2008/Pages/080423_HECM_Phase4.aspx, accessed 08/05/10.
- Tejeda-Paidilla, R., Badillo-Piña, I. and Morales-Matamoras, O. (2009). A systems science approach to enterprise resources planning systems, *Systems Research and Behavioral Science*.
- Tempest, M. (2007). Public confused about climate change, says miliband, *Guardian Unlimited*, <http://environment.guardian.co.uk/climatechange/story/0,,2095284,00.html>, accessed 16/07/07.
- Tepe, S. and Haslett, T. (2002). Occupational health and safety systems, corporate governance and viable systems diagnosis: An action research approach, *Systems Practice and Action Research* **15**(6): 509–522.
- Terenzi, G. (2006). *Metasystem Transitions and Sustainability in Human Organizations. Part 1 - Towards Organizational Synergetics*, Systemics of Emergence: Research and Development, Springer, pp. 585–600.
- The Insider: Packaging is Rubbish (2007). Documentary, The Insider, Mark Constantine.
- Theron, G. (2002). Back to norms! on the scope and dynamics of norms and normative action, *Current Sociology* **50**: 863–880.
- Thierry, I. and Anderson, J. R. (1986). Adoption in anthropoid primates, *International Journal of Primatology* **7**(2): 191–216.
- Thomas, C. D., Cameron, A., Green, R. E., Bakkenes, M., Beaumont, L. J., Collingham, Y. C., Erasmus, B. F. N., de Siqueira, M. F., Grainger, A., Hannah, L., Hughes, L., Huntley, B., van Jaarsveld, A. S., Midgley, G. F., Miles, L.,

- Ortega-Huerta, M. A., Peterson, A. T., Phillips, O. L. and Williams, S. E. (2004). Extinction risk from climate change, *Nature* **427**(8): 145–148.
- Thornton, J. (2008). Uk law significant environmental cases 2007-08, *Journal of Environmental Law* **20**(2): 293–321.
- Tichy, N. M., Tushman, M. L. and Fombrun, C. (1979). Social network analysis for organizations, *The Academy of Management Review* **4**(4): 507–519.
- Tickell, C. (1993). Gaia: Goddess or thermostat, *Biosystems* **31**(2): 93–98.
- Tinsley, S. (2001). *Environmental Management Plans Demystified. A Guide to Implementing ISO 14001*, Spon, London.
- Tompkins, E. L. and Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change?, *Ecology and Society* **9**(2): 10.
- Torlak (2001a). Rationalization of metaphorical exploration: Improving the creativity phase of total systems intervention (tsi) on the basis of theory and practice, *Systemic Practice and Action Research* **14**(4): 451–482.
- Torlak, G. N. (2001b). Reflections on multimethodology: Maximizing flexibility, responsiveness, and sustainability in multimethodology interventions through a theoretically and practically improved version of total systems intervention (tsi), *Systemic Practice and Action Research* **14**(3): 297–337.
- Trieb, F., Nitsch, J., Kronshage, S., Schillings, C., Brischke, L., Kniesb, G. and Czisch, G. (2002). Combined solar power and desalination plants for the mediterranean region - sustainable energy supply using large-scale solar thermal power plants, *Desalination* **153**: 39–46.
- Trivers, R. L. (1971). The evolution of reciprocal altruism, *The Quarterly Review of Biology* **46**(1): 35–57.
- Truss, J. (1994). *From Prototype to Protocol. Design for Doing*, Wiley and Sons, Chichester, chapter Surplus Two, pp. 281–299.

- Truss, J., Cullen, C. and Leonard, A. (n.d). The coherent architecture of team syntegrity from small to mega forms, *Team Syntegrity*, <http://www.team-syntegrity.com/web/tseliveoffen.nsf/8dc07b89528557a2c1256aee0035c51f/c1256ab6001acd26c1256c7e0038e3e8/FILE/ISSS\%20Artikel.pdf>, accessed 04/06/2010.
- Tukker, A. and Butter, M. (2007). Governance of sustainable transitions: About the 4(0) ways to change the world, *Journal of Cleaner Production* **15**(1): 94–103.
- Tullberg, J. (2005). On indirect reciprocity: The distinction between reciprocity and altruism, and a comment on suicideterroism, *American Journal of Economics and Sociology* **63**: 1193–1212.
- Tullberg, J. (2006). Group egoism; investigating collective action and individual rationality, *The Journal of Soci-Economics* **35**: 1014–1031.
- Turchin, V. (1977). *The Phenomenon of Science. A Cybernetic Approach to Human Evolution*, Columbia University Press, Guildford.
- Turner, W. C. and Doty, S. (2007). *Energy Management Handbook*, 6th edn, Fairmont.
- Tylor, S. E. B. (2004). *Anahuac*, Project Gutenberg EBook, <http://www.gutenberg.org/files/13115/13115-8.txt>.
- Ulanowicz, R. E. (1990). Aristotelean causalities in ecosystem development, *Oikos* **1**: 42–48.
- Ulrich, W. (1993). Some difficulties of ecological thinking, considered from a critical systems perspective: a plea for critical holism, *Systems Practice* **6**(6): 583–611.
- Ulrich, W. (2001). The quest for confidence in systematic practice, *Systems Research and Behavioural Science* **18**(1): 3–28.
- Umpleby, S. A. (2005). A history of the cybernetics movement in the united states, *Journal of the Washington Academy of Sciences* **91**(2): 54–66.

- Umpleby, S. and Dent, E. (1999). The origins and purposes of several traditions in systems theory and cybernetics, *Cybernetics and Systems: An International Journal* **30**: 79–103.
- UN (1987). Development and international economic co-operation: Environment, *Federal Office for Spatial Development (ARE)*, http://www.are.admin.ch/imperia/md/content/are/nachhaltigeentwicklung/brundtland_bericht.pdf, accessed 21/02/07.
- UN (1998). Kyoto protocol to the united nations framework convention on climate change, *UNFCCC*, <http://unfccc.int/resource/docs/convkp/kpeng.pdf>, accessed 21/04/10.
- UN (2009). Status of ratification, *UNFCCC*, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php, accessed 21/04/10.
- UNDP (2007). Human development report 2007/2008. fighting climate change: Human solidarity in a divided world, *Technical report*, United Nations Development Program.
- UNEP (1972). Declaration of the united nations conference on the human environment, *UNEP*, <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=97&articleid=1503>, accessed 21/04/10.
- UNFCCC (2009). United nations framework covention on climate change, *Technical report*, United Nations, [Online], *United Nations*, http://www.unifem.org/attachments/partnerships/climate_change/lac_text_15_Sept_2009.pdf, accessed 28/04/2010.
- UNSD (2009). Social indicators, *United Nations Statistical Division*, <http://unstats.un.org/unsd/demographic/products/socind/inc-eco.htm\#tech>, accessed 26/04/10.
- UoCambridge (2006). Green procurement guide: Environmental accreditations and logos, *Technical report*, University of Cambridge.

- UoH (2008a). Annual report 07/08. the university of hull, *Technical report*, University of Hull.
- UoH (2008b). Fare's fair at the university of hull, *The University of Hull*, http://www2.hull.ac.uk/news_and_events/news/2008_news_archive/january/fairtrade.aspx, accessed 11/01/10.
- UoH (2008c). Higher education carbon management. opportunities workshop - 18th june 2008, Presentation.
- UoH (2008d). Statement of accounts 07/08. the university of hull, *Technical report*, University of Hull.
- UoLeeds (n.d.). Power saving on pcs, *University of Leeds*, http://iss.leeds.ac.uk/info/278/power_saving/356/power_saving_on_pcs, accessed 09/05/2010.
- Urry, J. (2003). Social networks, travel and talk, *British Journal of Sociology* **54**(2): 155–175.
- Vaidya, O. S. and Kumar, S. (2006). Analytic hierarchy process: An overview of applications, *European Journal of Operational Research* **169**: 1–29.
- van Aalst, M. K., Cannon, T. and Burton, I. (2008). Community level adaptation to climate change: The potential role of participatory community risk assessment, *Global Environmental Change* **18**: 165–179.
- van den Berg, A. E., Koole, S. L. and van der Wulp, N. Y. (2003). Environmental preference and restoration: (how) are they related?, *Journal of Environmental Psychology* **23**(2): 135–146.
- van de Ven, B. and Jeurissen, R. (2005). Competing responsibly, *Business Ethics Quarterly* **15**(2): 299–317.
- van Kleef, J. and Roome, N. (2007). Developing capabilities and competence for sustainable business management as innovation: A research agenda, *Journal of Cleaner Production* **15**(1): 38–51.

- van Winsum, A. (2004). A practical guide to employing an environmental manager / sustainability officer for universities and colleges, *Technical report*, The Environmental Association for Universities and Colleges.
- Varela, F. G., Maturana, H. R. and Uribe, R. (1974). Autopoiesis: The organisation of living systems, it's characterisation and a model, *Biosystems* **5**: 187–196.
- Vermeij, G. T. (1993). Biogeography of recently extinct marine species: Implications for conservation, *Conservation Biology* **7**(2): 391–397.
- Vidal, R. V. V. (2009). Community facilitation of problem structuring and decision making processes: Experiences from the eu leader+ programme, *European Journal of Operational Research* **199**: 803810.
- Viebahn, P. (2002). Papers from 1999 environmental management conferencesustainable education. an environmental management model for universities: From environmental guidelines to staff involvement, *Journal of Cleaner Production* **10**: 312.
- Vilar, D. M. and Inglesa, F. (2001). The symbolic interaction theory in the violation of discourse principles, *Universitat Jaume*, <http://www.uji.es/bin/publ/edicions/jfi6/symbolic.pdf>, accessed 20/11/06.
- Vince, R. and Broussine, M. (1996). Paradox, defense and attachment: Accessing and working with emotions and relations underlying organizational change, *Organizational Studies* **17**(1): 1–21.
- Viskovatoff, A. (2002). Critical realism and kantian transcendental arguments, *Cambridge Journal of Economics* **26**: 697–708.
- Vogel, D. (2005). *The Hare and the Tortoise Revisted: The New Politics of Consumer and Environmental Regulation in Europe*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 13, pp. 225–252.

- Vogler, J. and Stephan, H. R. (2007). The european union in global environmental governance: Leadership in the making?, *International Environmental Agreements: Politics, Law and Economics* **7**: 389-413.
- Volk, T. (2003). Seeing deeper into gaia theory. a reply to lovelock's response, *Climate Change* **57**: 5-7.
- von Bertalanffy, L. (1950a). An outline of general systems theory, *The British Journal for the Philosophy of Science* **1**(2): 134-165.
- von Bertalanffy, L. (1950b). The theory of open systems in physics and biology, *Science* **111**(2872): 23-29.
- von Bertalanffy, L. (1972). The history and status of general systems theory, *The Academy of Management Journal* **15**(4): 407-426.
- Vonholdt, B. M., Stahler, D. R., Smith, D. W., Earl, D. A., Pollinger, J. P. and Wayne, R. K. (2008). The genealogy and genetic viability of reintroduced yellowstone grey wolves, *Molecular Ecology* **17**: 252-274.
- Vos, J. F. J. (2003). Corporate social responsibility and the identification of stakeholders, *Corporate Social - Responsibility and Environmental Management* **10**(3): 141-152.
- Vrasidas, C. (2000). Constructionism versus objectivism: Implications for interaction, course design and evaluation in distance education, *International Journal of Educational Telecommunications* **6**(4): 339-362.
- Wal-Mart: The High Cost of Low Price (2005). Film, Brave New Films, Robert Greenwald.
- Walker, D., Pitt, M. and Thakur, U. J. (2007). Environmental management systems. information management and corporate responsibility, *Environmental Management Systems* **5**(1): 49-61.

- Walker, J. (1998). The viable systems model a guide for co-operatives and federations, *ESRAD* http://www.esrad.org.uk/resources/vsmg_2.2/pdf/vsmg_2_2.pdf, accessed 29/08/07.
- Walker, K. R., Ricciardone, M. D. and Jensen, J. (2006). Developing and international consensus on ddt: A balance of environmental protection and disease control, *Organization Studies* **27**(3): 341–368.
- Walsh, B. (2007). Green acres, *Time* **170**(12): 55–57.
- Walton, J., Alabaster, T. and Jones, K. (2000). Environmental accountability: Whos kidding whom?, *Environmental Management* **26**(5): 515–526.
- Wamsley, M. (1999). Responding to pfiesteria: Increasing stakeholder understanding and collaboration through anthropological research, *Technical report*, University of Maryland.
- Wang, Y., Qiu, L., Ranson, H., Lumjuan, N., Hemingway, J., Setzer, W. N., Meehan, E. J. and Chen, L. (2008). Structure of an insect epsilon class glutathione s-transferase from the malaria vector *Anopheles gambiae* provides an explanation for the high ddt-detoxifying activity, *Journal of Structural Biology* **164**: 228–235.
- Warburton, K. (2003). Deep learning and education for sustainability, *International Journal of Sustainability in Higher Education* **4**(1): 44–56.
- Waring, A. (1996). *Practical Systems Thinking*, Thomson, London.
- Warren, L. (2003). Toward critical intervention in small and medium-sized enterprises: A case study, *Systemic Practice and Action Research* **16**(3): 197–211.
- Wasserman, S. and Faust, K. (1994). *Social Network Analysis: Methods and Applications*, Cambridge University.
- Watson, A. J. and Lovelock, J. E. (1983). Biological homeostasis of the global environment, *Tellus* **35B**: 284–289.

- Weale, A. (2005). *Environmental Rules and Rule-making in the European Union*, Environmental Policy in the European Union. Actors, Institutions and Processes, 2 edn, Earthscan, chapter 8, pp. 125–140.
- Weaver, G. R., Treviño, L. K. and Cochran, P. L. (1999). Corporate ethics programs as control systems: Influences of executive commitment and environmental factors, *The Academy of Management Journal* **42**(1): 41–57.
- Weibel, E. R. (2000). *Symmorphosis: On Form and Function in Shaping Life*, Harvard, Cambridge.
- Wellman, B. (1983). Network analysis: Some basic principles, *Sociological Theory* **1**: 155–200.
- Wenski, T. G. (2009). The challenge of climate change and environmental justice: A distinctive catholic contribution, *Notre Dame Journal of Law, Ethics and Public Policy* **23**: 497–514.
- Wey, T., Blumstein, D. T., Shen, W. and Jordàn, F. (2008). Social network analysis of animal behaviour: a promising tool for the study of sociality, *Animal Behaviour* **75**: 333–344.
- Whitaker, R. (2003). Pre-history of cybernetics, *ASC*, <http://www.asc-cybernetics.org/foundations/history/prehistory7.htm>, accessed 08/06/2010.
- White, L. (2002). Size matters: Large group methods and the process of operational research, *The Journal of the Operational Research Society* **53**(2): 149–160.
- White, L. (2009). Understanding problem structuring methods interventions, *European Journal of Operational Research* **199**: 823833.
- White, L. and Lee, G. J. (2009). Operational research and sustainable development: Tackling the social dimension, *European Journal of Operational Research* **193**: 683–692.

- Whitehouse, M. E. A. and Jaffe, K. (1996). Ant wars: Combat strategies, territory and nest defence in the leaf-cutting ant *atta laevigata*, *Animal Behaviour* **51**(6): 1207–1217.
- Whitmarsh, L. (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts, *Journal of Environmental Psychology* **29**: 13–23.
- Whitmarsh, L. and O’Neil, S. (2010). Green identity, green living? the role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours, *Journal of Psychology* **XXX**: 1–10.
- Wiener, N. (1966). *God and Golem Inc. A Comment on Certain Points where Cybernetics Impinges on Religion*, MIT, Cambridge.
- Willard, B. (2002). *The Sustainability Advantage: Seven Business Case Benefits of A Triple Bottom Line*, New Society.
- Williams, M. (2000). Interpretivism and generalisation, *Sociology* **34**(2): 209–244.
- Wiser, R. and Pickle, S. (1997). Green marketing, renewables, and free riders: Increasing customer demand for a public good, *Technical report*, Environmental Energy Technologies Division, University of California.
- Wolfe, C. (1995). In search of post-humanist theory: The second-order cybernetics of maturana and varela, *Cultural Critique* **30**(3): 33–70.
- Wu, W. and Lee, Y. T. (2007). Selecting knowledge management strategies by using the analytic network process, *Expert Systems with Applications* **32**: 841847.
- Yandle, B. (1999). Public choice at the intersection of environmental law and economics, *European Journal of Law and Economics* **8**(1): 5–27.
- Yang, C. and Yen, H. (2007). A viable systems perspective to knowledge management, *Kybernetes* **36**(5/6): 636–651.
- Young, O. R., Berkhout, F., Gallopin, G. C., Janssen, M. A., Ostrom, E. and van der Leeuw, S. (2006). The globalisation of socio-ecological systems: An agenda for scientific research, *Global Environmental Change* **16**: 304–316.

- Zanakis, S. H., Alvarez, C. and Li, V. (2007). Socio-economic determinants of hiv/aids pandemic and nations efficiencies, *European Journal of Operational Research* **176**: 1811-1838.
- Zetterström, R. (2007). Nobel prizes for discovering the cause of malaria and the means of bringing the disease under control: Hopes and disappointments, *Acta Paediatrica* **96**(10): 1546–1550.
- Zheng, M., Kashimori, Y., Hoshino, O., Fujita, K. and Kambara, T. (2005). Behavior pattern (innate action) of individuals in fish schools generating efficient collective evasion from predation, *Journal of Theoretical Biology* **235**(2): 153–167.
- Zhu, Z. (1998). Conscious mind, forgetting mind: Two approaches in multimethodology, *Systemic Practice and Action Research* **11**(6): 669–690.
- Zikmund, W. G. (2002). *Business Research Methods*, 7th edn, Southwestern College, Mason.

Appendix A

EWG Minutes

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
20th JUNE 2006, AT 14:30 PM
IN LOCATION 1**

1. Apologies
2. Initial Assessment
3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
20th JUNE 2006, AT 14:30 PM
IN LOCATION 1**

PRESENT: H, BBBB, X, II, KATHRYN KNOWLES, XX.

- 1. APOLOGIES**
- 2. INITIAL ASSESSMENT**

- The group discussed the establishment of a EWG Plan.

3. MATTERS ARISING

Work Allocation

1. Wait for the approval of the Dean, before committing resources.
2. Contact Local Authority.
3. Focus upon the identification of improvements within the Estates facilities.
4. Set up a distribution list.
5. Look for funding groups - II will speak with CCCCC.

Action ALL

6. KATHRYN KNOWLES will record minutes of group meetings and conduct interdisciplinary postgraduate research to support the group actions.

Action KATHRYN KNOWLES

4. CHAIR'S BUSINESS

- The group will meet twice a semester.
- The group will be called the EWG.
- The Terms of Reference for the EWG are: Transport Policy, Energy Efficiency, Resources, Estates and Corporate Ethic.
- The EWG will attempt to minimise the environmental footprint of the campus and produce concrete recommendations for improvements to OrgX academic management committee.
- Our remit is to examine the environmental footprint of OrgX focusing upon the core principles of transport policy, energy efficiency, resources and estates facilities.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

13th October 2006

ORGX

EWG

AGENDA FOR THE MEETING TO BE HELD ON
23th OCTOBER 2006, AT 12:30 PM
IN LOCATION 1

1. Apologies
2. Minutes of the Meeting Held on the 20th June 2006

previously circulated

3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

AGENDA FOR THE MEETING TO BE HELD ON
13th OCTOBER 2006, AT 12:30 PM
IN LOCATION 1

PRESENT: X, II, KATHRYN KNOWLES, HH, AAA.

1. APOLOGIES
2. MINUTES OF THE MEETING HELD ON 13TH OCTOBER 2006

- The minutes of the initial meeting held on 20th June 2006 were not circulated.
- A basic Environmental Action Plan was provided for all attending members.

3. MATTERS ARISING
Work Allocation

1. Obtain informative posters regarding energy usage.

Action HH

2. Contact the new Energy Manager at the OrgX(b) for practical recommendations.

Action HH

3. Contact Local Authority to discuss a recycling strategy.

Action HH

4. Ensure new refrigerator in the catering department meets environmental standards.

Action AAA

5. Contact Bradford University for recommendations on successful environmental strategies.

Action II

6. Continue environmental research and develop an in-depth EAP with practical recommendations, for the EWG.

Action KATHRYN KNOWLES

7. Report the latest group agendas to OrgX academic management committee.

Action X and II

4. CHAIR'S BUSINESS

- The group will meet in December to establish any progress achieved.
- All members of the group will try and increase awareness of the EWG goals and attempt to engender support from colleagues.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

- HH informed the group that the following activities are presently being undertaken: strategies for reduced lighting, potential for recycled paper towels, most chemical-based products are biodegradable, printer ink cartridges, white paper, lights and electrics are recycled.
- HH informed the group that ZZZ has obtained a quote for the installation of a wind turbine on the university grounds, but council permission has not yet been received.

- HH informed the group that she would like a greenhouse removing on the grounds so that the area can be made into a seating area with bird tables and a pond. This would require a non-smoking policy in order to encourage birds and other wildlife to reuse the area.
- AAA informed the group that her ability to purchase local produce is limited by the formal requirements set by her supervisors.
- AAA informed the group that the catering staff recycle oil and glass, and use biodegradable bin liners.
- AAA informed the group that catering facilities now purchase recyclable drinks containers but do not have the necessary bins to store the used products.

7. DATE OF NEXT MEETING

16th February 2007

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
16th FEBRUARY 2007, AT 12:30 PM
IN LOCATION 1**

1. Apologies
2. Minutes of the Meeting Held on the 13th October 2006

previously circulated

3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
16th FEBRUARY 2007, AT 12:30 PM
IN LOCATION 1**

PRESENT: H, X, KATHRYN KNOWLES, HH.

1. APOLOGIES

II

2. MINUTES OF THE MEETING HELD ON 16TH FEBRUARY 2007

- The minutes of the initial meeting held on 13th October 2007 were not circulated.

3. MATTERS ARISING

Work Allocation

1. Circulate an email to administrative teams to become aware of environmental issues i.e. recycle envelopes.

Action X

2. Ask OrgX academic management committee for representatives from each department and potential funding.

Action HH

3. Plan an environmental awareness lunch.

Action KATHRYN KNOWLES

4. Conduct surveys within the campus to determine current environmental activities.

Action KATHRYN KNOWLESs

5. Contact local charity Basic Plus regarding cardboard collection.

Action HH

4. CHAIR'S BUSINESS

5. PROGRESS

6. ANY OTHER BUSINESS

- HH informed the group that new paper and toilet roll dispensers have been bought for OrgX.
- H informed the group that he has purchased a printer for his office with a duplex facility.
- The group discussed the importance of engaging the culture of OrgX in environmental activities.
- HH raised concerns of storage in OrgX and alternative methods of assignment submission within departments was discussed.

7. DATE OF NEXT MEETING

To be confirmed

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
12 October 2007, AT 12:30 PM
IN LOCATION 1**

1. Apologies
2. Initial Assessment
3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
12 October 2007, AT 12:30 PM
IN LOCATION 1**

PRESENT: X, KATHRYN KNOWLES, BBBBB, HH, AAA, DDDDD.

- 1. APOLOGIES**
- 2. INITIAL ASSESSMENT**

- The group discussed the development of an Environmental Day in 2008.

3. MATTERS ARISING

Work Allocation

1. Recycling of cups and cans at OrgX could be developed, but there is insufficient storage.
2. Student Halls are badly damaged:
 - Ceiling tiles have been removed.
 - The disabled access door has been smashed.

- Fire signs and room numbers have been removed.
 - Litter has been thrown out of windows.
 - Sick on the floors.
3. Tree at the back of the kitchens have been cut down for storage and deliveries.
 4. Recyclable paper now in bathrooms.
 5. Added recycling bins will soon be available at OrgX.
 6. Student names to X, so that a warning can be issued about the possibility of criminal damage charges.
 7. Kitchen staff have been recycling paper and glass.
 8. Possibility of placing shredded paper into household composting.
 9. Decision to develop recycling initially within departments, and include students at a later date.
 10. Consensus of the group to start with small activities and gradually build upon achievements.
 11. Group fundraising for trees to be planted on site - initial ideas to have an environmental event on site, where people can purchase drinks and eco-related items. Potential for a raffle to win an organic hamper.
 12. Research into the plants that would be suitable to plant on site.
 13. Time the event around the BBC Springwatch.
 14. Contact III to see if collages could be made to promote the event.

4. CHAIR'S BUSINESS

- The group needs to develop plans for the environmental day for the next meeting.

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

25th January 2008

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
25th January 2008, AT 12:30 PM
IN LOCATION 1**

- 1. Apologies**
- 2. Initial Assessment**
- 3. Matters Arising**
- 4. Chair's Business**
- 5. Progress**
- 6. Any Other Business**

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
25th January 2008, AT 12:30 PM
IN LOCATION 1**

PRESENT: X, KATHRYN KNOWLES, XX, HH, AAA, DDDDD.

- 1. APOLOGIES**
- 2. INITIAL ASSESSMENT**

- The group discussed the upcoming Environmental Action Awareness Day.
- The group discussed how to spend the funding gained by X, to develop OrgX's natural boundaries.

3. MATTERS ARISING

Work Allocation

- 1. Develop awareness of the Environmental Action Awareness Day within departments, to be held on March 5th 2008 at 12:30pm in the caf area.**

Action ALL

2. Encourage own departments to donate items to the event - books, plants, seeds, unwanted Christmas gifts.

Action ALL

3. Try and get an advert for the event upon the flat screen television in the main reception.

Action X

4. Contact III for a display to help advertise the Environmental Action Awareness Day.

Action HH

5. Check with JJ as to the possibility of a Raffle at the event.

Action HH

6. Book the Mobiles and cafe for the event, if possible book a mobile the day before to act as a storage area.

Action HH

7. XX will contact his PhD student to acquire pictures of OrgX that can be sold at the event.

Action XX

8. Provide the tea, coffee and biscuits for the event (at a charge of 50p).

Action AAA

9. Contact EEEEE within the Student Union to encourage their involvement.

Action AAA

4. CHAIR'S BUSINESS

- The group needs to plan the new design for OrgX's boundaries.

- Current suggestions are:
 - Leave one metre of uncut grass around the boundary.
 - Develop the Hawthorn hedge that borders with the Golf course grounds.
 - If necessary remove the dead tree on the grounds, but leave the remnants for local wildlife.
 - Replant the Snowdrops from the canteen into the boundary.
 - Plant Bluebells within the woodland area.
 - Plant Alder trees next to the tennis court where there is excessive water.
 - Plant Crabapple trees on the boundary to block the view of the fences.
 - Plant Scots Pine on the boundary to block the view of the newly built road.
 - Plant Blackthorn, making sure that it is a suitable distance from the football pitch.
- Check security of the border - X, HH, GG and the gardeners.
- Ensure that new plantings are properly protected from local wildlife.
- For the next meeting, develop suggestions for the boundary design i.e. hedgerow, trees and shrubbery.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

29th February 2008

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
22nd February 2008, AT 12:00 PM**

1. Apologies
2. Initial Assessment
3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
22nd February 2008, AT 12:00 PM**

PRESENT: X, KATHRYN KNOWLES, XX, HH, AAA, DDDDD.

1. APOLOGIES
2. INITIAL ASSESSMENT

- The group discussed the upcoming Environmental Action Awareness Day.
- The group discussed how to spend the funding gained by X, to develop the Campus boundaries.

3. MATTERS ARISING

Work Allocation

1. Continue to develop awareness of the Environmental Action Awareness Day within departments, to be held on March 5th 2008 at 12:30pm in cafe.

Action ALL

2. Continue to encourage own departments to donate items to the event - books, plants, seeds, unwanted Christmas gifts.

Action ALL

3. Gather details of bird-box web-cam details and send to HH.

Action X

4. Determine a suitable North facing wall for the bird-box/web-cam to be situated.

Action HH

5. Tender for tree planting scheme from the usual gardening company to be rejected.

Action X

6. Formally accept Countrywide tender for tree planting.

Action HH

7. XX will contact the head of SHRUBs to discuss the involvement of the group within the tree planting scheme.

Action XX

8. Details of potential web-cam equipment to be sent to HH.

Action X

9. Check the possibility of having a compost bin on site, to be situated next to the compost bin owned by the golf course.

Action HH

4. CHAIR'S BUSINESS

- The group decided to use the supplier Countrywide as recommended by OrgX(b) colleague, to complete the tree planting scheme.
- Environmental awareness day:

- The group has been allocated Mobile 2 for storage of items.
 - HH will supply greetings cards and plaques.
 - XX and AAA will send collected pictures to III.
 - The group and other volunteers will bring what plants they can spare from their gardens for the sale.
 - Display boards will be used to advertise current achievements and planned actions - 1. Our Beautiful Campus (Photos), 2. The Bid (Photos, Tree Strategy, Plan of Boundaries), 3. Recycling (Bins, Paper and Cardboard, Taps, Batteries, Toner Cartridges, New Boilers), 4. Future (Web-Cam/Bird-Box, Spring Watch, Flower Planting, Recycling), proposition of 'What Can You Do?'.
 - Countrywide tender and OrgX(b) colleague should be at OrgX for the day.
 - Members should try and bring in used carrier bags, boxes and cartons.
 - Members should bring 5 change to start the cash flow at the beginning of the day and take this back at the end.
 - Liz provided the slides to be used on the reception screen to advertise the event.
 - Ruth, Elaine and Kathryn will meet the day before the event to label all the items for sale.
- The group has learned from OrgX(b) Energy Manager that OrgX has reduced its electricity consumption by 5% and water consumption by 16%.
 - For the next meeting, develop suggestions for the boundary design i.e. hedgerow, trees and shrubbery.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

10th July 2008

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

10th July 2008

ORGX

EWG

AGENDA FOR THE MEETING TO BE HELD ON
10th July 2008, AT 12:0 PM
IN LOCATION 1

1. Apologies
2. Initial Assessment
3. Matters Arising
4. Chair's Business
5. Progress
6. Any Other Business

ORGX

EWG

AGENDA FOR THE MEETING TO BE HELD ON
10th July 2008, AT 12:0 PM
IN LOCATION 1

PRESENT: BBBBB, X, KATHRYN KNOWLES, HH, DDDDD.

1. APOLOGIES
2. INITIAL ASSESSMENT

- The group discussed possible advertising strategies for the group.
- The group discussed how to spend the remaining funds to develop OrgX's boundaries.

3. MATTERS ARISING

Work Allocation

1. Contact III for pictures of wildlife at OrgX to be included in EWG logo.

Action KATHRYN KNOWLES

2. Contact JJ for garden suppliers to purchase flowers for planting in October.

Action HH

3. Establish costs of notice board and send details to DDDDD and KATHRYN KNOWLES.

Action HH

4. Establish feasibility of funding for EWG notice board and Freshers Fair Stall.

Action DDDDD and KATHRYN KNOWLES

5. Contact local schools for involvement in flower plantins.

Action KATHRYN KNOWLES

6. Make an official record within OrgX's academic management committee that the new building on site should be of eco-design.

Action X

7. Discuss the potential of local food sourcing within relevant committees, with reference to new procedural control at OrgX.

Action X and DDDDD

4. CHAIR'S BUSINESS

- The group needs to start advertising their achievements more:
 - Use of internal website facility. The group agreed that the web-page content developed by KATHRYN KNOWLES was suitable for use on this stie.
 - Development of EWG notice board on site.
 - From October the group will have open meetings on the first Wednesday of every month, at 2pm in the cafe. Anyone can attend.

- Start liasing with other groups at OrgX, such as SHRUBs.
- Involve local community within flower planting.
- DDDDD informed the group that eco-bags are now being bought to give to all staff and students.
- Elaine informed the group that a new employee has been hired who will ensure the cleanliness of the grounds and will also collect office recyclables.
- The group agreed to send the minutes of the meetings to OrgX(b) Energy Manager to help coordinate the efforts of both sites' EAGs.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

25th September 2008

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
25th September 2008, AT 14:00 PM
IN LOCATION 1**

- 1. Apologies**
- 2. Initial Assessment**
- 3. Matters Arising**
- 4. Chair's Business**
- 5. Progress**
- 6. Any Other Business**

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
25th September 2008, AT 14:00 PM
IN LOCATION 1**

PRESENT: HHHH, DDDDD, A, BBBBB, X, KATHRYN KNOWLES, HH, AAA, RRRR.

- 1. APOLOGIES**
- 2. INITIAL ASSESSMENT**

- The group discussed possible connections with local primary schools for planting day.
- The group discussed the upcoming Freshers Week and EWG stall - decision to distribute acorns for students to 'grow', pumpkin competition to fund bat boxes, pictures of previous work, student sign-up sheet, simple faCt sheets.
- The group discussed how to spend the remaining Alumni funds, 2000.

- 3. MATTERS ARISING**
Work Allocation

- 1. Bring acorns, plant pots and compost.**

Action HHHH and X.

- 2. Contact SHRUBS for help with planting.**

Action A

- 3. Supply pumpkin from local area.**

Action HHHH

- 4. Continue to bring donations for the harvest hamper.**

Action All

4. CHAIR'S BUSINESS

- HH informed the group that a new a new gardener has been employed who will work 3 times a week.
- HH informed the group that all trees removed on site will be replanted, small recycling bins for offices have been ordered and there are new benches in the outdoor seating area.
- The group should consider designs and donations for the HarveSt Hamper competition.

Action ALL

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

22nd October 2008

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
22nd October 2008, AT 14:00 PM
IN LOCATION 1**

- 1. Apologies**
- 2. Initial Assessment**
- 3. Matters Arising**
- 4. Chair's Business**
- 5. Progress**
- 6. Any Other Business**

ORGX

EWG

**AGENDA FOR THE MEETING TO BE HELD ON
22nd October 2008, AT 14:00 PM
IN LOCATION 1**

PRESENT: A, X, KATHRYN KNOWLES, AAA.

- 1. APOLOGIES:** HHHH, DDDDD, BBBB, HH, RRRR.
- 2. INITIAL ASSESSMENT**

- The group discussed the potential of installing a wildlife pond in conjunction with Local Authority.
- The group discussed the upcoming pumpkin and harvest hamper competitions. It was decided that the pumpkin raffle would be set at 20p and the harvest hamper 1 per ticket.
- The group discussed the upcoming Staff Development Day based upon sustainability concepts.

3. MATTERS ARISING

Work Allocation

- 1. Meet with Local Authority to discuss volunteers for OrgX Planting Day and potential wildlife pond.**

Action KATHRYN KNOWLES.

2. Continue to bring donations for the harvest hamper.

Action All

3. Establish status of bird-box web-cam installation.

Action KATHRYN KNOWLES

4. Prepare grounds for OrgX planting day.

Action A

5. Document recent activities and include in OrgX employee newsletter.

Action KATHRYN KNOWLES

6. Conduct the pumpkin and harvest hamper competitions.

Action AAA

4. CHAIR'S BUSINESS

- A informed the group that the new hedging needs replanting, and the privet and nettles need to be cleared.
- KATHRYN KNOWLES informed the group that she has been invited to present a workshop at the upcoming Staff Development Day. All EWG members have been invited to participate in the workshop and poster event.

5. PROGRESS

6. ANY OTHER BUSINESS

7. DATE OF NEXT MEETING

5th December 2008

The following minutes for the EWG were conducted by OrgX's administrative personnel as discussed within the Team Syntegrity workshop.

**NOTES OF THE EWG
MEETING HELD ON FRIDAY 5 DECEMBER 2008
IN LOCATION... AT 2.00PM**

Membership Category	Department	05/12/08	
X	-	✓	
HH	-	-	
DDDDD	-	✓	
EEEE	-	-	
HHHH	-	✓	
OrgX(b) Energy Manager	-	✓	
ZZZ	-	Apol	
Kathryn Knowles	-	✓	
AAA	-	-	
RRRR	-	✓	
JJ	-	✓	
XX	-	-	
A	-	✓	

In attendance: FFFFF (Notes) J (Deputy)

Action:

1 **Apologies for absence:** Apologies were received from zzz.

2 **Matters relating to Terms of Reference and Membership:**
It was proposed that LLL be appointed to represent -, ZZZ to represent the - and RRRR, -. YYYY would like to be involved and represent - with a and it was agreed that he and other interested members of staff could be approached to give talks. The - have still to appoint a representative. X to speak to U concerning the appointment of an OrgX Environmental Officer. Proposed changes to the format of the minutes of the meeting were approved.

Agreed

X

3 **Notes of the Previous Meeting held on 22 October 2008:**

Agreed

4 **Chairs Business:** The chair had no business to discuss.

5 **Planting Update:** KK Informed the members the planting day had been very successful. There were nine Scarborough volunteers and 13 students. Catering Staff provided refreshments and all the plants were planted in two hours. X asked for thanks to be minuted to - for his involvement. X suggested we should monitor the planting in Spring and Summer and ask the gardening contractor to make changes where appropriate. A suggested that the bluebells planted will seed very well, and informed the group the hedgerow is now planted correctly. X informed the members that they had some approximately £1000.00 left from the Alumni and Development Fund bid, and asked for suggestions

from the group of what they would like spend the money on. Several suggestions were put forward. X asked the group to email suggestions to her.

All

- 6 **Update on current Status of :**
- (a) **The Higher Education Carbon Management Programme and how it affects Scarborough:** OrgX(b) Energy Manager gave a presentation to the group members and the effects on the OrgX.
 - (b) **Carbon Footprint 2007:** OrgX(b) Energy Manager explained about the University Carbon footprint and how it effect's both OrgX and OrgX(b).
 - (c) **Carbon Reductions mechanisms and influencers for Scarborough:** OrgX(b) Energy Manager explained the code of practice for students on both campuses and offered to supply a copy of the presentation to all members. The group also discussed PC Hibernation, and power down for PC's and for photocopiers, and RRRR asked if we could investigate the use of Power Down in the IT areas. X (Chair) thanked OrgX(b) Energy Manager for his presentation.

- 7 **Campus New Build:**
- (a) **Concerns re Trees and other Environmental Aspects:**
RRRR asked group members if they had had an opportunity to look at the 'New Build Strategic Plan' that had been on view in the main Reception. RRRR was concerned that the proposed new build was positioned over some mature trees. RRRR asked the group how final the plans were, and whether EWG would be consulted on these plans. RRRR was also concerned at the changes to the flowerbeds which he felt needed to retain traditional planting to fit with the building and grounds.
 - (b) **Transitional phases:**
 - (c) RRRR expressed his concerns on how the new build might affect OrgX and the phases involved in the new build. He gave the example of York St John, where trees were removed with no warning. It was suggested we talk to -.

- 8 **Vice Chancellors 'Special' Environmental Prize:** The group would like to apply for the Vice Chancellors prize to fund a wild life pond. X asked KK to progress with this, and thanked KK for all the work she had done for the group.

KK

- 9 **Any other Business:**
- (a) Future Meetings for the group are scheduled for February, June and October 2009, dates to follow. KK Suggested we look at using the video conferencing facilities available on the campus. X We need to all talk about this. **KK**
 - (b) KK informed the group she had been asked to do a further workshop by the Staff Development team. KK asked if any of the group would like to be involved. **KK**

Minute	Action List	Date initiated	By who	By when
--------	-------------	----------------	--------	---------

2	Terms of Reference and membership: X to speak to U concerning appointment of an OrgX Environmental Officer	05/12/08	X	ASAP
5	Planting update: All Members to email X with suggestions for spending the remaining £1000.00	05/12/08	X	All
8	Vice Chancellors Environmental Prize: KK To progress this and get back to group	05/12/08	KK	ASAP
9	Any other Business: (a) KK Suggested using video conferencing for meetings with OrgX(b) (b) KK Has been asked to do a further workshop by Staff Development	05/12/08 05/12/08	KK KK	KK All

**NOTES OF THE EWG
MEETING HELD ON WEDNESDAY 4 MARCH 2009
IN LOCATION... AT 2.00PM**

Membership Category	Department	05/12/08	04/03/09
X	-	✓	✓
HH	-	-	Apols
DDDDD	-	✓	✓
EEEE	-	-	Apols
HHHH	-	✓	✓
OrgX(b) Energy Manager	-	✓	Apols
ZZZ	-	Apols	Apols
Kathryn Knowles	-	✓	✓
AAA	-	-	✓
RRRR	-	✓	-
JJ	-	✓	✓
XX	-	-	- Deputised by YYYY
A	-	✓	Apols

In attendance: FFFFF (Notes) J (Deputy)

- Action:**
Agreed
- 10 **Notes of Meeting held on 5 December 2008:**
- 11 **Update on Campus Initiatives:**
The group discussed at length the introduction of the recycling policy. X asked if staff could be informed about the new recycling policy which has been implemented at OrgX(b). JJ stated offices would soon have recycling bins outside offices and it will be the responsibility of each member of staff to empty their own office bins into these. AAA raised a concern re: the Catering Department as to how they were going to introduce the policy in their area. **JJ**
- 12 **Update from Kathryn Knowles on External Links:**
There is a new compost training in the region, - have set up a training scheme, it will be either available at the weekend or evenings for those with an interest in composting. X asked KK how her contribution to the weekly Green Page column was progressing in a local newspaper. KK explained that it went well even though it was heavily edited. **KK**
- 13 **Plans for the Following Year:**
X asked if anyone had plans to discuss. KK suggested more links with the SU like the pumpkin competition in which we could get students involved. Suggested annual or seasonal competitions with an environmental theme. AAA pointed out that not many students or staff participated in the hamper competition, it was very difficult to sell tickets. X suggested we should **KK**

think more clearly as to what the next competition should be and keep it modest but questioned whether we have any students who would like to take part. X stated it is not that easy to get people involved as they all have busy lifestyles.

- 14 **Student Union Representative – work with SU for Student Outreach:**
X asked KK to speak to SU to get someone to succeed KK when she leaves in November. **KK**
- 15 **Environmental officer:** EWG/Environmental Activity within OrgX KK **JJ**
suggested we canvas members of Group to be 'Face' of EWG
JJ to speak to HH.
- 16 **Action List:**
- a) **Min 2: Appointment of Campus Environmental Officer:** X had **JJ**
spoken to U re: appointment of Campus Environmental officer. KK is
due to leave in November 2009; someone to take control temporarily.
JJ suggested HH to take role on.
- b) **Min 5: Planting update - Suggestions for spending of remaining
funding:** X suggested money that we have left could be used for **X**
animal welfare i.e. Animal Housing. The problem could be finding
companies which are on the suppliers list. X suggested two
companies Nest Boxes and the RSPB X to look at putting the
companies on as new suppliers.
- c) **Min 8: Vice Chancellor's Environmental Prize (Wildlife Pond):** X **JJ**
asked KK if she had heard anything regarding the Vice-Chancellor's
Environmental Prize. KK stated the information was unavailable at this
time. Agreed Local Authority to be contacted over the wildlife pond
and be kept informed as to future expenditure of funds. X asked KK if
she would be happy to continue in her role until a new person was in **JJ**
place and KK agreed to continue. X asked JJ to check with HH if the
bird box with the camera had been put in place.
- 17 **Chairs Business:** **None**
- 18 **Any Other Business:**
- (a) **KK asked about the architects' plan and was OrgX(b) Energy
Manager involved?** **JJ**
After a lengthy discussion between JJ and KK it was agreed that JJ would
speak to the architects designing the new build at OrgX and report back at
the next meeting.
- (b) **HE could the students who live in halls have an environmental
competition?** KK reported there had previously been a successful
sculpture competition which would be followed up at the OrgX staff
development day on March 31st.
- (c) **Staff development** X indicated that the staff development day will be
all about sustainability including environmental sustainability.
- 19 **Date of Next Meeting:** **To follow**
To be arranged

<u>Minute</u>	<u>Action List</u>	<u>Date initiated</u>	<u>By who</u>	<u>By when</u>
11	<u>Update on campus initiatives</u> – JJ to update on start of new policy	4/03/2009	JJ	Next Meeting
12	<u>Update from KK on external links</u> KK to	4/03/2009	KK	Next

	update			Meeting
13	<u>Plans for following year</u> Student involvement	4/03/2009	X	Next Meeting
14	<u>Student Union Representation</u> KK to meet with SU for student outreach.	4/03/2009	KK	Next Meeting
16a	<u>Min 2 Appointment of Environmental officer</u> JJ to speak to HH	05/12/09	JJ	Next Meeting
16b	<u>Min 5 – Suggestions for spending remaining funding:</u> X to add companies to supply list	05/12/09	X	ASAP
17c	<u>Min 8 Vice Chancellors Environmental Prize:</u> JJ to speak to HH re Bird Boxes.	05/15/09	JJ	ASAP
18(a)	<u>Architects' Plans:</u> JJ to report back	04/03/09	JJ	Next Meeting

NOTES OF THE EWG
MEETING HELD ON WEDNESDAY 28 OCTOBER 2009
IN LOCATION... AT 12.30PM

Membership Category	Department	28/10/2009	
X	-	✓	
HH	-	Apologies	
DDDDD	-	✓	
EEEEEE	-	Apologies	
HHHH	-	✓	
OrgX(b) Energy Manager	-	Apologies	
ZZZ	-	✓	
Kathryn Knowles	-	-	
AAA	-	-	
RRRR	-	✓	
JJ	-	-	
XX	-	-	
A	-	Apologies	
X	-	Apologies	

In attendance: J (Notes)

Action:

20 **Notes of Meeting held on 3 March 2009:** Agreed.

21 **Matters Arising and Actions:**

- (a) **Minute 11 Update on campus initiatives:** JJ advised that recycling bins were in place and reminded people to make sure bottles etc. were empty and washed before going into the bin. Clear signage linked to the Local Authority recycling procedure will be placed above the bins in the near future. Bins in the office will not be removed as it will be up to each individual to empty their own.
- (b) **Minute 12 Update from KK on external links:** After initial contact with SU and GGGGG, Accommodation Office, GGGGG is engaging with students in an attempt to get them recycling.
- (c) **Minutes 13 Plans for the Following Year:** Ongoing
- (d) **Minute 14 Student Union Representation:** Unfortunately there has not been much success.
- (e) **Min 16a Appointment of Environmental Officer:** Ongoing.
- (f) **Min 16b Suggestions for Spending Remaining Money:** The money was spent on nest boxes and animal homes which are now in place in the campus grounds. The camera needs to be working for the

nest box at the back of - in the Spring with a possibility of being fed live to the plasma screen in Reception for the March Open Day. KK to contact HH to ask that these are in place and working for Spring. A pond liner has also been donated and it is hoped that SHRUBS will set this up this year.

KK

(g) **Minutes 17c Vice Chancellors Environmental Prize:** No prize was received.

(h) **Minute 18a Architects' Plans:** JJ advised that the New Build was to green standards and environmentally friendly, and a helical windmill would be installed.

22 **Future Leadership:** X is retiring on the 31st December. KK is going to the OrgX(b). X we will need someone to lead this project and suggested that it is done on a yearly basis. JJ suggested that EM could keep it ticking over. KK advised GGGGG has expressed an interest in taking on this role. KK to ask GGGGG to take on the role. JJ will chair the next meeting.

KK

23 **Recycling Withdrawn Library Stock:** X suggested looking at different ways for recycling e.g. selling them. X to contact LLL to discuss the possibility.

X

24 **Chairs Business:** X thanked KK for all her help and support and expressed her thanks to all the people who have been involved with EWG in the past couple of years.

25 **Any Other Business:** JJ thanked X and KK for all their hard work since the setting up of the EWG Committee. X and KK thanked JJ and agreed that a lot has been achieved in a short time. They hoped that it would be kept going. X announced that KK had achieved a Northern Leadership Academy Fellowship, along with a paper jointly published with her supervisor. X suggested this should be sent to DDDDD to publicise. KK to send information to DDDDD. X asked KK to send published papers to EWG members. DDDDD reminded members to complete the Survey on behalf of - as per U email and also advised that she is the contact.

EH/KK

26 **Date of Next Meeting:** 20 January 2010 at 2.30pm in the Board Room

<u>Minute</u>	<u>Action List</u>	<u>By who</u>	<u>By when</u>
21(a)	Campus Initiatives Place signs on bins.	JJ	ASAP
21(f)	Suggestions for Spending Remaining Money Contact HH to ensure nest box camera equipment will be in place and working for Spring.	KK	ASAP
22	Future Leadership Ask GGGGG to take over her role.	KK	Next meeting
23	Recycling Withdrawn Library Stock Contact LLL to look at options.	X	Next Meeting
25	Any Other Business Send Fellowship details to DDDDD	KK	ASAP

25	Any Other Business Send published Papers to EWG members.	KK	ASAP
25	Any Other Business Publicise KK's Fellowship details.	EH	ASAP

Title and Category	Name
Chair	Aca A
Secretary	Serv D
Bursar	JJ
Appointed Members Department Representatives:	
Aca C	A and YYYY
Aca D	<i>To be appointed</i>
Aca B	ZZZ
Aca A	HHHH
Aca E	RRRR
Serv E	AAA
Campus Environmental Officer	<i>To be appointed</i>
Serv F	HH
Serv C/ Serv B	<i>To be appointed</i>
Student	Researcher
Serv A	BBBBB
OrgX(b)	Energy Officer

Appendix B

Cultural Analysis

Please take a few moments to complete this questionnaire about the role of environmental activities in both the workplace and at home.

General Information

1	Age:	Under 20	<input type="checkbox"/>	21 - 30	<input type="checkbox"/>	31 - 40	<input type="checkbox"/>	41 - 50	<input type="checkbox"/>	Over 50	<input type="checkbox"/>
2	Gender:	Male	<input type="checkbox"/>	Female	<input type="checkbox"/>						
3	Country of Birth:										
4	Ethnicity:										
5	Position in Campus:					Department:					
6	Are you:	Full-time	<input type="checkbox"/>	Part-time	<input type="checkbox"/>	Student	<input type="checkbox"/>				
7	Which of these sources do you use for national and local news? Please provide details.										
	Local newspaper	<input type="checkbox"/>									
	National newspaper	<input type="checkbox"/>									
	Colleagues	<input type="checkbox"/>									
	Internet	<input type="checkbox"/>									
	Other	<input type="checkbox"/>									

In the workplace

- 8 In your position at the Campus, which colleagues do you interact with most?

Please name up to 3 people and indicate their position in the Campus.

1 _____

2 _____

3 _____

- 9 Who would you contact in the workplace for information regarding environmental concerns/ideas?

Please name up to 3 people and indicate their position in the Campus.

1	
2	
3	

- 10 Which groups/departments do you interact with on a regular basis for your job requirements?

Please name up to 3 people and indicate their position in the Campus.

- 1 _____
- 2 _____
- 3 _____

11	What are the typical subjects that you discuss with your work colleagues? Please name up to 3 subjects.				
	1				
	2				
	3				

12 How often do you discuss environmentally related activities in the workplace?

Regularly ☐ Occasionally ☐ Little ☐ Never ☐ Not sure ☐

Social Settings

13	Who do you socialise with most outside of the workplace i.e. friends, family? Please indicate the relationship of the person to yourself and their area of work/study.			
	1			
	2			
	3			

14 Who would you contact for environmental information regarding activities outside of your work role?
Please name up to 3 organisations/people and indicate their area of work/study.

1 _____

2 _____

3 _____

15	Do you support/belong to any voluntary action groups i.e. NSPCC, WWF, neighbourhood watch etc.? Please name up to 3 groups.			
	1			
	2			
	3			

16 Do you typically socialise with your work peers, in which settings would you do so?

Smoking ☐ Car pooling ☐ Dining Out ☐ Lunch ☐ Shopping ☐

Other ☐ _____ Not applicable ☐

17	Name 3 activities that you pursue as hobbies. Please name up to 3 groups.			
	1			
	2			
	3			

18 What topical issues do you often discuss with your friends and family?

Please name up to 3 subjects.

1 _____

2 _____

3 _____

Environmental Activities

19 Are you aware of the following environmental activities at Scarborough Campus?		Yes	No
Society, Environment and Economics Group (SEE)		<input type="checkbox"/>	<input type="checkbox"/>
Scarborough Environmental Action Group (SEAG)		<input type="checkbox"/>	<input type="checkbox"/>
Energy Reductions:			
Turning off lights		<input type="checkbox"/>	<input type="checkbox"/>
Turning off electrical equipment		<input type="checkbox"/>	<input type="checkbox"/>
Recycling:			
Paper		<input type="checkbox"/>	<input type="checkbox"/>
Glass		<input type="checkbox"/>	<input type="checkbox"/>
Stationery		<input type="checkbox"/>	<input type="checkbox"/>
Cooking Oil		<input type="checkbox"/>	<input type="checkbox"/>
Environmentally-focused Seminars and Conferences		<input type="checkbox"/>	<input type="checkbox"/>
Ethical Refuse Disposal:			
Electrical goods		<input type="checkbox"/>	<input type="checkbox"/>
Chemicals		<input type="checkbox"/>	<input type="checkbox"/>
Ethical Purchasing:			
Recyclable drinks containers		<input type="checkbox"/>	<input type="checkbox"/>
Recycled toilet paper/paper towels		<input type="checkbox"/>	<input type="checkbox"/>
Generic Initiatives:			
Car pooling		<input type="checkbox"/>	<input type="checkbox"/>
Video-conference facilities		<input type="checkbox"/>	<input type="checkbox"/>
Community outreach		<input type="checkbox"/>	<input type="checkbox"/>
Email communication		<input type="checkbox"/>	<input type="checkbox"/>
Other, please specify: <input type="checkbox"/>			

20 Which of the following activities do you pursue at home?

	Yes	No
A member of an Environmental Action Group	<input type="checkbox"/>	<input type="checkbox"/>
Energy Reductions:		
Heating restrictions	<input type="checkbox"/>	<input type="checkbox"/>
Turning off lights	<input type="checkbox"/>	<input type="checkbox"/>
Turning off electrical equipment	<input type="checkbox"/>	<input type="checkbox"/>
Recycling:		
Plastic carrier bags	<input type="checkbox"/>	<input type="checkbox"/>
Paper	<input type="checkbox"/>	<input type="checkbox"/>
Glass	<input type="checkbox"/>	<input type="checkbox"/>
Stationery	<input type="checkbox"/>	<input type="checkbox"/>
Food waste i.e. oil, composting etc.	<input type="checkbox"/>	<input type="checkbox"/>
Attend environmental workshops/conferences in the region	<input type="checkbox"/>	<input type="checkbox"/>
Ethical Purchasing:		
Recyclable drink containers	<input type="checkbox"/>	<input type="checkbox"/>
Fairtrade and Charity food	<input type="checkbox"/>	<input type="checkbox"/>
Fairtrade and Charity clothing	<input type="checkbox"/>	<input type="checkbox"/>
Recycled toilet paper/paper towels	<input type="checkbox"/>	<input type="checkbox"/>
Generic Initiatives:		
Car pooling	<input type="checkbox"/>	<input type="checkbox"/>
Use of public transport	<input type="checkbox"/>	<input type="checkbox"/>
Email communication	<input type="checkbox"/>	<input type="checkbox"/>
Other, please specify: <input type="checkbox"/>		

21 Does/has environmental concerns affected your purchasing patterns?	
Car type/model	<input type="checkbox"/> _____
Fairtrade food	<input type="checkbox"/> _____
Local food sources	<input type="checkbox"/> _____
Ethical cosmetics	<input type="checkbox"/> _____
Holiday destinations	<input type="checkbox"/> _____
Other, please specify	<input type="checkbox"/> _____

22 How do you travel to the Scarborough Campus?

Car ☐ Walk ☐ Bus ☐ Cycle ☐ Car pool ☐

Other ☐ _____

23 In your opinion, how responsible are the following groups in ensuring that environmental activities are conducted at the Scarborough Campus?				
1 = highly responsible, 2 = partially responsible, 3 = little responsibility, 4 = not sure				
Students	1	<input type="checkbox"/>	2	<input type="checkbox"/>
Staff	1	<input type="checkbox"/>	2	<input type="checkbox"/>
Management	1	<input type="checkbox"/>	2	<input type="checkbox"/>
Estates/facilities	1	<input type="checkbox"/>	2	<input type="checkbox"/>

24 Do you have any further comments on the role of environmental activities in the workplace and/or in social settings?

Thank you for taking the time to complete this questionnaire.



Figure B.1: Choice of ethical purchasing.

Appendix C

Interview and Meeting Summaries

All original interviews are available as audio recordings if required, unless indicated otherwise. Meetings were not audio recorded.

C.1 Interview Manager A & Academic A, 12th June 2008

1. Both interviewees signed personal consent forms for partaking in the study.
2. Manager A to review organisational consent form and return at later date.
3. Academic A main points - recycling of non-white paper, only bottom-up approaches at the moment, commitment of Vice Chancellor, contamination of recyclables, education of staff and students, current system, promotion of re-use of equipment in departments, EWG, taking paper home for recycling.
4. Manager A main points - paper consumption, food waste, heating, travel, selling/auctions of old equipment, OrgX(b) - Estates and EAG have merged.
5. Support of EWG - promotion funds can be obtained from OrgX Marketing Budget.
6. Would like me to present findings to ORGX SMT and student services management when I hit milestones - first one after TS.
7. Environmental blog - ask Web Development Officer to add an environmental section to the Pocket OrgX application.
8. Environmental notice board - ask Manager B.
9. Monthly environmental forum - book room with necessary department, no charge. Possibly advertise meetings and just suggest for people with an interest to meet in the bar on a specific date.

10. Access to information - arrange meeting with Manager A and Manager B.
11. Syntegration - arrange for August 20th or 21st, Manager A has given full support and will attend, will also provide catering for the day. Academic A will also attend. Suggestion to get cleaners and catering involved as well.

C.2 Interview Manager A & Manager B, 17th June 2008

1. Explanation of TS.
2. Consent form - Manager A provided with a copy of his signed form, Manager B given consent form which he has taken away to review.
3. Consent form for organization - would like a thesis proposal first.

C.3 Interview Service A, 19th June 2008

1. Uncomfortable with dicatphones so will not be used in future with this individual.
2. Priorities: electricity, general carbon footprint, paper, fuel - heating and travel.
3. Culture - environmental issues are very much a personal choice, other things often take priority.
4. Service Area A - paper, personally (turn off equipment, print double-sided), project to make admissions paperless, try to car share. Want paperless meetings.
5. Barriers - lack of segregated bins across OrgX, need to travel to OrgX(b), little public transport. No structural barriers, as long as facilities are onboard.
6. Opportunities - smaller OrgX so there are less people to train, SU are usually very active in these sorts of events, set an example with the new building.
7. Contact for environmental concern - Manager B or Service F.
8. Would like to be contacted once actions were taken, but aware of time constraints so would not expect it.
9. EWG - member of group.
10. EWG activities - hedges, environmental awareness day, PR/marketing.

11. Service Team A - some are likely to be involved, feel that information on why we should be environmentally friendly and the benefits would be helpful, awareness days and high-profile speaker to launch initiatives.
12. Permission to attend Service Team A meeting June 20th 2008.
13. Two potential volunteers for TS.
14. Happy to meet again a few months for further discussions.
15. Suggestion of accessing students within freshers fair.

C.4 Interview Service B, 19th June 2008

1. Priority - paper consumption, disposal of books, would like to recycle more, energy consumption (PCs - shut down procedures).
2. Environmental contact - initially could not think of anyone, then suggested possibly himself for instances within own department, or manager in Service C, then suggested Service F. Indicated that if he contacted Service F it would simply be a case of whoever answered the phone, no specific person but probably Service Team F.
3. Would expect to be told when action had been taken.
4. Culture - some people are trying but not enough is being done, no segregation of waste, unsure of process when recyclables taken away, no directives or reinforcement, what happens to shredded paper.
5. Barriers - lack of facilitation, awareness.
6. Opportunity - more bins, small OrgX easier to get people involved.
7. Not sure of who is responsible for environmental activity and would like to know.
8. Library - shut down computers during the summer and end of day during term, turning off lights, recycling paper, trying to establish scheme to recycle old books.
9. EWG - researcher, Academic A, Service F.
10. Would consider being involved in workshop and happy to meet for future meetings.
11. Would like me to check with manager as to whether I can attend the next team meeting.

C.5 Interview Service C, 19th June 2008

1. Priorities: heating, development of technology, double-sided printing, staff awareness, training of video-conferencing.
2. IT - promotion of video-conferencing, currently attempting to gain funding from HEFCE for video-conference in boardroom, cardboard recycling.
3. Culture - not much need for environmental action, lack of awareness, printing of meeting documents.
4. Little printing in Service C and Service B.
5. New VLE.
6. Barrier - negative attitudes towards the worth of recycling.
7. Opportunities - video-conferencing and IT development.
8. Yearly statistics.
9. Constraints - cost, virtually need to pay for recycling (WEEE), loss of free recycling of toner cartridges.
10. Contact for environmental concerns on OrgX - Service Team F.
11. Would not expect to be notified.
12. EWG - Service F, Academic A, researcher. Thought that a member of Academic Team C was on the team, but believed it was an employee no longer with the organisation.
13. EWG activities - environmental awareness day, could not think of any others but later in interview remembered the tree planting scheme - did not know what was being done and was not aware that the project had already been implemented.
14. Staff engagement - believe the IT team will respond positively to the workshop, happy for me to attend both IT and library meetings.
15. Will setup a departmental meeting for August 7th/8th.
16. Happy to meet again to discuss project.

C.6 Interview Academic B, 20th June 2008

1. Consent form signed
2. Priorities: Lighting (need for subtle options), paper consumption, more efficient push taps.
3. Contact for health and safety concerns on OrgX - Academic Team B member.

4. Contact for environmental concerns on OrgX - Academic Team B member.
5. Would expect to be contacted once action had been taken, but not sure if this would happen.
6. Unsure of environmental activities in business school - possible staff research and delivery of environmental modules.
7. Not aware of EWG - vague recollection of an email once I stated that I was part of the group.
8. Not aware of any EWG activities - just Academic Team B members' efforts for wind turbines.
9. Need for big visual campaigns - possibility of graphs indicating consumption levels and differences over time.
10. Believes Academic Team B staff will be willing to help and is personally happy for staff to attend workshop.
11. No meetings planned over the summer - send email with a brief summary and suggest a time for volunteers to meet around graduation.
12. Suggestions for two likely volunteers for TS.
13. Culture on OrgX towards environmental issues is poor.
14. There is no direct visual/monetary effect to individuals when using OrgX resources - graphs would be nice.
15. Potential gadget - Effegy.
16. It is easier to be wasteful in an organization than at home, as you are aware of costs etc when you are directly responsible for bills.
17. Barriers - need incentives for change, probably financial motives rather than eco.
18. Opportunities - OrgX is incredibly wasteful so any activity will be an improvement.
19. Constraints - need a SMT on board.
20. Syntegrity - from experience, may be a good idea to establish topics before the day.

C.7 Meeting with Service Team A, 20th June 2008

1. Researcher observation - paper consumption, need for networked printers, awareness, lack of facilities (bins).

2. Team Issues: Trying to use eDocuments where possible, Recycling paper and card, but a member of the team actually takes these items to the large collection bins himself, Radiators have individual temperatures, Most of the team turn off computers, There is not much natural light in the office (need for trees to be maintained outside the office), Lack of insulation, Noise pollution, Most know of EWG - but are only aware of the awareness day.
3. Three possible TS volunteers.
4. Later discussion with web-development officer on July 4th 2008 - department are developing eco-bags to give to staff and students at the beginning of the new academic year.

C.8 Meeting with Academic Team B, 2nd July 2008

1. Researcher observation: need for networked printers, paper consumption and lighting.
2. Team Issues: Turn A/C off and open windows, Power generation on site, Visible segregated bins, Radiator valves, Carbon offsetting - lecturers travelling abroad, Tree planting around ground, video-conferencing, Access new employees and students, TurnItIn, Colleague - is attempting to have a paperless office, Reading on computer versus paper? benefits?, Re-circulation of heating within new build.
3. Volunteers - one member, later discussion with another team member also identified himself as a volunteer

C.9 Meeting with Service Team D, 4th July 2008

1. Researcher observations: paper, photocopiers, printers, awareness
2. Team Issues: SSCG - constant need to remind them of less paper usage, Meant to send any printing above 50 copies to OrgX(b), ACA D - use a lot of paper, ACA A - many use blackboard but technicians seem to use a lot of paper, Team leader has had some confrontations with members within the department, Possible need for surplus charging/blocking accounts on photocopiers/printers, Need for effective time-keeping to ensure last minute printing is not needed (lecturers need to plan ahead), New technology - need to keep up-to-date easily, Networked printing - big drive across OrgX by Service D no-one would agree, Budgeting - too free, departments can do whatever they want, contract with Lyreco, Need a best purchase list, Enhanced communication channels, Supplier packaging is an issue, Need for increased bins in offices,

Recycling is not an issue, Not aware of cardboard recycling, Trying to use video-conferencing more, Need more awareness of facilities, Need for better understanding in OrgX(b), Need for bins to recycle paper cups from canteen, Light bulbs have been changed, Larger offices - cut-down on overheads, Fans in every office, In comparison OrgX brings in far more revenue than OrgX(b) - better budget distribution, OrgX policy - recycle stationary (envelopes), all use same letter heads to save printing, Shred paper where possible - unsure of final process of shredding (highly confidential waste), Interconnections 3 times a week - trips not wasted, Library interchange - do not double up on books.

3. Volunteer: one member

C.10 Interview Academic C (Prior Manager of Department), 9th July 2008

1. Consent form signed
2. Priority is awareness: estates (heating), car sharing, public transport, cleaning products
3. Environmental concern - would probably go directly to department and if need by contact Manager B or Service F.
4. Would expect to be notified on some occasions
5. OrgX cultures - low environmental priority, focus on money.
6. Barriers - time, no responsibility, formalize EWG?
7. Strengths - interested employees, size, awareness of some members of staff
8. Constraints - no formal rules
9. Possibly access staff during Continued Professional Development programme
10. Head of Academic Team C - temporary placement of Academic Team E
11. Departmental activities - student group, chemical disposal, some paper, personal choice/ethic, time is an issue
12. Familiar with EWG - helped develop the group in its initial stages, no longer aware of its activities bar the awareness day.
13. Academic Team C engagement - formal lunch? needs to be seen as formal, use the staff as experts.
14. Suggestion of contact within the Service Team E.

C.11 Interview Academic Team A, 9th July 2008

1. Staff given an opportunity to meet for an informal chat during the lunch period - no departmental meeting scheduled until September.
2. Only department Head arrived for meeting.
3. Contacted by one member of staff via email - unable to meet on this date but willing to volunteer for workshop.
4. Volunteer: two members.

C.12 Interview Academic D, 9th July 2008

1. Consent form signed.
2. Cannot go paperless due to student requirements
3. Need to tailor food
4. Never a medium heat always far too hot or too cold
5. Uses video-conferencing where possible - asking for old equipment from meeting room for department
6. Need clear guidance from OrgX(b)
7. Need Involvement from OrgX(b) Energy Officer.
8. Environmental concern - would contact Service Team F member and would expect to be informed of follow-up
9. Culture - fairly good - desire to be eco-friendly influenced by HEFCE
10. Barriers - lack of staff development and training, need incentives
11. Strengths - more commitment, raised profile
12. Constraints - focus on short-term budgets
13. Academic Team D activity: personal choice, shut down equipment, helping my research, second nature, need to be a role model for students, use networked printer, recycle paper, stationary where possible, double-sided printing
14. Aware of EWG - Academic A, Academic Team D member, researcher and aware that Academic Team C is also involved
15. Aware of environmental awareness day - birdbox/webcam. Unaware of planting that has took place.
16. Department engagement - meeting.
17. Aware of movement sensitive lighting being installed

18. Ordering recycled pens for students
19. Suggestion to access staff at a conference in Easter
20. Discussion of Glastonbury - Green Police
21. Send blank copy of ethics form to Jane
22. Volunteer: interviewee

C.13 Interview Service E, 9th July 2008

1. Consent form signed
2. Need to engage staff and students
3. Need for added facilities and awareness
4. Environmental concern - Service Team F members, would expect follow-up
5. Culture - volunteers only, few people care
6. Barriers - apathy, time, effort
7. Strengths - small, closed area/have control, incentives scheme
8. Constraints - need for formal management, support of Manager A, stronger control of Halls.
9. Service Area E: recycle oil, white paper, printer cartridges, glass, plastic, tins, cardboard, same for bar. Shut electrical down when not needed, efficient use of dishwasher
10. Confusion - bar cooks one specialist has condemned them another has said they are fine - what to do?
11. Part of EWG and fully aware of activities
12. Need nil costs of change
13. Possible trip to the tip? unaware of talk by council representative recently
14. Need better advertising and encouragement
15. Catering engagement - meetings
16. Workshop- email invitation, many on holiday so unsure of possibility to attend
17. Volunteers: two members

C.14 Interview Academic C(b), 10th July 2008

1. Signed consent form
2. Paper consumptions - within limits must consider students with disabilities
3. Food waste is a big issue in the canteen and offices
4. Heating - when it works. Why not solar panels?
5. Definitely need broader awareness within staff and students.
6. Travel is an issue within Academic Area C as students need to visit field sites, OrgX(b) is an issue as well.
7. Need for segregated bins
8. Environmental concern - Service Area F, Service F. Would expect to be informed of follow-up, especially if it was a health and safety issue
9. Culture - low, high within department
10. Barriers - rules and regulations, timeframe, no clear policy for anything on OrgX
11. Strengths - incentives (easy), put extra savings into grants for OrgX improvements, better education, better use of grounds, conservation area?
12. Constraints - same as barriers.
13. SHRUBs - student eco-group, 70 to 80 members
14. bird-feeders - Academic C students could use these for research, but told to remove before
15. Unaware of tree planting
16. EWG - know of Academic A and Academic Team C member, unaware of activities
17. Flower planting etc - interest for students and courses - ACA C could monitor changes in insects, wildlife etc and conduct free analyses of biodiversity
18. Scented gardens - open workspace, calming. Gardens in Bloom - competition
19. Interviewee for next EWG meeting? as expert
20. Strategy - new planting etc, part of modules, stops some travel for fieldwork, useful for visiting schools
21. Funding - SpringWatch, YourVenture

22. Academia - debate between Academic Area C and Academic Area B - ecologists vs business, real-world scenario. One colleague-environmental legislation
23. Contact Head of Academic Area E for department meeting, not likely before end of August
24. Volunteer - interviewee.

C.15 Interview Service F, 15th July 2008

1. Signed the consent form
2. Uncomfortable with dicatphones so will not be used in future with this individual.
3. Agrees priorities of Manager A and Academic A
4. Paper is a definite issue
5. Waste in general
6. Continued loss of motivation
7. Environmental concern - personally identifies, assess' and acts upon any issues, daily assessment by security and grounds people
8. Culture - more aware, students are not aware of acceptable behavior
9. Barriers - loss of motivation, need clear responsibility channels, storage, costs, using more paper now than ever, people forget to send copying through to OrgX(b)
10. Strengths - moving forward with times, consultation with OrgX(b) Energy Officer, new technology
11. Structural constraints - need a dedicated role for responsibility, need to teach more
12. Departmental activity - electronic waste, recycle other departments stationary found in bins, water bricks, sensitive lighting, employee collects departmental recycling, shut-down computers (needs to become automatic)
13. EWG - member
14. Departmental meeting - email to remind for dates

C.16 Meeting with Academic D Team, 21st July 2008

1. Researcher official place on meeting agenda.
2. Researcher observations: paper, networked printing, video-conferencing.
3. Team issues: down to the individual. New boilers and lighting. Not enough video-conferencing - old technology. OrgX(b) policies - patio heaters on campus. Senior management. Department focus elsewhere at the moment. Needs to be easy - policies - ordering recycled paper, need to be rewarded not shutdown, recycle bins. Need communication of strategies - new recycling collector - no email. Supplier packaging. Long time period between bin collections.
4. Two volunteers for TS workshop.

C.17 Meeting with Service B Team, 25th July 2008

1. Researcher official place on meeting agenda.
2. Researcher observations: paper, eco-bags, computer shut-down, old materials and environmental advistor.
3. Team issues: lack of communication - recycling materials, not informed of new policies. Not enough bins. New recycling employee met on rounds, not told before. Shredding paper - transport to Hull, what happens to it? Saloon car for inter-site transport. Lack of recycling collection - better now. Students food at paper recycling, payment not wasted. Double-sided option as issue - queue, quality of paper (no control over quality). Excessive packaging - possibility of tender for local sourcing? Eco-bags - SU, selling. Some employees aware of OrgX fair-trade status. Computers - heat, 20 computers, shut-down procedure needed. Hot water pipes in rooms, 3 of 4 have thermostats, windows can be opened but need to climb on furniture and one is next to the extractor vent.

C.18 Meeting with Academic A, 29th September 2008

1. Need to write TOR for senior management team.
2. Discussion of EWG freshers stall - design of posters and competitions, grow your own acorn.

3. Confusion during beginning of freshers week - cotton bags used to distribute student materials, except for Monday when plastic bags were used.

C.19 Meeting with Academic A, 8th October 2008

1. Development of EWG TOR - title, chair, secretary, reporting channels, scope, delegation, accountability, responsibility, consultation, informed about, mode of operation, meeting schedule, composition and membership.

C.20 Meeting with Academic A, Academic C(b) and SHRUBs leader, 10th October 2008

1. Discussion of plans to upgrade the natural boundaries of the site.
2. General inspection of site.

C.21 Meeting with Staff Development team representative, 17th October 2008

1. March 2009 - staff development day "Sustainability", lifelong learning, environment, economic/institution.
2. Key note speaker Phillipa Forrester.
3. To be held at a local hotel - three sessions on the environment. One is possibly being held by OrgX(b) Energy Officer on carbon footprinting, another by EWG?
4. Workshop will need to be 45 minutes long and a poster display will also be possible.
5. Researcher to send details to be included on OrgX(b)'s environmental web-site, including own case studies.
6. Potential to EWG to apply for the VC's Environmental Prize.
7. Discussion of EWG activities at OrgX.

C.22 Meeting with Local Authority Representatives, 24th October 2008

1. Potential to install wildlife pond at the site borders, need to - develop a proposal, size, plans (linings, seasonal water?), LA source vegetation, maintenance program, academic management of pond?, frogs stones/logs.
2. Design competition.
3. Benefits of pond - Teacher training of OrgX students and the invite of primary school children to the site.
4. Apply for funding.
5. Tree planting day - Local conservation volunteers and LA volunteers.
6. Wildlife to consider onsite - hedgehog, house sparrow, tree sparrow, owl, house martin, send list to LA.
7. LA currently do presentations at OrgX.
8. Pleased with the addition of bat boxes to OrgX - part of local BAP.
9. Potential to champion species onsite to fulfil the local BAP.

C.23 Meeting with Academic A, 28th October 2008

1. Discussion of EWG's potential to apply for the VC's Environmental Prize.
2. Develop discussion of eco-awareness day.
3. Purchase of recycling bins for non-office paper.
4. Awareness and departmental recycling need addressing.
5. Staff development day.
6. Now reporting to OrgX(b) EWG.
7. Funds - need to spend Alumni Development Fund.
8. Discussion of Academic Team A away day presentations.
9. Discussion of an Environmental Workshop, bird-box, marketing opportunities and community relations.
10. Need for clear understanding of LA commitment to fund a pond to border the site. Additional potential to champion a specific species i.e. crescent newt.

11. Invite the local newspaper to cover the environmental planting day.
12. Researcher to send Academic A the TOR for the EWG.
13. Need to talk with golf course to discuss natural boundaries.

C.24 Meeting with SHRUBs leader, 29th October 2008

1. EWG planting day - already been provided with plans.
2. SHRUBs should be able to help with the 12th November pre-planting day and 26th November for full planting.
3. Potential for on-site pond - need to find a SHRUBs member to take on a leadership role. Activities are only pursued by the group if someone chooses to take on the project. Would need to have a SHRUBs meeting and for a vote to take place.
4. Discussion of EWG attempts to engage students - pumpkin hamper, posters.

C.25 Meeting with Staff Development Day team, 16th December 2008

1. Discussion of workshop to be held by the researcher and EWG.
2. Researcher to determine if any additional members of EWG will be involved in the workshop.
3. SDD team to provide a stand for the EWG to display pictures and details of past activities.
4. Need to advertise via SHRUBs and EWG.

C.26 Meeting with OrgX(b) Higher Education Carbon Management team, 16th December 2008

1. Presentation of approximately 200 staff/student questionnaire responses.
2. Recycling - Procurement, reduction, reuse, recycle, dispose of responsibly.
3. Need to change practices - solid oak furniture recently sent to landfill.

4. January 1th - OrgX(b) will install recycling bins.
5. February 9th - Green week will include a central recycling feature onsite (OrgX(b)).
6. Landfill cost to OrgX(b) is currently 128,000 per year.
7. Senior manager perspective that cultural change is necessary.

C.27 Meeting with Manager A, 28th April 2009

1. Conduct and ISO audit in line with BSI standards, keep the audit anonymous.
2. Discussion of EWG leadership and the need to ensure that an employee replaces the researcher soon.
3. Discussion of future funds - nothing can be guaranteed.
4. Arrange a follow-up syntegeation and Manager A will try and attend.
5. Discussion of a forth coming meeting with a regional Energy Savings Officer.
6. Discussion of the researcher contacting the sub-regional Rail Development Officer, following employee suggestion.
7. General discussion of a green campus week.
8. Researcher expression of concern over the new recycling bin policy.

C.28 Meeting with Manager B, 16th June 2009

1. Speak to Service F for more details of environmental audit e.g. consumption meters, fire standards, housekeeping.
2. Effluents - reactive system. We take action if a problem occurs.
3. Legionellosis - regular monitors.
4. Students cause a great deal of damage to site buildings.
5. New parking pemit scheme coming into force.
6. New recycling scheme will soon be in place - no office bins, centalised recycling locations.
7. Community - need to maintain good relations with local residents. Residents consulted about height of trees and hedging, new buildings and wind turbines.

C.29 Meeting with Service F (two team memberS), 26th June 2009

1. Legionellosis monitoring systems are controlled by external contractors.
2. Annual health and safety check within September - PAC testing. Students are asked to conduct their own tests. Aca E perform their own tests.
3. As of 2009 OrgX has installed five meters within on-site halls and additional meters in buildings owned outside of the central site. The main site already holds seventeen meters. Meter readings are conducted monthly and sent on the same day by fax/email to OrgX(b) Energy Manager who checks for irregularities within the system. Meter Reading Record is held within Service F.
4. Individual radiator-thermostats; areas are time controlled, heating is typically 'off' between May 1st and September.
5. Windows are sealed in winter and unsealed in the summer.
6. In 2009 the main site was equipped with four new condensing boilers, additional boilers were installed within halls and an exchange heater was also installed.
7. External contractors conduct system audits annually in May, providing a report detailing emissions and operational efficiency that go into a permanent store. Besides this annual check the system is not checked at any other time unless there is a loss in functionality.
8. Special taps have been installed within laboratories and kitchens to prevent water backflow.
9. Bathroom taps throughout the site are now push buttons.
10. There are three cold-water tanks located above the site library which are used as a gravity flush within the toilet system. These tanks are checked annually by external contractors, internal checks are conducted monthly on tank ball valves. If there are any problems within the system external contractors are brought in and the site is issued within a certificate once repairs are made.
11. The site draining plan is kept by Service F and OrgX(b) counterparts; OrgX(b) colleagues update the plans when new equipment is installed.
12. Currently the sump drains are monitored as and when a problem occurs, there is a proposal to return to an annual monitoring regime; there are no plans to check bacteria levels in the system.
13. External contractors are called in emergencies; this can involve the use of a camera to analyse faults in the lower parts of the drains.

14. The organisation is now able to recycle cardboard materials through an external contractor.
15. Used batteries are collected on site and taken to local tipping facilities by a member of staff.
16. Used electronic equipment is refurbished and sold at auction where possible, donated to local schools or disposed of through an external contractor (Yorwaste, Refurbit).
17. The local council recycles paper, plastic and glass materials from the site.
18. Used furniture is refurbished where possible or transferred to other sites owned by the organisation. Furniture is also offered to the local charity Basics Plus.
19. Garden waste is disposed of by Countrywide external contractors who maintain the natural boundaries.
20. Food waste is currently disposed of through a 'food gobbler' with a fat-trap that is emptied once a month during term time by an external contractor (water bowser). Waste transfer notices are kept by Service F in a permanent record.
21. Service F have use of an on-site waste skip most weeks of the year.
22. An employee has now been contracted to work 4 hours per day, 5 days per week to maintain the site; tasks include sweeping and collecting recyclable materials from offices.
23. General housekeeping duties are conducted to keep the main OrgX buildings tidy for staff and student usage, and the Halls facilities on site.
24. The perimeter of the site is a natural boundary that was improved by the employee EWG in 2008; 10,000 of funds were dedicated to introducing indigenous plants on site. External contractors (countryside)
25. Renovation work is scheduled from 2008 until the foreseeable future. A new build has been designed for the site and is due to be initiated in 2010.
26. Housekeeping materials are chosen to reduce environmental impacts: Sandet (multi-purpose cleaner, powder or dilute), Neutral washing-up liquid, CG10 (pine gel floor cleaner). Special materials are required for mould and mildew in Halls, cream cleaners and floor polish.
27. No spray polish or air-sprays are used on site, with the exception of fly spray when necessary.
28. Housekeeping adheres to the organisations sustainable purchasing policy where possible.

29. Paper towels and toilet rolls on-site are made from recyclable materials - new hand dryers are to replace paper towels.
30. There is a weekly check of on-site fire-alarms, conducted every Wednesday afternoon. Test evacuations are conducted at least once per term.
31. The fire-alarm system is checked four times a year by an external contractor, each check involves the analysis of 25% of the system.
32. The fire policy manual is kept with the site Bursar. It was updated in 2009 to comply with new legislation.
33. The site has fire-doors throughout the site, there are clear evacuation points, disabled evacuation points that are fitted with body-carriers and alarms directly linked to security on-site.
34. External contractors are used to identify vehicle owners and issue fines for car owners without permits.
35. Parking permits can now be issued within two car registrations to encourage car sharing.
36. Parking permits cost 50 for one year for a member of staff.
37. A new Park n Ride scheme in the area (completed Spring 09) has OrgX as a specific stop on its route, staff and students are able to use the facility at half price.
38. University vehicles bring books and mail to the site and return to OrgX(b) with similar loads.
39. New policies are coming into effect in the academic year 09/10 that will significantly reduce the amount of employees and students being awarded permits; students who live in Halls will no longer receive an automatic permit.
40. Legionella checks are conducted at least annually - external contractors are used. Contractors analyse site systems and feed results directly into a handheld PC, collected data is then sent directly to OrgX(b) where the information is logged and stored on the computer. OrgX(b) determines how long these statistics remain on the system. Failure to input data on specific days results in a non-conformity report that is sent to the external contractor.
41. There are three members of staff on-site with legionella awareness training, certificates displayed in Service F. Staff perform checks on a monthly basis, shower heads are removed/replaced/sterilised on a three month schedule.
42. Cars are given a yearly MOT and service. Monthly visual, oil, water, tyre and petrol checks are conducted. Reports are not provided for these checks unless a problem arises.

C.30 Meeting with potential researcher replacement in EWG, 3rd November 2009

1. Discussion of employee taking over researcher's role in the EWG.
2. Explanation of EWG informal meetings the first Wednesday of every month.
3. Explanation of EWG activities - continuation of seasonal competitions.
4. Explanation of coordination with EWG members, specifically the Chair.
5. Employee decision to work with EWG.

Appendix D

Environmental Workshop

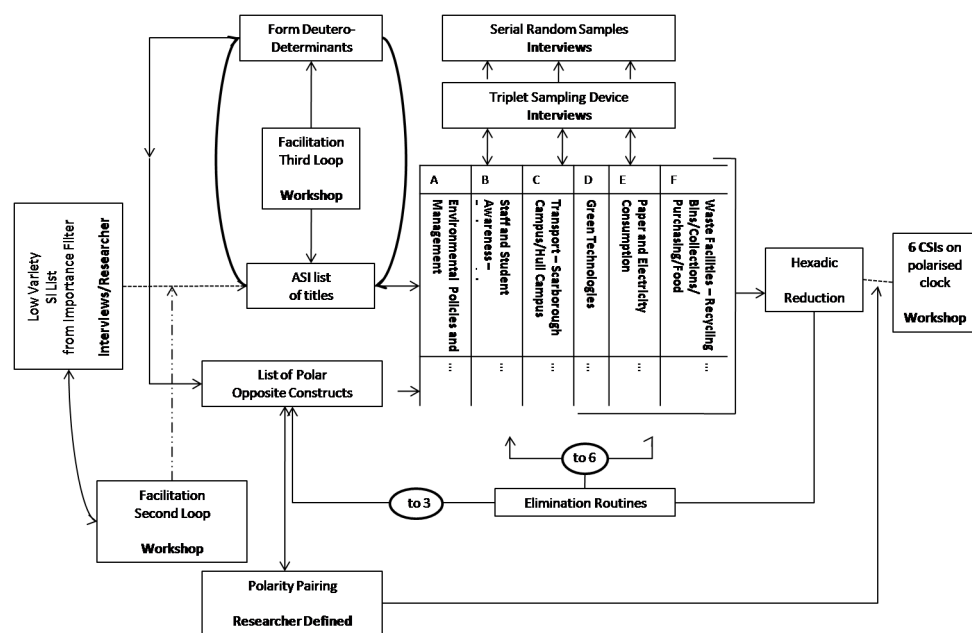


Figure D.1: Problem Jostle Protocol with Hexadic Reduction

Adapted from Beer (1994 p.121).

D.1 Problem Jostle - Sticky Notes

D.1.1 Environmental Policies and Management

- Alpine garden in specific location of OrgX site. perhaps a local honey bee farm.
- OrgX green policy - plants - monumental/display versus eco-friendly.
- Turn part of golf course into staff allotments.
- What about outside? use of grounds as conservation area.

- Conservatory cafe over the whole roof of one building.
- Locally produced food in the dining room.
- Directives from Academic Management Committee.
- Expertise within the University used for developing practical solutions.
- Regular review of existing systems.
- Make sure on the ground estates staff have strong input.
- University has Environmental policies. Environmental guides - departments 'Best Practices'.
- Provide the Environmental action Group with resources/responsibilities.
- Heating and Ventilation - lag, double glaze, provide thermostats throughout.
- Lack of information regarding what we can do on OrgX to be more 'green'.
- Environmental management - conservation of energy, clear policies evident to staff and students. What are they?? Dinosaur approach/clash.
- Increased use of video-conferencing.
- Make sure the new developments (buildings...etc) are done with green technologies.
- Develop an Environmental audit of the OrgX to support/compliment environmental strategy.
- Include the idea of a 'Green OrgX' in the main strategy/policy of the OrgX.
- Facilitate the process of 'greening OrgX' conferences, events, advice to Council.

D.1.2 Staff and Student Awareness - Environmental Responsibility

- Let staff/students see results of actions they have championed.
- Encourage use of blackboard/eBridge.
- Waste energy consumption is often down to laziness.
- Staff and students to use more VLE.
- EVERYONE should be responsible. Higher profile.

- Need campaign. Lack of participation evident. Lead from the top staff & students.
- Simple things help. Switch off light as leave room, OR do not switch it on at all!!
- Include and 'environmental awareness' slot in ALL induction weeks.
- Staff and students need to be made aware of the strategy and the reasons for why it is important.
- Create a lecture or seminar to explain, explore and research? the environmental issues related with students and the university.
- STAFF/students not always aware of their own or departments responsibility.
- Develop postgrad provision on interdisciplinary 'environmental management' topics.
- Bridging the gap between awareness and action.
- Get students involved in halls - competition between blocks for lowest power consumption.
- Energy Saving Training challenges and competitions.
- Stimulate 'green responsibility' (e.g. competitions for green actions).
- Been seen to be green rather than just telling others.
- Communicating the green credentials to applicants (students).
- Involvement of the academic programs in the creation of informative, education tools.
- Cleaners awareness - they should not open windows, leave lights on, turn thermostats up (in winter).
- Promote awareness through activities and actions in canteen/calvinos.

D.1.3 Transport - to/from OrgX

- Develop a car pool scheme (sharing cars).
- Car sharing.
- Promote a cycling culture between students and staff.
- Alternative choices for transport.
- Encourage cycling/walking to work (bike racks, showers etc.).
- Provide cycling parking facilities.

- Bike shed.
- Vehicles over 2L have to pay more parking permit.
- Vehicles over 1.5L to pay more.
- Localised structure to feed into uni encouragement (OrgX representatives for all areas where possible).
- Prioritise meeting attendance - are they all really necessary.
- Make less OrgX to OrgX visits.
- Reduce the need for OrgX to OrgX visits through localised management structures.
- More video-conferencing.
- Unnecessary travel to OrgX(b) could be avoided by video conferencing but not enough facilities available - needs addressing.
- Hybrid cars, video-conference? transport in general. Necessary to travel. Invent teleporter.
- Need to work with OrgX(b) on this one to make video-conferencing easier.
- Promote use of Skype.
- More video-conferencing facilities.
- Transport to from OrgX - More use of video-conferencing facilities to decrease travel between OrgXes.
- Better video-conference facilities/raise awareness of.
- Better cycle lanes.
- Agreements with transport providers to provide friendly access to students (discount in the service, etc.).
- Inter-OrgX bus for students between OrgX and OrgX(b). Visit villages on demand.
- Link with school bus service - improve access to public transport.
- Proper cross town bus routes/ many staff have to catch 2 buses.
- Teach overseas students. Overseas or via electronic data transmission.

D.1.4 Green Technologies

- Computer screen savers - computers to put hard drives and screens on to power save.
- Long term investment but big statement.
- Reflective/adaptive lining for windows to retain heat.
- Digital paper, e-paper, e-ink.
- Heat-absorbent paint.
- Meter showing energy consumption in different areas.
- Windmill to pump rain-water to height use as 2 water.
- Wave power!
- Potato heating system.
- Green tech (ground source, WIND) for all new builds.
- Power generation.
- Gassifier to convert kitchen waste to gas, and then burn for power.
- Heat storage panels on flat roofs-store heat under park.
- Solar panels - regulate heating properly!! (save energy). SAVE energy.
- 3 x 5KW wind turbines, new drama.
- Hybrid cars! Wind turbine for outside lights.

D.1.5 Paper and Energy Consumption

- Instigate electronic assignments and marking.
- Paper now multi-functioning, photocopies, fax, printers.
- Paper slides vs. electronic online slides - which is more carbon-friendly?
- Recycled paper (teaching will ALWAYS use paper), sensors for lights, computers ALSO turn-off energy save.
- Raise awareness/force leaving appliances turned on.
- Encourage switching off of electrical equipment not in use.
- Heating, too hot - to cold, old building.
- Need better 'Temp control' (open windows in winter!).
- Double glazing/heat loss in main building/heat recycling? circling.

- Power issues, Halls swipe card system, connected to lights.
- Be used to wearing more clothes!
- New build should be cutting edge with power consumption.
- Grass roof on new build! Grass roof on existing building!
- More trees, grass roof.
- Any new build should be self sufficient for its energy needs, geo-thermal/solar/wind etc.
- Heating by heat pumps (air conditioning) is 10x ,pre efficient than gas.
- LED lighting.
- Eliminate inefficient lamps.
- Low power bulbs/lights.
- Energy saving bulbs throughout. Turn off!!
- Less paper for meetings. More electronic paper/tablets (although is this more costly environmentally)?
- Need to understand facts on paper vs electronic - What is the environmental reality?
- Need practical tips/advice and 'good practice' ideas to reduce - then share this.
- CSCW for less paper.
- Culture of shorter documents and electronic reference.
- Motion detectors, printing headed note paper when needed, not order reams of headed paper.
- Halls should need to insert key card to put light on.
- New lighting to lower consumption - example first floor corridor.
- Motion sensor lights on all corridors/in departments.
- Automatic lights in corridors that react to movement or/end high intensity.

D.1.6 WasteFacilities

- New waste systems needed.
- 1 and 2 water. Water for toilets/garden from rain barrels.
- More accessible recycling bins.
- More recycling bins in place on OrgX - in EVERY department.
- Need to 'Encourage' recycling by making access to bins etc. easy and visible.
- Facilitate recycling of e.g. batteries.
- Create more awareness about recycling ('advertising' idea in all bits of OrgX).
- Need specific recycling bins around OrgX including catering areas.
- Facilities to recycle in Halls and departments. Campaign to reduce waste/conserve energy. BUY recycled paper.
- Recycling bins. Not all staff aware of where these are located.
- Use of local suppliers.
- Local procurement/buying for food.
- Promote green purchasing, favouring eco-products (washing, toilets, etc.).
- Local food sourcing.
- More collections for cardboard boxes etc.- instead of waiting nearly 2 weeks.
- Use place of work a collection. Canteen for domestic recyclable materials.
- Recycling centre - money to charity. Cans etc. Litter? Clear direction/labelling of bins.
- Recycling activities in association with groups of interest - charities, NGO's, etc.
- Remove bins from offices, corrifor.
- Develop a composting system and collecting of bio-waste.
- Composting facilities.
- A wormery for waste food.
- Paper consumption too high. Cut down need for student handouts.
- More recycling bins around OrgX.
- Provide 'paper collection' bins in each teaching/working room.
- More use of VLEs.

D.2 Outcome Resolves

Italicised text indicates comments from observers.

D.2.1 Outcome Resolve 1

D.2.1.1 Environmental Policies and Management

Strategies:

- Scented garden.
- Bee hive - sell honey. *Health and safety.*
- No policy/management.
- OrgX(b) policies? strategy? *yet another document/email. Cost.*
- Lack of information.
- Movement sensitive lighting - strategy or general plans.
- Invent strategy. *Enforcement.*
- Different definitions of 'environment'.
- Visual appearance. *Personal responsibility.*
- Attractive and conservation.
- Boilers changed.
- Need guidance - audit.
- Need EAG.
- Display board - EAG.
- Local food sourcing.
- On-site allotments. *Law and health and safety (composting). Alienation? football.*
- Energy use policy.
- Need for recycled products - paper cups.
- Spend more on eco-policies, save money elsewhere (FSC).
- Teaching policies - account for disability needs but reduce most printing.
- Online slides - not more eco-friendly.
- Reduce pamphlets.

- Increased recycling bins - save money - donate to charity or carbon offset. *Confidential paper recycling.*
- Educate.
- Eco-friendly cleaning agents.
- heating - facilities.
- Audit and monitor - electricity, charge students? halls?
- Policy for renewable energy,
- Increase awareness of policy - targets and incentives, statistics.
- Needs to be lead from the top.

Solutions:

1. Development of policy and awareness.
2. Strategy for implementation.
3. Involve all people.
4. Audit and monitoring - full dissemination.

D.2.1.2 Staff and Student Awareness - Environmental

Strategies:

- Student Incentives - induction, involve students with environmental interests, compulsory, residents.
- Involve other universities/educational institutions and community.
- Wind turbine would make high profile statement. Leading the community.
- Staff have bigger impact.
- Make environmental issues routine like health and safety.
- Communication e.g. battery collection, sharing good practice.
- Formalise group work already happening, currently ad-hoc, needs reporting - minuted.
- More conspicuous recycling bins.
- Need central budget.
- Lead from Heads of Departments.
- *Compost bin system - pest problem?*

- *Students do need incentivising.*
- *People are still shutting their eyes to the issue.*
- *Pressure and lack of time.*
- *Costs.*
- *Can statistics be provided on waste?*
- *Work with local businesses.*
- *Matrix Masters - research outcomes fed back in.*
- *Bins can be ugly - new designs each semester.*
- *Confidential data on paper.*
- *Waste food sold off - staff wait till end of day to buy?!*

Solutions:

1. Raising awareness.
2. COMMUNICATION - committees, location maps, induction for staff.
3. External - image.
4. Best practice.
5. Making it easy.
6. Culture.

D.2.1.3 Transport - to/from OrgX

Strategies:

- Walking to work - exercise, encouragement. Age and disability discrimination.
- No real policy. Do not want to live in OrgX location. Incentives? Removal of policy restricting distance of staff residences.
- Mini-bus.
- Communication.
- Zones in car park for car-pooling - parked in zone = prepared to car pool. *Why incentivise to drive?*
- Email system or notice board.
- Rebate on parking.

- Stamp for car-pool - enough credits = free parking following year.
- Cycling to OrgX(b)?
- Need for showers - *where, how many? changing?*
- Bike storage.
- Less trips to OrgX(b) = able to walk to work.
- Video-conferencing - *does not work, not enough facilities.*
- Specific days for full-day meetings in OrgX(b).
- Standardised time for meetings.
- Reduce amount of meetings - one core representative for OrgX(b).
- OrgX meeting - 1 x representative to OrgX(b).
- Staff accommodation on each OrgX - not communicated (OrgX(b) OrgX). *Space and money.*
- Cut down stress.
- Slightly larger cars - added comfort, added car pool?
- University car - drive from OrgX(b) to OrgX to pick up and take to OrgX(b).
- Personal choices to use public transport. *Costs more than car.*
- *Extra time needed to walk/cycle. Weather?*
- *Feasibility of change?*

Solutions:

1. Car-pool policy - OrgX minibus? hybrids.
2. Stamp cards - accumulate green points, game?
3. Video-conferencing. zitem Less visits to OrgX(b).

D.2.1.4 Green Technologies

Strategies:

- Solar panels - heating, trial in OrgX(b).
- New build - all green technology, solar panels, geo-thermal.
- Kitchen waste into gas.
- On-site gasifier - local resource for town.

- Look at short-term and long-term, 'quick wins' at low cost.
- Ideas gathering push.
- Rain water recycling - cost?
- needs marketing.
- No-one pulling everything together.
- Wave power.
- More lobbying by University into community.
- Links with neighbouring college - re composting.
- Monitoring scheme.
- Use students in research projects - project in each department.
- University to take community lead.
- COMMUNICATION.
- Could use student volunteers.
- Staff lead by example.
- Involve Student Union.
- Diagnosis service for problems.
- Environmental leader in each department.
- *Old building.*
- *Communication of trial results from OrgX(b) OrgX.*
- *Lack of knowledge and expertise.*
- *Cost - some very expensive.*
- *Ideas - local scale - management a problem.*
- *Health and Safety issues can conflict.*
- *Image conflicts.*
- *If no economic reward - might not happen.*
- *Travel conflict e.g. students flying and promotion of green courses.*
- *Need to include wider remit - to include town not just OrgX.*
- *Motion sensors - power require? Not good for offices where not a lot of movement. Best for communal areas.*
- *Auto-shutdown, problems with long running software.*

- *Kitchen waste - better management.*
- *hedge trimming waste.*
- *Staff need to be involved in local policies.*
- *'Green' literature - put in bin.*
- *Email 'to all staff' should be available to all.*
- *No meeting area/staff room hinders communication.*
- *Individual into 'own area' only.*
- *No communication channels, especially since became 'OrgX(b)'.*
- *Avoid contradiction e.g. health and safety.*
- *Avoid contradiction in presentation of information e.g. printing.*
- *Lead by example.*
- *Duplication - OrgX(b) and OrgX.*
- *Problems of scale.*

Solutions:

1. Communication.
2. Long-term and short-term views needed (low and high cost too).
3. Demonstrating value and viability.
4. Technologies - electricity and heating, solar, wind.
5. leadership.
6. Conflicts of interest.
7. Community involvement.
8. Lack of knowledge.

D.2.1.5 Paper and Energy Consumption

Strategies:

- Eliminate T12 lamps. *Technology advances will reduce consumption, as will VLE.*
- Lighting - heat. *Card slots hindrance. Bulbs costly, upset decorating.*
- Light switches - zone lighting.

- Full room lit up even when only certain areas are used.
- New technologies.
- Theatre have changed lighting - needs doing elsewhere.
- PIRs - certain areas (not Ian's choice).
- Bathrooms - careful lighting, not movement sensitive.
- Screensavers - *difficult if start hibernation.*
- Careful line between voluntary and enforcement.
- New idea for Halls - *hotel-style card slot to activate electricity. costs, lost cards, security constantly bothered.*
- Financial incentives for students. *Difficulty of recruitment.*
- Difficult to monitor students energy consumption.
- Printing versus online access.
- Lecturers do not want to read assignments on screen.
- Duplex printing and single line spacing. *Annoying and accessibility.*
- Heating - supplementary heaters, portacabins.
- Air-conditioning - heat recovery. *Very expensive to install and maintain.*
- Eliminate incandescent lamps (law). *Cost, slow to turn on.*
- Full lighting assessment.
- Sub-metering - enhanced awareness (traffic light system), difficulty to monitor each department. *No incentives.*
- Supplementary heaters - staff bringing own heaters - 21 fine. *Will be hidden, harder to detect dangerous heaters.*
- Windows - some cannot ever be closed. *Cost.*
- Students - part of contract - unable to bring own heaters.
- Recyclable paper - unbleached (better for dyslexics). *Suppliers? Contract in OrgX(b).*
- Now have one paper for all forms of use.
- Could recycle more if staff took paper to central bins - porters trolley/once per month.
- Needs to be easy, reduce EFFORT. *No-one wants to bother.*
- More training.
- Cut-down photocopying.

- Ban spare copies. *Delay meetings, increase photocopying. Everyone is different and cannot expect to please everybody.*

Solutions:

1. Lamps.
2. PC's - hibernation.
3. Paper versus electricity - which is better? comparative study.
4. Need facts/statistics.

D.2.1.6 Waste Facilities

Strategies:

- Purchase everything locally and seasonally - save money.
- OrgX in charge of own purchasing.
- Cooking own food - cut down on processed food.
- Student food shop - 'green' food shop, cook communally.
- Better food = less waste.
- Recycle vegetable waste.
- Need 'green' budget - ring fenced.
- Empower action group.
- Recycling centre needed - sell for profit.
- Free cycling scheme - would work well locally.
- Education - campaigns.
- Need less of non-recyclable e.g. glossy magazines from OrgX(b) to OrgX.
- Use recycled wherever possible.
- Communication.
- Environmental goals.
- Listen to staff - they have ideas re their own jobs.
- Build time into work schedule.
- Visible recycling e.g. outside halls.
- Need creative approach - competitions.

Solutions:

1. Built into OrgX policy.
2. More formalised.
3. Budgets - ring fenced and investment, bids.
4. Education.
5. Participation.
6. Community involvement.
7. Halls.

D.2.2 Outcome Resolve 2

D.2.2.1 Environmental Policies and Management

Strategies:

- Environmental Action Group
 - support staff.
 - Academics and administration.
 - Policy task forces (leaders of particular areas).
 - Hands-on activities.
 - Budget.
 - Develop reports.
 - Workload model.
 - Equal standing.
 - Accessibility and feedback
 - Agenda within meetings.
 - Notice board.
 - Formal recognition.
 - role - “This is a policy...” and enforcement powers.
 - agreement at OrgX level.
- Policies
 - Clear communication channels. *Co-ordination of departmental efforts are lacking.*
 - Locally sourced food.
 - Staff/student involvement.
 - Travel

- Energy Use.
- Better targeted email broadcasts.
- Waste
- Auditing and monitoring. *Management support of EAG.*
- Conservation and landscaping.
- PR - advertising.
- Targets - EAG policy. *Policy for everything, or just certain areas.*
- Deadlines/milestones. *Lose enthusiasm, long to write up?*
- Stamp cards - need a specific use and easy accessibility. *Who would police? Administrative Costs? Cannot be used for pool car as driver or passenger earns stamp? Do not want to incentivise cars.*
- Education.
- Culture.

Solutions:

1. Give EAG 'teeth' with clear remit and support to enable policy creation.
2. Top-down support.
3. Broad access of EAG representatives.
4. Staff/student committees.
5. Co-ordinate departments.
6. Budget!!

D.2.2.2 Staff and Student Awareness - Environmental Responsibility

Strategies:

- Students participation - students 'sense' of community?

Solutions:

1. To improve communications among and between individuals and groups.
 - (a) Statement to all staff/student on what they can do currently in environmental issues.
 - (b) Induction- Include 'green info'.
 - (c) Access possibility of new modules on environment.
 - (d) OrgX Away Day - Sustainability theme.

2. To develop research projects on environmental issues.
3. Formalise EAG and creating clear links to departments.
4. Publishing 'green achievements'.
5. Standing issues in Employee Newsletter- good practice.
6. SC (Pocket OrgX) - 'Environmental section'.

D.2.2.3 Transport - to/from OrgX

Strategies:

- Travel plan for each OrgX.
- Awareness of car pool.
- Some meeting travel together.
- Minimise trips to OrgX(b).
- Car pool - issues of insurance, fund for extra insurance?
- Reception - chart/timetable for car pool, 7 day notice, diary on outlook?
- Analysis of trips to OrgX(b) - OrgX minibus, hold meetings on Wednesday afternoons, all travel on minibus.
- Pocket OrgX - car pool list, liftshare.com.
- Car pool - current policy for two registration plates on one license to allow car pool.
- Stamp cards - need a specific use and easy accessibility. *Who would police? Administrative Costs? Cannot be used for pool car as driver or passenger earns stamp? Do not want to incentivise cars.*
- Education.
- Culture.

Solutions:

1. Education.
2. Good practice.
3. Alternatives to travel.

D.2.2.4 Green Technologies

Solutions:

1. Any action/decision in OrgX must consider environmental issues. Everybody must confirm have done so. *How to do it?*
 - (a) Setup a webpage that informs of any new environmental issues and linked to emails.
 - (b) Use Employee Newsletter as 'green' newsletter to inform what the University is doing, what OrgX is doing.
 - (c) Do a faculty competition to reduce carbon emissions.
 - (d) Make a 'sustainable purchasing' policy. *Review OrgX(b) purchasing/tendering policy - localisation.*
2. To influence decisions in the OrgX(b) OrgX (affecting OrgX's green policies).
3. Empowering the EAG to have tools (teeth), progressing towards more autonomy in environmental issues.
4. Developing OrgX as a PILOT STUDY- that will influence OrgX(b) OrgX. *Old infrastructure in OrgX - limiting!!*
5. Developing a 'green' new building. *But = key! Central control!! Financial benefits in the long-term for 'greening'.*
6. Buy energy from a 'green provider'.

D.2.2.5 Paper and Energy Consumption

Strategies:

- PC hibernation software, able to switch off if necessary. *Document retrieval.*
- Lighting strategy assessment. *We all need lights.*
- Purchasing attitude.
- Measure of value - environmental vs. cost.
- Value of being a GREEN OrgX.
- Gardeners now contracted from OrgX(b).
- Best purchase guide for OrgX(b) on the internet, only one person in group knows of document. *Connect/co-ordination awareness.*
- Over printing of prospectuses and also placed in a plastic bag.
- Online prospectus. *Need 'proper' prospectuses.*

- Targeting correspondents responsibly.
- Reading irrelevant emails adds to electricity costs.
- Waste of staff time.
- Opt in/opt out emails and posts - RSS feeds. *What are they?*
- Difference in departments and OrgX - some areas only use paper.
- Paper-based culture - central position. *Central committee - capacity to instigate change?*
- Next year UCAS is online only. *Responsibility now on OrgX.*
- Paper journals - hard to be removed from mailing list.
- Employee Newsletter now online.
- Need to use stationary more than once - university policy. *Health and safety.*
- Who defines policies? Local culture.
- Tablet PC's - 3 per department.
- Minutes should be posted online only.
- Paper less meetings.
- *OrgX(b) not using video-conference facilities.*

Solutions:

1. Awareness and education.
2. Lighting and PC's - stickers.
3. Timetable showing last lecturer in each room - encouraged to turn electrics off.
4. Poster campaign.
5. OrgX 'green gown' award.

D.2.2.6 Waste Facilities

Solutions:

1. Establish what/how we want the environmental policies.
2. Communicate
 - (a) How it should be done (waste management).
 - (b) What is on offer.

3. Include these activities in
 - (a) Staff meetings.
 - (b) Through lectures.
 - (c) Involve student union.
 - (d) Promote 'green events'.
 - (e) Departments competition (zero carbon).
 - (f) OrgX wise competition.
 - (g) Students strategies for 'greening the OrgX', students green day, collecting student leader's strategies.
 - (h) Join 'international green awards'.
4. Involve the local schools. *Start from small projects, aim for big changes.*
5. Environmental Awareness days (with local council).
6. Develop postgrad on environmental issues e.g. MSC.../community links (educating staff).
7. Get a BUDGET for environmental strategy - include workload hours for environmental agents from each unit/department.
8. To improve provision of healthy food
 - (a) Vegetarian menu (canteen). Could be too expensive?
 - (b) Locally sourced food. (Develop the link with organic producers). *Is there a 'captive market'? Need to RESEARCH the local market.*
 - (c) Develop a farmers market. *Enough catering facilities?*
9. Possibility of new food ordering system? Select menus in advance (web??, pocket OrgX).

D.2.3 Outcome Resolve 3

D.2.3.1 Environmental Policies and Management

Solutions:

1. EAG responsibility - Dean, Heads of Departments, start of next semester.
2. EAG - each member develop own taskforce within department.
3. IT setup account for environmental volunteers - David, Tuesday.
4. Department and hierarchy representative - EAG/researcher, November.

5. Staff and student involvement - SU and freshers fair - researcher and EWG representative, now.
6. Co-ordination of departments - EAG.
7. EAG - additional volunteers (three new members).

D.2.3.2 Staff and Student Awareness - Environmental Responsibility

Solutions:

1. Recycling guidelines.
 - (a) Estates - representative, SAS - representative. Prepare before start of term, coordinate with staff (in charge of Induction), put it in POCKET ORGX - so that it can be updated, create link staff/Estates to update any news, FLYER - statistical issues (environmental.)
 - (b) SMC/CEMS. Heads of Department to discuss possibilities of new curriculum, themes (sustainability) in most lectures, "Environmental Week" every module on green issues and OrgX away day Academic Management Committee.
 - (c) OrgX research groups.
2. EAB. Manager A and Academic Management Committee.
3. Employee Newsletter.

D.2.3.3 Transport - to/from OrgX

Solutions:

1. Education and encouragement.
2. Heads of Department.
3. Pocket OrgX car pool timetable. *Not appropriate as pocket OrgX is accessible to students.*
4. Travel timetable to be places in staff room.
5. Whiteboard, Manager A.
6. Implementation - Estates.
7. Minibus - need for long-term feasibility study to include added advertising potential (OrgX logo on bus).
8. Video-conferencing - more facilities and upgrades of existing systems.
9. IT.
10. Manager A to encourage OrgX(b) to use conference facilities more.

D.2.3.4 Green Technologies

Solutions:

1. Academic Management Committee- discuss it at management level, decide how to do it.
2. Employee Newsletter and OrgX - Energy Officer (University level) - EWG members to collect information and provide it to Employee Newsletter communicating to staff/students/executives.
3. Faculty 'green competition. Manager A/executives/Vice-Chancellor - decision. EWG to suggest criteria/proposal. Energy Officer - what has been done in OrgX(b) to drive the competition.
4. SMT. versus Manager A/Academic Management Committee - sustainable purchasing policy.
5. Manager A/EWG and OrgX(b) EAG - discussion group and conference? Debate OrgX Environmental Strategy with HEAG.
6. Manager A/Academic Management Committee.
7. Manager A/EWG.
8. Energy Officer.

D.2.3.5 Paper and Energy Consumption

Solutions:

1. Awareness and education.
2. Energy Officer - stickers and posters.
3. Estates to put up posters.
4. PC's shutdown automatically upon log off - including student areas.
5. tests in September.
6. Full implementation at the end of October.
7. Turning electrics off - general policy to close windows and turn off electrics in lecture rooms if no-one is waiting outside to use room.
8. Academic Management Committee and IT specialist.
9. Green gown award - external funding?

D.2.3.6 Waste Facilities

Solutions:

1. Manager A/ Heads of Centre - Review EAG, representative from each department (short-term).
2. Estates (Short-term).
3. Staff representatives in EAG (feedback on staff meetings) and students representatives (Short-term).
4. Each faculty - announcement each year, slot for speakers and seminar series.
5. EAG - Green events, competitions, student green day, schools green day, environmental awareness events (Long-term).
6. Manager A/Department Heads - annual planning and SBC - MSC by research environmental issues?? Push MSC OrgX (long-term).
7. Manager A and DEANS (short-term).
8. EWG/Estates/Manager A/Staff.

Added thoughts at the end of the workshop:

Green week - all academics devote one-week of topic to eco-issues. Staff devote time as well. Car pooling. Paperless week.

Arrange EWG meeting at the end of September to solidify actions

D.3 Syntegration Summary of Discussions

D.3.1 OR1

The first OR iteration D.2.1 focused upon ‘what’ environmental considerations needed to be addressed within OrgX. With regards to environmental policies and management within the organisation the underlying themes of ‘member’ discussion focused upon adapting service delivery platforms, increase of practical environmental facilities on-site, reduction of consumables and improved community engagement. ‘Critics’ were then asked to review the main points for discussion and highlighted potential issues within the allocation of responsibility, health and safety considerations, and the potential for yet another management manual. The Aggregated Statements of Importance (ASIs) developed at the end of this topic included the need for clear policy guidelines, strategy for implementation, holistic engagement and a thorough audit of current operational procedures. With regards to employee and student engagement Infoset members identified the need for a formalised environmental group within the management structure, including

financial aid, engagement of students in environmental awareness from the beginning of service provision and broader external community, and highly visual environmental projects. Critics recognised the difficulty in obtaining financial resources to develop practical strategies for change, the 'ugliness' of recycling bins and the health and safety implications of compost bins. This topic discussion ended with ASIs focused upon enhanced internal and external communication, company image, study of best practice in tested environmental projects, making environmental action as easy as possible for the community and adaptation of the organisations culture.

The transport topic members placed emphasis upon the improvement of video-conferencing facilities, car-pool scheme and encouragement of walking/cycling to work. Critics were quick to identify that age and disability discrimination needed to be considered, local transport was inadequate for employees (high cost, poor schedules and reliability) and the cost of installing showers and bike sheds onsite. Transport ASIs were focused upon those activities that were practicable for change including car-pool policy development and incentives scheme, video-conferencing and reduced meeting schedules with OrgX(b) counterparts. With regards to green technologies members suggested the potential use of solar panels, rain water recycling, kitchen waste recycling and specific research projects within each department. Critics identified the restrictions placed upon the organisation as it is located within a listed building that cannot easily be modified, a lack of expertise in technological equipment, health and safety implications and insufficient communication channels to discuss innovations. The ASI for green technologies included communications, long and short term goals versus costs, viability analysis, range of projects, leadership, development of common interests, community engagement and utilisation of staff knowledge.

Member discussion of paper and energy consumption also identified the need for improved technology with regards to energy efficient lighting, default duplex printing facilities, automatic PC shut-down, sub-meters for each department and the purchase of recycled paper; however members at this stage voiced concern at the distinction of voluntary action and management enforcement. Critics viewed these activities as costly, choice of suppliers was restricted by OrgX(b) policy and the reduction of paper use was seen as a potential annoyance. As a result the ASIs for this topic were summarised as energy efficient lamps, PC hibernation, need for analysis into paper versus email consumption statistics and other similar analyses. The final discussion topic of waste facilities was identified by members to include local food sourcing, development of a free cycle scheme and recycling centre, empowerment of the environmental action group through the allocation of time and resources. There was insufficient time for the critics to review this topic within the first OR due to the scheduling of a midday break, and was thus incorporated into the second OR topic discussion. The ASIs developed for this topic included the development of OrgX policies, formalisation of

environmental activities, budgetary allocation, educating employees and students, community involvement and participation.

D.3.1.1 OR 1: Environmental Policies and Management.

The first discussion of environmental policy and management within the organisation was met with much enthusiasm and a surmountable variety of ideas. The group suggested plans to adapt both the policy structure of the organisation and what were deemed 'actual' environmental activities, such as conservation zones. The mixture of ideas and difficulties encountered were significantly aided by the diversity of the group, which included amongst others an environmental scientist and business specialists, all of whom had different definitions of the term 'environment'. The core outcomes suggested by the group were consolidated into the following themes: Development of policy and awareness, Strategy for implementation, Involve all people, Audit and monitoring - full dissemination. The development of full CSIs became inappropriate within each individual topic as the time frame of thirty minutes proved too short. It was quickly determined that the development of CSIs would become the main objectives of the second Outcome Resolve, with the third Outcome Resolve used to define responsibilities, timeframes, resources and precise actions.

D.3.1.2 OR 1: Staff and Student Awareness - Environmental Responsibility.

The initial ideas of the group dedicated to generation of environmental awareness within the OrgX, primarily identified the need for formal environmental management structures within the organisation alongside increased eco-facilities e.g. visible recycling bins. Communication as a key driver to change was first identified within this session and quickly became a recurrent theme throughout the workshop.

Core themes of development: Raising awareness; Communication - committees, location maps, induction for staff; External - image; Best practice; Making it easy; Culture.

D.3.1.3 OR 1: Transport - to/from OrgX.

The initial discussions of transport to and from the OrgX dealt with the significant hindrance of public transport facilities within the area. The town is in the middle of the rural and urban divide, many staff members live in neighbouring villages all of which are rural communities. A core barrier to improving the OrgX transport policy focused upon the practicalities of the local region: to drive from a neighbouring village to the OrgX takes approximately fifteen minutes, using the public transport available in the area to travel the same distance would require one hour and a half for a single trip. The added cost of using public transport also proved too much of a deterrent for staff, with some members easily

spending five pounds per day to travel via buses in the area. For members of staff who live within the town buses are also impractical as the time and cost to travel in this way is again significantly higher than travelling by car. The potential of cycling to work was discussed by the group but this was again seen as an unlikely solution when taking age and disability discrimination into account, as well as accounting for the range of unending hills. For these reasons focus was placed upon reviewing transport between the two University OrgXes. It was decided that car pooling needed to become far easier for staff to use, with a clear car pool timetable for all staff members to access and update regularly. Similarly it was decided that pressure needed to be placed upon colleagues at OrgX(b) to use video-conferencing facilities more, reducing the amount of trips to the OrgX(b) OrgX. This would be far more cost effective for the University by reducing staff petrol claims and would also increase the safety of University employees; a member of staff had previously been killed in a car accident on the popular road between the OrgXes. These suggestions were further supported by the entire group with the proposal that meetings need to be refined, ensuring that meetings are purposeful and necessary rather than just a procedural requirement.

Core themes of development: Car-pool policy (OrgX minibus, hybrids); Stamp cards - accumulate green points (game); Video-conferencing; Less visits to OrgX(b).

D.3.1.4 OR 1: Green Technologies.

Within the discussion of green technologies it was evident that most individuals had knowledge of a range of eco-products. However there were clear gaps between those with technological knowledge and understanding and those who were more familiar with the economic practicalities of the organisation. Furthermore those with technological knowledge were restricted to products that they were familiar with in terms of job usage or general interest, there was little specialist knowledge within the group. It was determined that both long-term and short-term studies were necessary to establish the feasibility and payback period of implementing any new technologies/facilities on site. A prior study had been conducted on the site for the installation of a wind turbine, a study which had been in decision for approximately two years before the workshop date. The concept of installing renewable energy facilities on site is one that requires added research within the local community, as the implementation of a wind turbine could easily be objected to by nearby residents on the basis of noise pollution and that they are perceived as an 'eye-sore'. The main summation of this topic was the identification that a full technological analysis of the site needs to be conducted, enabling the organisation to rank the feasibility of the different projects suggested.

Core themes of development: Communication; Long-term and short-term views needed (low and high cost too); Demonstrating value and

viability; Technologies - electricity and heating, solar, wind; Leadership; Conflicts of interest; Community involvement; Lack of knowledge.

D.3.1.5 OR 1: Paper and Energy Consumption.

Within the initial outcome resolve one participant produced a document available on the staff web-site called 'Environmental Purchasing Guide'. This guide was not a familiar document to anyone else within the meeting group and due to the restricted time of the event the group decided not to focus upon this rather lengthy report. Upon studying the document after the event it became evident that the core provider of the University's supplies, Lyreco, was indeed ISO 14000 accredited and had been for many years. Yet one of the most consistent complaints of the staff across the OrgX focused upon their annoyance that when ordering a small pack of staples, or any like products, the items would arrive in highly excessive cardboard packaging. This once again iterates earlier claims that ISO 14000 is not an infallible system and can in fact be awarded to those organisations which are 'trying' to do better rather than specific operational improvements. This issue was not dwelt upon within the workshop due to the majority of the group feeling that supplier selection was a matter that they had no control over. The group then focused upon current activities in motion, all lamps are being altered to energy-efficient products and computers are currently being tested for an automatic hibernation protocol when individuals log-off from the system. Within academic departments new policies have been implemented to allow students to submit one copy of their assignments in paper format and one electronically. The group seemed pleased with the ongoing development of paperless activities and debated the potential of becoming completely paperless. This resulted in the unanswerable question: "Which is better paper or electricity?" The group determined that they would like a comparative study to be conducted on this issue before taking the full transition to a paperless OrgX. Of course, this would then lead to the added frustration of establishing whether or not you can guarantee that when an individual is using paper that their computer is turned off.

Core themes of development: Lamps; Computers - hibernation; Paper versus electricity - which is better? Need for comparative study, facts/statistics.

D.3.1.6 OR 1: Waste Facilities.

Within the discussions of waste facilities the group debated the possibility of using local food sources to supply the canteen, which would both support the local community and improve the quality of the produce available for sale. This idea came under the claim that better food equals less waste. Added suggestions of food waste recycling were discussed briefly, but previous attempts to gain a site compost bin were met with concerns of pest control, which still overshadowed any benefits of installation. The group decided that they would like a clear

policy requirement that where possible all items should be recycled, and the management support of a OrgX ‘freecycle’ scheme is desired. As was discussed earlier with the illusive Environmental Purchasing Guide the University does in fact have a stationary recycling policy, where all staff are required to reuse stationary until they literally fall apart. Once again this was not known by many members of the InfoSet, clearly demonstrating that current policy guidelines are not effectively communicated. It was also decided that there should be more visible recycling facilities on site, with many staff wanting to recycle but unable to easily find an appropriate bin.

Core themes of development: Built into OrgX policy; More formalised; Budgets - ring fenced and investment, bids; Education; Participation; Community involvement; Halls.

During the lunch break which immediately followed the initial meetings many participants discussed their enjoyment at using the technique. This was the first TS event that the researcher had been involved within, as a facilitator and novice of the technique the early reverberations of the topics initially went unnoticed. It was later during the second Outcome Resolve that the researcher explicitly noticed the reverberation of the topics, and it was with quite some surprise that the participants began to notice and indeed comment on the usefulness of the method.

D.3.2 OR2

The second iteration of ORs D.2.2 focused upon the development of the defined ASIs into Composite Statements of Importance (CSIs) in order to establish ‘how’ to achieve the desired goals. It was at this stage of the event that the different topics began to merge/crossover into one another, with the InfoSet recognising similarities in strategic focus and potential barriers to implementation that spanned all of the discussions. The CSIs produced at this stage with regards to environmental policy and management focused upon providing the EWG with top-down management support (formalisation, policy enforcement and budget), representatives from each department in EWG to coordinate activities and engage employees and students. CSIs specific to employee and student engagement included once again the formalisation of the EWG, development of OrgX environmental statement, induction materials, team building days, service agendas, publication of achievements to external community, dedicated section in employee newsletter and website for EWG updates. Transport CSIs were restricted to those activities that involved educating peers on the best use of their vehicles (efficient breaking speed, responsible acceleration speed) and where possible the use of alternative travel (walking and car pool). This topic was quickly deemed to be limited for adaptability due to the local transport system being quite unreliable due to the somewhat rural setting of the locale; it is quite typical in the area that a fifteen minute car journey could take one hour and a half using the local bus services.

The CSIs for green technologies experienced a significant reverberation of ideas from other topics with the suggestion for the use of employee web-site and newsletter to disseminate new developments and empower the EWG. This topic also developed upon suggestions that OrgX should attempt to become autonomous from the control of OrgX(b) in relation to its purchasing policy, and set itself as a 'pilot study' site for innovation. Paper and energy consumption CSIs focused again upon the need for effective education and communication on the efficient use of consumable materials and the added need for visual displays of environmental policies and achievements to maintain an environmental presence onsite. The final topic for this OR iteration was that of waste facilities which experiences another significant reverberation of ideas, where the defined CSI again highlighted the need for improved communication channels to establish a holistic outreach for environmental activities, budgetary allocation to EWG, provision of environmental education to students, and the sourcing of healthy locally sourced food.

D.3.2.1 OR 2: Environmental Policies and Management.

This topic experienced reverberations of staff and student awareness, with the primary focus of holistic change within the organisations culture to accommodate the new strategy. Core themes of development: Give EAG 'teeth' with clear remit and support to enable policy creation; Top-down support; Broad access of EAG representatives; Staff/student committees; Co-ordinate departments; Budget.

D.3.2.2 OR 2: Staff and Student Awareness - Environmental Responsibility.

This topic experienced reverberations of policy management and green technologies, with participants suggesting that the EWG become formalised within the organisation and that the group should have a dedicated page on the University website.

Core themes of development: Management support; Communication through online resources; Induction topics; External 'sustainability' visits; Development of research topics.

D.3.2.3 OR 2: Transport - to/from OrgX.

This topic experienced reverberations of policy management, green technologies, staff and student awareness, with the group deciding that best practice policies should be iterated and supported by management.

Core themes to development: Education; Good practice, Alternatives to travel.

D.3.2.4 OR 2: Green Technologies.

This topic experienced reverberations of policy management, with the recognition that the financing and installation of new technologies is highly dependent upon the management structure.

Core themes to development: Management support; Green newsletters/webpage; Departmental competitions; Empower EWG; OrgX as a pilot study with potential to influence/advice OrgX(b) OrgX; Sustainable Purchasing.

D.3.2.5 OR 2: Paper and Energy Consumption.

This topic experienced strong reverberations of staff and student awareness, with core factors to success placed upon individual efforts to behave more responsibly.

Core themes to development: Awareness and education; Visual displays; Enhanced communication; OrgX 'green gown' award.

D.3.2.6 OR 2: Waste Facilities.

This topic experienced reverberations of policy management, staff and student awareness, similar to the previous topic the group felt that this was highly dependent upon individual choice but that it could be improved with the increase of recycling facilities on site.

Core theme to development: Environmental policies; Communication; Holistic Responsibility; External Awards; Community Outreach; Budget for Eco-Strategy; Healthy food.

D.3.3 OR3

Within the third/last iteration of the topics the establishment of 'who' was responsible for the developed action plan was pursued. It was with some surprise that virtually all of the developed topics were viewed as the responsibility of Manager A, suggesting that there is little autonomy within the departments of OrgX. There was a stage during the allocation process where someone did ask why Manager A was being given the lead of all of the projects, to which a response was provided stating to the group that unless they stood forward and took responsibility the automatic default was Manager A. This responsibility attribution was not through a lack of willingness on the part of the info set, but when faced with the question of 'who will take on this action?' nobody was able to say that they would as they literally needed the permission of Manager A to undertake any of the suggested projects. It seemed that everyone wanted to undertake specific projects but felt that the inevitable barrage of meetings and ensuing battles for resources would require too much time and effort outside of their already hectic work schedules.

D.3.3.1 OR 3: Environmental Policies and Management.

1. Embed the EWG into the formal management structure of OrgX. *Manager A, HoD*
2. Allocate time for EWG members to develop projects and recruit taskforce from department. *Manager A, HoD*
3. IT to setup email account for environmental volunteers. *Infoset participant*
4. Develop policy requirement that all departments/hierarchies are represented within EWG. *EWG and KATHRYN KNOWLES*
5. Increase staff and student involvement within environmental activities. Access students through SU and freshers fair. *KATHRYN KNOWLES and EWG member*
6. Co-ordinate the efforts of all departmental eco-projects through enhanced communication channels. *EWG*
7. Develop communication channels to enhance the recruitment of environmental volunteers. *3 Infoset participants*

D.3.3.2 OR 3: Staff and Student Engagement.

1. Develop recycling guidelines that are easily accessible to all at OrgX. *Service C and Service F*
2. Develop new curriculum upon sustainability themes, “Environmental Week” every module on green issues and campus away day Academic Management Committee. *Academic Management Team*
3. Develop Campus research groups enabling interdisciplinary study. *Manager A, HoD*
4. Develop an Environmental Action Board. *Manager A and Academic Management Team*
5. Assign a specific section of each Employee Newsletter issue to environmental activities at OrgX. *Infoset participant*

D.3.3.3 OR 3: Transport.

1. Educate and encourage staff on best practices of travel e.g. car pools, cycling, etc. *HoD*
2. Travel timetable/whiteboard to be placed in staff room for those who want to car pool. *Manager A*
3. Implement a long-term feasibility study of purchasing an OrgX Minibus.

4. Develop and expand current video-conferencing facilities on Campus. *Service C*
5. Increase demand upon OrgX(b) colleagues to use video-conferencing facilities to reduce visits to the OrgX(b) Campus. *Manager A*

D.3.3.4 OR 3: Green Technologies.

1. Develop the range and amount of eco-friendly technologies at OrgX. *Academic Management Team*
2. EWG members will collect information about new technologies and distribute ideas of best practice to staff/students/executives through Employee Newsletter. *EWG and OrgX(b) Energy Officer*
3. Develop departmental 'green' competitions within EWG and through consultation with the Energy Officer in OrgX(b), to promote the reduction of consumption and increased waste recycling. *Manager A, OrgX(b) SMT*
4. Develop an OrgX 'Sustainable Purchasing Policy'. *OrgX(b), Manager A, Academic Management Team*
5. Coordinate with OrgX(b) Environmental Action Group. *EWG and OrgX(b) EWG*

D.3.3.5 OR 3: Paper and Energy Consumption.

1. Develop awareness and understanding of staff and students in their personal responsibility for reducing paper and electricity consumption. *HoD, OrgX(b) Energy Officer*
2. IT to develop automatic PC shutdown procedures upon log off - including student areas. *Service C*
3. Develop general policy to close windows and turn off electrics in lecture rooms if no-one is waiting outside to use room. *Academic Management Team and Service C*
4. Develop feasibility study of gaining external funding for a student 'Green gown award'.

D.3.3.6 OR 3: Waste Facilities.

1. Management shall monitor and review the EWG activities. *Manager A, HoD*
2. Estates to reiterate to cleaners that radiators and lights should not be left on when leaving rooms. *Service F*
3. Staff representatives in EWG will feedback to departmental staff meetings and students representatives to the SU.

4. Departments will allocate time for environmental speakers and seminar series within each academic year.
5. The EWG will develop 'Green Events' - competitions, student green day, schools green day, environmental awareness events to be held periodically throughout the academic year. *Manager A, HoD*
6. Develop a feasibility study of implementing a OrgX and Local Authroity MSc by research in local environmental issues. *Manager A, HoD*
7. Determine the feasibility of local healthy food sourcing. *Manager A, Service F member, EWG, all staff*

Appendix E

SSM Rich Pictures and VSM Analysis

E.1 System In Focus

The interview questions for this section were altered after the initial interview with Service person A, so as to focus the study more upon environmental activities within the system in focus.

E.1.1 Service A - 1st December 2008

No Audio Recording Available.

S1-S2

1. What is the core purpose of your department?
 - Supporting academic departments and students.
2. What are the primary tasks of your department?
 - One manager for all of Service A.
 - Admissions, graduation, timetable, exams, results, marketing, web-site, publications, OrgX magazine, Recruitment.
3. Does your department decide on which tasks to undertake and how to conduct them? or is this dictated by another department?
 - Both. Need to fit into the same mission statement.
 - There is one person for each OrgX(b) department.
4. How often are these tasks reviewed to ensure that they are still a necessary operation?
 - Yearly system.
5. When a team member is unavailable e.g. through sickness, how is their workload managed?

- Split between colleagues.
6. Does your department share any activities with other departments?
 - OrgX(b) campus.
 7. Optional: Can you describe three core attributes of the management style of your Head of Department?
 - Only in post for a few months, so not sure.

S3

1. Is there a missions statement and budget for each operational unit i.e. teaching research, community outreach?
 - Not a budget or statement for each, broadly linked to department.
2. What performance indicators are in place to assess your department?
 - General statistics of customer and deadline.
3. How are the departmental activities evaluated by the organisation?
 - Mystery shoppers, questionnaires.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Fortnightly meeting (broad), specific scheduled as activities occur (specific individuals).
5. Can these meetings be arranged by any member of the team?
 - Could ask if needed to, typically added to agenda of regular meeting.
6. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
 - Manager C, ORGX SMT fortnightly.
 - Two members, Service A monthly.
 - OrgX(b) committees every few months.
7. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - (a) Input from Manager A.
 - (b) Head of Departments for each individual activity.
 - (c) Employees themselves.

S4

1. What future planning procedures or prediction systems are in place?
How do you remain competitive?
 - Targets (from OrgX(b)), surveys, past activity analysis.
 - Research activities with colleagues.
2. Who is responsible for the collection and analysis of such information?
 - Senior Management Team.
 - Team suggestions, approval from OrgX(b).
3. How is such information recorded and made available to employees?
 - Manager C decides if the information is relevant to the whole team or acting representative.
4. What external outreach activities does your department pursue?
How do you attract students and business partnerships?
 - See primary tasks.
5. Who is responsible for undertaking such activities?
 -

S5

1. Who does your department report to?
 - Manager A (solid), OrgX(b) (dotted lines).
2. What information and/or analyses are you required to produce for this authority? How often?
 - Reports, statistics, updates, feedback, monthly OrgX SMT report.
3. Who has the authority to design and implement new policies in your/for your department?
 - Manager C - implement.
 - Manager A and OrgX(b) - approval.

E.1.2 Service B - 3rd February 2009

No audio recording available.

S1-S2

1. Describe your department's main tasks?

- Facilitation of lecturer requirements (materials/books).
- Delivery of Information Skills sessions (teaching).
- Providing access to books and online resources.
- Issuing books.
- Customer Services.
- Storage of materials and environment to study.
- Network PC's.

2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?

- Local decisions - personal choice to recycle paper, shut-down electrical equipment, bring used plastic bags from home for students to carry books in.
- Governed by Service departments for activities such as electrical equipment disposal.

3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:

(a) Relationship with higher management

(b) Autonomy to manage your own budget

- Determined by Service C manger.
- Need to find local solutions - would like to recycle used books like OrgX(b) Campus.

4. Does your department share any environmental activities/resources with other departments?

- Service F.

5. Is there a mission statement and budget for each operational unit i.e. teaching, research?

- Approximately a dozen budgets within the department - nothing specifically allocated to environmental issues.
- Eco-funds/purchases are determined by an individuals choice.

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Formal annual check of objectives.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Budget - typically analysed by OrgX(b).
 - Service standards.
 - Balanced Scorecard.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - Personally my work would simply remain until I returned.
 - In general everyone helps where/when they can.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Monthly meetings - all of team.
 - Management aim for monthly meeting.
5. Can these meetings be arranged by any member of the team?
 - All team members are involved in the monthly meetings.
 - Any of the 3 members of management can call a meeting.
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - Publish rules and regulations of the service for all to see.
 - Some specific policies.
 - OrgX(b)-based colleagues and Service C Manager would enact the intervention.
7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Speak to Service D.
 - (b) Environmental activities - car pool system
 - Would try and set one up for own team, for an organisation-wide system would contact Service F or Manager A.
8. Optional: Can you describe three core attributes of the management style of the Head of Department?
 - Choose not to answer.

1. What future planning procedures or prediction systems are in place?
 - (a) How do you remain competitive?
 - Annual reviews.
 - General meetings.
 - Cannot be compared to similar services in the external community due to the specific products available to the customers.
 - (b) Who is responsible for the collection and analysis of such information?
 - Keep service departments statistics in house - analysed by OrgX(b) colleagues.
 - Objectives decided by OrgX.
 - (c) How is such information recorded and made available to employees?
 - Spreadsheets and surveys.
 - National student survey.
 - Feedback forms.
 - All library staff see the analysis, information is kept within the relevant service departments.
 - (d) Timescale?
 - Primarily the National Student Survey - annual review.
 - (e) Decision maker - prioritisation?
 - Service C manager makes the decisions which are then reviewed by OrgX(b).
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?
 - No specific external outreach activities.
 - Involved in HE for Me week, host student ambassadors.
 - (a) Who is responsible for undertaking such activities?
3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?
 - Ad hoc.
 - Identify need, check feasibility, liaise with Service F/Service C manager/Academic services.
4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
 - 2 or 3 quarterly meetings (service committees).
 - Students - annually.

- No formal customer service meetings between OrgX and OrgX(b).

S5

1. Who does your department report to?
 - Service C manager, some dotted lines to OrgX(b).
2. What information and/or analyses are you required to produce for this authority? How often?
 - Annual statistics and meetings.
3. Who has the authority to design and implement new policies in your/for your department?
 - Service C manager.

E.1.3 Academic C(c) - 5th February 2009

Interviewee decided not to provide a rich picture, the participant was new to the organisations EAG and felt that they did not know enough about current activities.

S1-S2

1. Describe your department's main tasks?
 - Teaching.
 - Learning.
 - Research.
 - Consultancy.
2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?
 - Governed by department but primarily an individual's choice.
3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:
 - (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - Not a major problem.
 - Follow Campus and OrgX(b) formalities.
 - Voluntary. Personal opinion that the Campus is not 'dirty'.
 - Budget controlled by Aca E(a).

4. Does your department share any environmental activities/resources with other departments?
 - Not sure - assume that more will be found out when I attend meetings of EWG.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 - There is an overall mission statement for the University, you are required to work in line with that statement.
 - Budget is primarily allocated to teaching.
 - There used to be a research budget, but this is now a research fund that staff must apply for.

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Staff meetings once or twice a month.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Exam results.
 - National Student surveys.
 - End of year - module assessment for Director of Teaching and Learning.
 - Three to four meetings per semester - Teaching and learning committee
 - Once of twice a semester SERVICE A.
 - Quality Assurance committee.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - People will help where they can, but if a specific expertise is required certain individuals will have to take their place.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Module board and Programme board meet in the summer.
 - There are meetings in the semesters following examinations.
5. Can these meetings be arranged by any member of the team?
 - Director of Teaching and learning.
 - Aca E(a).
 - Examinations Officer.

6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - Programme approval before OrgX(b) allow teaching to commence.
 - Concerns are discussed during drafting processes, reviews of modules etc are permitted after a few years.
 - Assessment material would identify any problems with the teaching standard - module assessments must align with module specifications, these are checked before exams are undertaken. Many mechanisms in place to ensure quality.
7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Do not conduct purchases. Would request items from relevant Aca C member, who would then seek permission from Aca E(a).
 - (b) Environmental activities - car pool system
 - Do not know. This is typically done by individuals via email.
8. Optional: Can you describe three core attributes of the management style of the Head of Department?
 - Ensures that all team members are involved in the decision-making process.
 - Wants to be seen to be fair.
 - The department has been under the supervision of an Acting Head for the past five months.

S4

1. What future planning procedures or prediction systems are in place?
 - (a) How do you remain competitive?
 - Attractive product.
 - Value for money.
 - Renowned for field-based trips - Indonesia, Malaysia, Majorca.
 - Open door policy for students to visit lecturers.
 - Research needs to improve.
 - (b) Who is responsible for the collection and analysis of such information?
 - Marketing and Admissions representatives within department.
 - (c) How is such information recorded and made available to employees?

- Made available to all employees in department.
- (d) Timescale?
- Strategic planning reviewed every five years by Head of Department.
- (e) Decision maker - prioritisation?
- Senior Management Team.
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?
- Field trips, open door policy.
 - Contact with local council, professional bodies and consultancy.
- (a) Who is responsible for undertaking such activities?
- Everyone, it is expected that you will do these activities but it is not required.
3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?
- Discuss, send emails, staff meetings.
4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
- Once or twice a month with Aca E(a).
 - Depends on the difference committees that staff members belong to, not sure how often.

S5

1. Who does your department report to?
- Manager A, who then reports to OrgX(b) colleague.
 - OrgX SMT.
2. What information and/or analyses are you required to produce for this authority? How often?
- OrgX SMT as and when required.
3. Who has the authority to design and implement new policies in your/for your department?
- Senior Management Team, then Manager A, then Head of Department, followed by staff meeting for all to input.

E.1.4 Academic C - 6th February 2009

S1-S2

1. Describe your department's main tasks?

- Science-bit of Campus - would feel like a typical FE if we were not here.
- Delivery of three undergraduate degrees.
- Train students to have correct/practical skills.
- Small departments, 8 or 9 academics, couple of ordinary staff.
- Field trips.
- Dive training.
- Mainly teaching (70%), Administration (70%).
- Research.

2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?

- Aca E(a).
- Unofficial.
- Driving force of the department and field of teaching - save the world.

3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:

(a) Relationship with higher management

(b) Autonomy to manage your own budget

- Time is the main issue.
- Do not tend to utilise the expertise of academics within campus.
- This could be facilitated better.
- Problem - need to use same suppliers as OrgX(b), would be better if we could source locally. Example to take some students on a field trip we are required to use a company in OrgX(b) that costs 460, but we could get the same transport in OrgX for 290.
- Commitment.
- Easier mechanisms.
- Sometimes need to remove voluntary aspect of an activity.
- Many undertake such activities on a recreational basis.

4. Does your department share any environmental activities/resources with other departments?

- Not sure, current Head of Department (Aca E(a)) is from a different department.
 - Would be useful to try and establish a taxi-share system for the local region.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
- No, just agreed direction of the department. Would be laughed at.
 - There is a budget for each activity.

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Big review once a year.
 - Continuous discussion - many informal actions.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Teaching - quite complex. Module evaluation questionnaire, reviewed by Service A, feedback loop to students through module handbook.
 - Level 6 changes all the time to remain current.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - Level 6 modules could not be covered, would need to cancel or postpone.
 - Long-term - informal meetings to establish who can help and where. Recent instance required the purchase of external expertise to cover module, this required a battle with the Senior Management Team for necessity of the purchase.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Staff meetings are held formally every two weeks.
 - Environmental and Research need bigger presence within departmental meetings.
5. Can these meetings be arranged by any member of the team?
 - Aca E(a) and administrator.
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?

- Annual plan.
 - Must follow module handout - otherwise students could complain directly to the tutor, Aca E(A) and Service A.
7. What procedures would you need to undertake to attain:
- (a) Environmental products - recycled printing paper
 - In previous role as Head of Department I would have just bought the items that I wanted.
 - (b) Environmental activities - car pool system
 - Personal drive through information networks - voluntary if not supported by the top.
8. Optional: Can you describe three core attributes of the management style of the Head of Department?
- Administrative, Slow (considered), Straight/Honest.

S4

1. What future planning procedures or prediction systems are in place?
- Amount of applications for study.
- (a) How do you remain competitive?
 - Keeping as a small centre.
 - Small costs to run the centre.
 - (b) Who is responsible for the collection and analysis of such information?
 - Different people have different roles: Admissions tutor will analyse admissions statistics, personally as the Research tutor I analyse the research statistics, Aca E(a) analyses the financial and HR aspects of the department.
 - (c) How is such information recorded and made available to employees?
 - Generally the information is made available to all members of staff - but certain financial and HR information is not made public.
 - (d) Timescale?
 - The analysis is primarily constant - for each financial expenditure the budget will be reviewed.
 - (e) Decision maker - prioritisation?
 - Tutor - own time.
 - Aca E(a) and Director of Learning - deadlines.
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?

- SHRUBS - eco-student group are involved in local monitoring and survey projects.
- Not typically business partnerships - local council, central science labs.

(a) Who is responsible for undertaking such activities?

- All academics.

3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?

- convince colleagues over tea, bring up at a staff meeting.

4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?

- Twice a semester I meet with the Campus Research Committee.
- Aca C(b) in EWG.
- Dependent upon Campus Committee attendance.

S5

1. Who does your department report to?

- OrgX SMT - Manager A.
- Dotted line to faculty.

2. What information and/or analyses are you required to produce for this authority? How often?

- General report to all OrgX SMT meetings - fortnightly.

3. Who has the authority to design and implement new policies in your/for your department?

- Aca E(a) - but they are the first among equals.

E.1.5 Academic E(b) - 9th February 2009

S1-S2

1. Describe your department's main tasks?

- Research and training.
- Cluster of four groups with subdivisions - English, Theatre, Music, New Digital Media (internet Computing and Digital Media).

2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?
 - No control in department. Low priority.
 - Previous activities developed from student initiatives/pressure e.g. recycle bins.
 - Used to provide free printing - default of two pages per sheet and duplex.
 - Set up defaults to use specific printers to use old paper type.
 - Have tried estates for recycling bins - agreements are made, but did not happen, later centralised bins were made available.
3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:
 - (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - There is no sense of urgency (estates).
 - Heating and windows are a huge problem.
 - Financially there are other priorities - research.
4. Does your department share any environmental activities/resources with other departments?
 - No, only voluntary choice.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 -

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Module allocation - annual.
 - Four groups - mid-semester review with students/informal, two weeks later there is a formal meeting with Service A.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Student assessment.
 - Module evaluation questionnaire - given to year representatives who then collect and provide the second marker.
 - Online evaluation - the system was unfair as only the 'good' students and those who were unhappy with the module would leave comments.

- Module review week during summer.
 - External examiners review assessments and provide a report to the exam board and Vice Chancellor.
 - External examination by accreditation body - currently hold highest rank, therefore students are able to graduate as recognised professionals immediately.
 - Departmental review every five years - self-evaluation, all documents in place, reports are sent to the external assessor.
 - Internal review - not sure how often, conducted by the Vice Chancellor and Business School.
 - Government assessment, 1 year in every three - all academics must supply a time management report.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
- Long-term we would re-plan the modules around it.
 - Short-term we can cover each others work within our own cluster, if necessary we would need to postpone.
 - Constrained through specialities.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
- Expect once or twice a year - just academics.
 - Away days - previously staff from the Digital Media section attended a Staff Development Day, but this was more of a Programme Development Day.
 - Recently had a Staff Development Day for entire department E.
 - Student Orientated.
5. Can these meetings be arranged by any member of the team?
- Yes - there is now a time slot reserved in all departmental schedules each week, where a meeting can take place. Meetings are likely to occur every other week.
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
- Module handbook and second marker.
 - External review.
7. What procedures would you need to undertake to attain:
- (a) Environmental products - recycled printing paper
- Informal - speak with administrator in Aca E who is responsible for fund allocation for staff printers.

- For the student printers I would discuss informally with Aca E(c).
- (b) Environmental activities - car pool system
 - Informal discussion with Manager A.
- 8. Optional: Can you describe three core attributes of the management style of the Head of Department?
 - Centralist, Orderly, Fair.

S4

1. What future planning procedures or prediction systems are in place?
 - (a) How do you remain competitive?
 - Advertising of degree names - this can significantly alter student application figures.
 - Best department in country for Digital Media.
 - Complimentary specialties across the department.
 - External outreach - potential projects at the moment are being developed for GCHQ and BBC New Media.
 - Open days are essential - if students visit they tend to stay.
 - (b) Who is responsible for the collection and analysis of such information?
 - Group discussions and team meetings.
 - Admin tutor will analyse the information.
 - (c) How is such information recorded and made available to employees?
 - Senior Admin Tutor conducts the analysis - the data is not centralised.
 - Information is shared every now and then.
 - (d) Timescale?
 - Every few months.
 - (e) Decision maker - prioritisation?
 - All involved - there are gurus for different areas.
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?
 - Previously discussed - GCHQ and BBC New Media.
 - You Tube lecture sessions.
 - (a) Who is responsible for undertaking such activities?
 - Specific tutors have responsibility for marketing and advertising.

- All academics are meant to be involved with external work - you all start in the mud and pull yourself out. The current process is that you apply to funding bodies and gain finance for the University, this means that you can then have a PhD student or reduce teaching allocation to improve your own research projects. OrgX(b) seem to be unaware of the amount of work/teaching that is conducted at OrgX (only four tutors teaching computing) - there is no time to research or even apply for funding.
3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?
 - Would not think to do this.
 - Example I wanted a shredder and coffee machine for my office - so I bought my own and leave it here.
 4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
 - ORGX SMT - not sure how often.
 - Formal/informal meetings for research - not sure how often.
 - PGCHE - all new tutors are required to attend these sessions each week.

S5

1. Who does your department report to?
 - Internet Computing research students (MSC Res and PhD) - Faculty of Science.
 - Undergraduates and postgraduates - Faculty of Arts and Social Sciences.
 - Manager A.
 - Faculty of OrgX?
2. What information and/or analyses are you required to produce for this authority? How often?
 - Not sure.
 - There would usually be a review of the Academic Information System (AIS) - the university student database.
3. Who has the authority to design and implement new policies in your/for your department?
 - Formally - two thirds of the module managers on exam board.
 - Senior Management Team would inform Aca E(a) of required changes.

E.1.6 Service F- 12th February 2009

No rich picture provided.

No audio recording available.

S1-S2

1. Describe your department's main tasks?

- Facilities in OrgX - household and cleaning, care takers, constant maintenance, Service F(b) to organise staff and check work, security 24 hours a day of building and grounds (also 98 Filey Road), book field trips and conferences - sell the university during holidays, pay for cardboard/ink toner/batteries and WEEE disposal, first contact for site organisation, student/staff/visitor problems, Incident Team - 24 hours a day i.e. leak, fire, sickness. Primarily led by OrgX(b) operations - coordinated through Service F, new recycling facilities (aim of 20 centralised sites).
- Refurbishment/upgrades and maintenance- 700,000 refurbishment of two blocks in Cayley Halls, in-house work where possible with the view to minimise impact on teaching, cleaning of gulleys and drains, safety procedures, looking at rain water collection and solar panels, grounds maintenance is subcontracted but controlled, now a specific employee for site cleaning and collection of recyclables, actions such as push tap/low energy light bulb/energy efficient boilers, reupholstering of chairs (cost effective).
- New build - planting of trees.
- Voluntarily - emails of unused property to staff or sent to local charity, lost items donated to charity after specific timeframe, some computers are reused (either sold or stripped for components), buy natural products where possible, recyclable paper and new hand dryer installation, cleaning product reduction, glass is recycled, new gas tumble dryers.

2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?

- Do this myself.
- Watch OrgX(b) then transfer policies to OrgX.
- Budget constraints - last year over 700,000 spent on refurbishment of main building.
- Survey next week of electrics on site.

3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:

- (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - OrgX(b) leads but quite independent.
 - Change of use of rooms - may require the removal of walls and construction of new facilities.
 - Budgets - lack of allocation.
4. Does your department share any environmental activities/resources with other departments?
 - All.
 5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 - Set budget for Vehicle Cost, Laundry, Cleaning, Furnishings/purchases, Workshops, disposal, Uniforms, Gardens, Rent, Maintenance, Building Maintenance.
 - General statement for department (possible).

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Audited - not sure.
 - Manager B - every month, also weekly meetings.
 - New suppliers always checked by OrgX(b).
 - WR1 - OrgX(b) decision for approvals.
 - All jobs require 3 quotations.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Own internal targets.
 - Work is graded and prioritised.
 - Negotiation.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - Myself and Service F(c) interchange positions if necessary.
 - Cleaners - will cover each others work.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Myself, Manager B and Service F(c) meet weekly.
5. Can these meetings be arranged by any member of the team?

- Yes - as well as Service F(b)
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - Informal discussion with colleagues and employees from area where work is undertaken.
 - Manager B.
 7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Generally purchase whatever I want (cleaning products).
 - Would contact Service D.
 - (b) Environmental activities - car pool system
 - Negotiate and set-up - dependent upon day.
 8. Optional: Can you describe three core attributes of the management style of the Head of Department?
 - No answer provided.

S4

1. What future planning procedures or prediction systems are in place?
 - Security.
 - (a) How do you remain competitive?
 - Campus could not function without us - we do a lot of the background work e.g. room settings and maintenance etc.
 - (b) Who is responsible for the collection and analysis of such information?
 - N/A.
 - (c) How is such information recorded and made available to employees?
 - N/A.
 - (d) Timescale?
 - N/A.
 - (e) Decision maker - prioritisation?
 - Joint with Service F(c), Service F(b), Manager B and Manager A.
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?
 - Basics Plus.
 - Recycle to schools.

- Miller Recycling services.
 - Subcontract of gardening.
- (a) Who is responsible for undertaking such activities?
- Service F.
3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?
- Identify needs (example recycling), assess impact on others, look at implementation.
4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
- Service F and Service F(c) - daily or weekly.

S5

1. Who does your department report to?
 - Manager B.
2. What information and/or analyses are you required to produce for this authority? How often?
 - Reports and records, budget controls in weekly discussion if need be.
3. Who has the authority to design and implement new policies in your/for your department?
 - Manager B gives approval of team decisions.
 - Check with HR and unions.

E.1.7 Academic B - 13th February 2009

S1-S2

1. Describe your department's main tasks?
 - Teaching.
 - Research.
 - Reach Out.
 - International Business, Business Management, Sport Management, Tourism Management, Business Management and IT. Possibility of reinstating the Sustainable Business degree soon.

2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?
 - Decided by OrgX(b) campus.
 - Follow ACADEMIC B2 guidelines e.g. paperless submissions.
 - Require project champions - such as the wind turbine idea.
 - Department could segregate waste - individual drive.
3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:
 - (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - Need commitment and leadership - Fairtrade status gained through the support of the Director of Finance.
 - Tradition needs to be overcome - ebooks are difficult to adjust to.
 - Some autonomy but very limited. Controlled by ACADEMIC B2 Dean.
4. Does your department share any environmental activities/resources with other departments?
 - Occasionally share a bus and other resources.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 - Budget for each distributed from overall departmental budget.
 - Academic B2 strategic plan.

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Bi-monthly/monthly meetings.
 - Formal and informal meetings.
 - Committees in OrgX(b).
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Strategic plan (per department of ACADEMIC B2) - targets and objectives.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?

- Dealt with very quickly - voluntary cover, all tend to help.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Once very 6-8 weeks.
 5. Can these meetings be arranged by any member of the team?
 - Set formal meetings.
 - Informal meetings happen all the time.
 6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - Head of Department.
 - Manager A.
 - OrgX(b).
 7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Ask administrator in Academic Team B to order items that are specifically eco-friendly.
 - (b) Environmental activities - car pool system
 - Proposal to Manager A (informal) - see as a friend.
 8. Optional: Can you describe three core attributes of the management style of the Head of Department?
 - Discrete, Intelligent, Fair.

S4

1. What future planning procedures or prediction systems are in place?
 - (a) How do you remain competitive?
 - Value for money.
 - Practitioners/theorists balanced.
 - Sensible programmes.
 - Good teaching staff.
 - Good physical environment.
 - Happy alumni.
 - Good library.
 - Football team in the Premiership League.
 - (b) Who is responsible for the collection and analysis of such information?
 - Recruitment team - 3 admin tutors, academic outreach.
 - (c) How is such information recorded and made available to employees?

- Admissions process and database.
 - Head of Department.
 - Most have access.
- (d) Timescale?
- Ongoing, reports when needed.
- (e) Decision maker - prioritisation?
- OrgX(b) - budgets and strategies.
 - Local implementation.
2. What external outreach activities does your department pursue? How do you attract students and business partnerships?
- Local businesses.
 - KTP.
 - Consultancy and information.
 - Research.
- (a) Who is responsible for undertaking such activities?
- Academics - some more than others.
3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?
- Direction from Manager A or SMT.
 - Green officer per department - develop plan and budget, meet with others for unity across campus.
4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?
- Depends on committees e.g. Learning Teaching Resources, Campus Research etc. As and when.

S5

1. Who does your department report to?
- Academically - Dean of Academic B2.
2. What information and/or analyses are you required to produce for this authority? How often?
- Teaching, research and outreach reports.
 - Informally - ongoing.
 - Formally every 1-2 months.
 - Module boards.

3. Who has the authority to design and implement new policies in your/for your department?
 - Design - whole department (academics and administrators).
 - Implementation approval - Senior Faculty, Dean of Academic B2.

E.1.8 Academic A(b) - 19th February 2009

No audio recording available.

S1-S2

1. Describe your department's main tasks?
 - Administration.
 - Research.
 - Teaching - external moderation, pastoral care and support, structure (different students - professional or academic), development, widening participation, collaboration with other HE (moderator), organise.
2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?
 - Academic A.
3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:
 - (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - Huge processes - at least 8 pieces of paper per activity, needs less protocol.
 - Service F willing/open to change.
 - With regards to budget - not sure of cohesion of team in environmental issues, led by individuals.
4. Does your department share any environmental activities/resources with other departments?
 - No.
 - Ideas - but not sure of efficiency. Specific employee to collect recyclables from offices but this is rarely done.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 - Teaching - general budget and policy statement.

- Research - controlled by OrgX(b) (budget and running).

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Annual review with individuals.
 - Not sure of tasks.
 - New change in Campus structure at the end of August - not sure of new processes, but department will now be structure like ACADEMIC B2 in OrgX(b).
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Offsted - lecturer assessment.
 - External examiners - all programmes.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - Teaching - record power points onto blackboard, informal help of colleagues.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Not very often, twice a year.
 - Nowhere to meet, need a common room.
 - Staff away days - ad hoc.
 - Actively seek people out.
5. Can these meetings be arranged by any member of the team?
 - Subgroup - yes.
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - PGCHE
 - National Students Survey.
 - Students - module evaluation questionnaires.
7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Individually decided to print double-sided.
 - (b) Environmental activities - car pool system
 - Approach Academic A.

8. Optional: Can you describe three core attributes of the management style of the Head of Department?

- Decisive (ways evidence), Approachable, Integrity.

S4

1. What future planning procedures or prediction systems are in place?

(a) How do you remain competitive?

- Quality - '1' Offsted rating, specific quality officer within department.

(b) Who is responsible for the collection and analysis of such information?

- Offsted and departmental quality officer.

(c) How is such information recorded and made available to employees?

- Academic A usually sends email to departmental staff with updates.

(d) Timescale?

- Difficult to say with upcoming structural change in August.

(e) Decision maker - prioritisation?

- Academic A.

2. What external outreach activities does your department pursue? How do you attract students and business partnerships?

- Widening participation - liaison with students union.
- Moderate HE and FE.
- Employer Strategy Groups.
- Alumni.

(a) Who is responsible for undertaking such activities?

- Dependent upon programme.

3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?

- Approach Academic A, set up meeting, contact EWG (necessary to have group, getting activities done).
- Need small scale activities.

4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?

- Depends upon activities - personally working with Academic D, Academic B and Academic E team members.

- PGCHE opens up connections.

S5

1. Who does your department report to?
 - IFL until August - of which CES, Academic Team D and Academic Team A are contributing departments.
2. What information and/or analyses are you required to produce for this authority? How often?
 - Induction report.
 - Annual appraisal.
 - Application for funding report.
 - Moderation reports for collaboration (OrgX(b), Quality Office, External examiners).
3. Who has the authority to design and implement new policies in your/for your department?
 - Academic A - some.
 - Dean of IFL - tied with change.

E.1.9 Academic A - 20th February 2009

S1-S2

1. Describe your department's main tasks?
 - Teaching and learning.
 - Research that supports the teaching and learning process.
2. Does your department decide on which environmentally-related tasks to undertake and how to conduct them? or is this dictated by another department?
 - Mixture - some from Service F and Facilities Directorate, some from individuals.
3. In your view what are the major constraints that you have in developing your environmental tasks, from the following perspectives:
 - (a) Relationship with higher management
 - (b) Autonomy to manage your own budget
 - Lack of coherent policy/systems.
 - Not much flexibility in budget.
4. Does your department share any environmental activities/resources with other departments?

- No.
5. Is there a mission statement and budget for each operational unit i.e. teaching, research?
 - There is a broad departmental budget that is then split.
 - No mission statement.

S3

1. How often are departmental tasks reviewed to ensure that they are still a necessary operation?
 - Ongoing - departmental meetings.
2. What performance indicators/auditing procedures are in place to assess your departments' efficiency?
 - Programme reviews, feedback - student module evaluation questionnaires, SERVICE A.
 - Many different systems.
 - Annual - quality assurance, external examiners.
3. When a team member is unavailable e.g. through sickness, how is their workload managed/distributed?
 - Varies - another colleague may step in, students may be set tasks, rearrange the session.
4. How often do department employees meet to discuss performance statistics, current and future work? Specific schedule or ad hoc?
 - Every 6 weeks.
5. Can these meetings be arranged by any member of the team?
 - Formal committee.
6. What intervention procedures are in place to ensure that the department works towards the common goal of the organisation?
 - Planning - strategic plan (campus and faculty).
 - Student feedback - personal supervisor, staff/student representative or Academic A.
7. What procedures would you need to undertake to attain:
 - (a) Environmental products - recycled printing paper
 - Not sure of control - certain University suppliers. Could request.
 - (b) Environmental activities - car pool system
 - Staff meeting - agreement.

8. Optional: Can you describe three core attributes of the management style of the Head of Department?

- No answer provided.

S4

1. What future planning procedures or prediction systems are in place?

(a) How do you remain competitive?

- Latest developments and initiatives in education, government policies, University committees.
- Funding work-based learning - new degrees.

(b) Who is responsible for the collection and analysis of such information?

- Campus and department - specific individuals.
- Admissions office in OrgX(b).

(c) How is such information recorded and made available to employees?

- Email spreadsheet.
- Available to all.

(d) Timescale?

- Depends on time of year - approximately monthly.

(e) Decision maker - prioritisation?

- Senior Management Team.
- Academic A and admissions tutor.

2. What external outreach activities does your department pursue? How do you attract students and business partnerships?

- Not a huge amount - not positive financially.
- Reduction in funding.
- Small amounts of consultancy.

(a) Who is responsible for undertaking such activities?

- Outreach coordinator.

3. How would you implement a new (environmental) strategy in your department - stages between proposal and implementation phases?

- Campus - depends on policy origin. Setup own policy at OrgX SMT and circulate. Implementation Service F (e.g. new waste collection).
- Needs to be discussed through departments to encourage compliance of staff.
- Department - discuss at staff meeting (make sure the idea is sold). Example 'yellow boxes', not embedded in Service F, need to work together with specific employee for collections.

4. How often does a representative from your department formally meet with colleagues from other departments? Specific schedule or ad hoc?

- IFL - fortnightly.

S5

1. Who does your department report to?

- IFL.

2. What information and/or analyses are you required to produce for this authority? How often?

- Planning documents (March/annually).

3. Who has the authority to design and implement new policies in your/for your department?

- Myself.

E.2 VSM Diagnosis

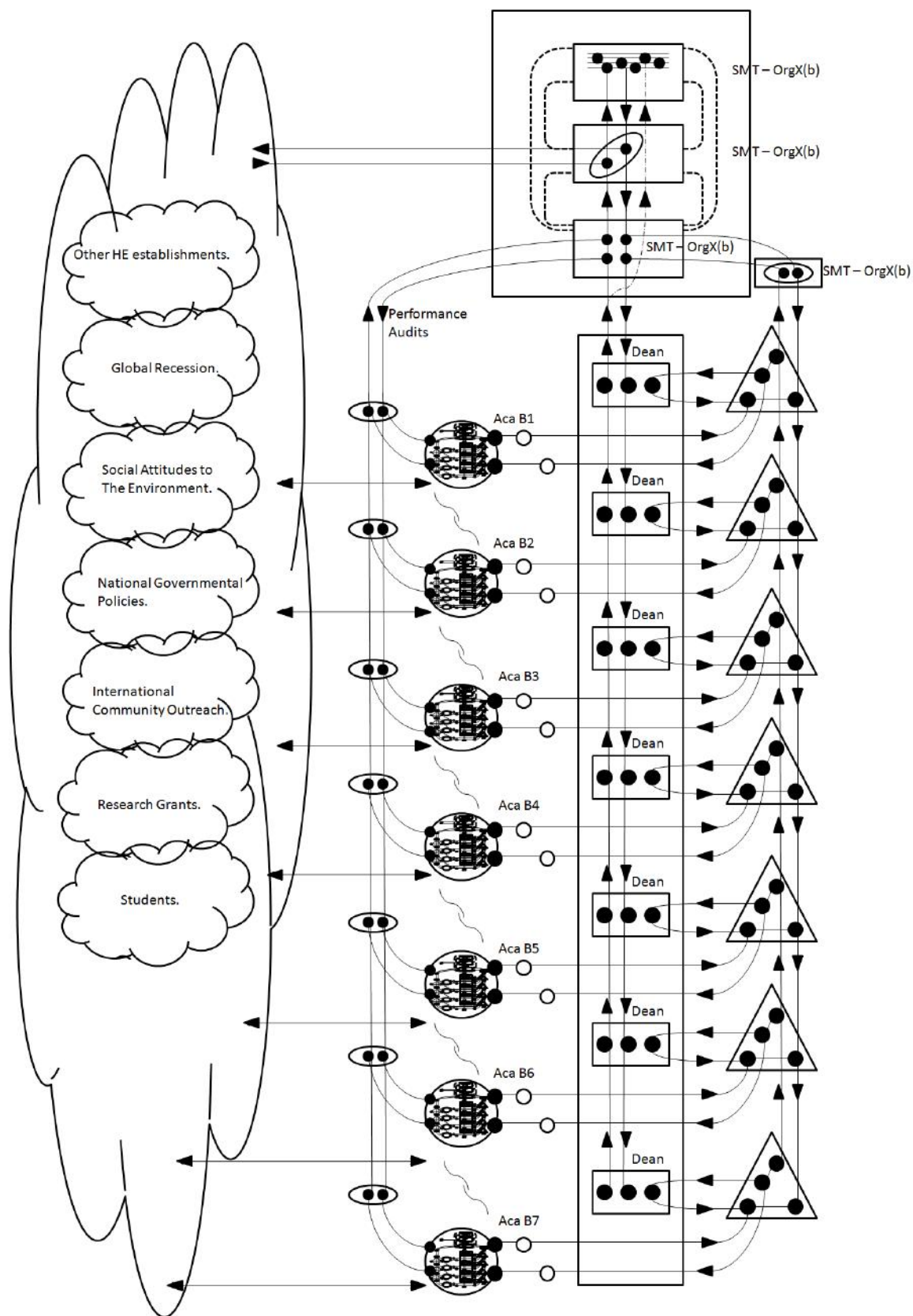


Figure E.1: VSM Diagnosis Level 0

Appendix F

Environmental Management System

G.1 New Environmental Management System

Environmental Management System - Activity Set							
Environmental Aspect and Operating Procedures			Activities in Place			Score	
			None	Partial	Complete	Max	
Electricity						262	
	Lighting	Movement sensitive lights	0	1	2		
		<i>Corridors</i>	-	-	-	-	
		<i>Bathrooms</i>	-	-	-	-	
		Energy efficient bulbs	0	1	2		
		<i>LED</i>	-	-	-	-	
		<i>Lower wattage</i>	-	-	-	-	
		Natural lighting	0	1	2		
		<i>Window design</i>	-	-	-	-	
		<i>Solar fibre optics</i>	-	-	-	-	
		Timer switches	0	1	2		
		<i>Corridors</i>	-	-	-	-	
		<i>Bathrooms</i>	-	-	-	-	
		Meters	Weekly records	0	1	2	
			Monthly records	0	1	2	
	Public display of energy monitor		0	1	2		
	Individual (per building)		0	1	2		
	Office equipment		Automatic PC shut-down	0	1	2	
		Energy efficient equipment	0	1	2		
		<i>Computer monitors</i>	-	-	-	-	
		<i>Printers</i>	-	-	-	-	
		<i>Photocopiers/Scanners</i>	-	-	-	-	
		<i>Electronic projector screens</i>	-	-	-	-	
		Individual on/off switches	0	1	2		
		<i>Awareness raising</i>	-	-	-	-	
		Domestic equipment	Energy efficiency ratings	0	1	2	
<i>Washing machines</i>	-		-	-	-		
<i>Dishwasher</i>	-		-	-	-		
<i>Eco-kettle</i>	-		-	-	-		
<i>Tumble dryers</i>	-		-	-	-		
Natural drying	0		1	2			
Maximum hot water temperatures	0		1	2			
Heating	Maximum hot water temperatures		0	1	2		
	Timed heating		0	1	2		

Gas and gas oil	Individual radiator thermostats		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Targeted heating locations – only heat those areas in use		0	1	2	
	Local resourcing					
	Wind turbine		0	1	2	
	Solar panels		0	1	2	
	Supplier		0	1	2	
	<i>Renewable sourcing</i>		-	-	-	-
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
	Meters					
	Weekly records		0	1	2	
	Monthly records		0	1	2	
	Public display of energy monitor		0	1	2	
	Individual (per building)		0	1	2	
	Domestic equipment					
	Heating	Reduction	0	1	2	
		Maximum hot water temperatures	0	1	2	
		Timed heating	0	1	2	
		Individual radiator thermostats	0	1	2	
		<i>Awareness raising</i>	-	-	-	-
		Targeted heating locations – only heat those areas in use	0	1	2	
	Supplier		0	1	2	
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
Water Usage	Meters					
	Weekly records		0	1	2	
	Monthly records		0	1	2	
	Public display of water consumption levels		0	1	2	
	Individual (per building)		0	1	2	
	Domestic equipment					
	Energy efficiency of washing		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Energy efficiency of dishwashers		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Push tap/movement sensitive		0	1	2	
	Reduction of bottled water		0	1	2	

Effluents	<i>Awareness raising</i>		-	-	-	-
	Cistern 'water bricks'/Half flush system		0	1	2	-
	Local resourcing					
	Rain water harvesting		0	1	2	
	<i>Toilet system</i>		-	-	-	-
	<i>Gardening purposes</i>		-	-	-	-
	On-site pond		0	1	2	
	Supplier		0	1	2	
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
	Disposal					
	Weekly checks		0	1	2	
	Monthly checks		0	1	2	
	Management					
	Weekly records		0	1	2	
	Monthly records		0	1	2	
	Wastes					
	Office					
	Electronic equipment		0	1	2	
	<i>Refurbishment</i>		-	-	-	-
	<i>Auction</i>		-	-	-	-
	<i>Donation to charity</i>		-	-	-	-
	Plastic recycling		0	1	2	
	Paper recycling		0	1	2	
	Glass recycling		0	1	2	
	Ink cartridge recycling		0	1	2	
	Re-use of stationary		0	1	2	
	Food		0	1	2	
	<i>Composting</i>		-	-	-	-
	Domestic					
	Electronic equipment		0	1	2	
	<i>Refurbishment</i>		-	-	-	-
	<i>Auction</i>		-	-	-	-
	<i>Donation to charity</i>		-	-	-	-
	Plastic recycling		0	1	2	
	Paper recycling		0	1	2	
	Glass recycling		0	1	2	
	Re-use of stationary		0	1	2	
	Food		0	1	2	
	<i>Composting</i>		-	-	-	-
	Heating					
	Natural air-conditioning		0	1	2	
	<i>Window design</i>		-	-	-	-
	Geothermal		0	1	2	

Packaging Waste	Double glazing		0	1	2	
	Cavity wall insulation		0	1	2	
	Loft insulation		0	1	2	
	Green roof		0	1	2	
	Academic activity					-
	Organic/biological disposal		0	1	2	
	<i>Composting</i>		-	-	-	
	Reduction of chemical usage		0	1	2	
	Materials					
	Biodegradable plastic		0	1	2	
	Recyclable cardboard		0	1	2	
	Reduction					
	Demand upon supplier packaging disposal		0	1	2	
	Demand upon supplier packaging material		0	1	2	
Housekeeping and Site Appearance						
	Domestic					
	Energy efficient floor cleaning equipment		0	1	2	
	Reusable cleaning cloths		0	1	2	
	Reuse of furniture		0	1	2	
	<i>Re-upholstering</i>		-	-	-	
	<i>Auction</i>		-	-	-	
	<i>Donation to charity</i>		-	-	-	
	Environmentally friendly paint		0	1	2	
	Energy efficient hand dryers		0	1	2	
	Recycled toilet paper		0	1	2	
	Cleaning Products					
	Environmentally friendly detergents		0	1	2	
	<i>Washing liquid</i>		-	-	-	
	<i>Bleach - toilet, etc</i>		-	-	-	
	<i>Fabric cleaner</i>		-	-	-	
	Reduction of aerosols		0	1	2	
	Minimal use		0	1	2	
	<i>Awareness raising</i>		-	-	-	
	Natural polish		0	1	2	
	Suppliers		0	1	2	
	<i>EMS</i>		-	-	-	-
Fire						
	Prevention					
	Weekly checks		0	1	2	
	Monthly checks		0	1	2	

	Management		0	1	2	
	Weekly records		0	1	2	
Paper Usage	Monthly records		0	1	2	
	Office					
	Default Double-sided printing facilities		0	1	2	
	Default draft printing		0	1	2	
	Departmental allowances for printing		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Departmental allowances for photocopying		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Departmental competitions		0	1	2	
	Domestic					
	Default Double-sided printing facilities		0	1	2	
	Default draft printing		0	1	2	
	Departmental allowances for printing		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Departmental allowances for photocopying		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
Solvent Emissions	Supplier		0	1	2	
	<i>Eco-Products</i>		-	-	-	-
	<i>EMS</i>		-	-	-	-
	Domestic					
Traffic	Reduction		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Environmentally friendly solvents		0	1	2	
	Academic activity					
	Reduction		0	1	2	
	<i>Awareness raising</i>		-	-	-	-
	Environmentally friendly solvents		0	1	2	
	Local sourcing		0	1	2	
	Video-conferencing		0	1	2	
	Car pool scheme		0	1	2	
	<i>Between geographic locations</i>		-	-	-	-
	<i>Regular schedules</i>		-	-	-	-
	<i>Departmental competitions</i>		-	-	-	-
	<i>Increased mileage reimbursement</i>		-	-	-	-

Legioneliosis		<i>Parking incentives</i>	-	-	-	-
		<i>To/from home and work</i>	-	-	-	-
		Reduction of parking spaces	0	1	2	
		<i>Reintroduction of natural environment</i>	-	-	-	-
	Management					
		Parking permits	0	1	2	
		Parking charges	0	1	2	
	Alternatives					
		Car-free zones	0	1	2	
		Public transport	0	1	2	
		<i>Park n Ride</i>	-	-	-	-
	Prevention					
		Weekly checks	0	1	2	
		Monthly checks	0	1	2	
	Management					
		Weekly records	0	1	2	
		Monthly records	0	1	2	
Company Cars						
	Reduction					
		Amount of vehicles in fleet	0	1	2	
		Annual service and MOT	0	1	2	
		Mileage records per use	0	1	2	
		Hybrid vehicles	0	1	2	
	Alternatives					
		Cycling	0	1	2	
		Carbon offsetting	0	1	2	
	Supplier					
		<i>Local provider</i>	-	-	-	-
		<i>EMS</i>	-	-	-	-
Community						
	Employees					
		Environmental Working Group	0	1	2	
		<i>Resources</i>	-	-	-	-
		<i>Representation</i>	-	-	-	-
		<i>Regular schedules</i>	-	-	-	-
		<i>Official Reporting Channels</i>	-	-	-	-
		Induction	0	1	2	
		<i>Course for specialist roles</i>	-	-	-	-
		<i>Training</i>	-	-	-	-
		Social activities	0	1	2	
		<i>Seasonal competitions</i>	-	-	-	-
		<i>Local regeneration events</i>	-	-	-	-
		<i>Energy and paper reduction competitions</i>	-	-	-	-

Life Cycle Assessment	Local community		0	1	2	
	Advertising		0	1	2	
	<i>Policies</i>		-	-	-	-
	<i>Social activities</i>		-	-	-	-
	Partnerships		0	1	2	
	<i>Work experience</i>		-	-	-	-
	<i>Funding</i>		-	-	-	-
	<i>Biodiversity projects</i>		-	-	-	-
	Students		0	1	2	
	Student Action Group		0	1	2	
	<i>Resources</i>		-	-	-	-
	<i>Representation</i>		-	-	-	-
	<i>Regular schedules</i>		-	-	-	-
	<i>Official Reporting Channels</i>		-	-	-	-
	Induction		0	1	2	
	Social activities		0	1	2	
	<i>Seasonal competitions</i>		-	-	-	-
	<i>Local regeneration events</i>		-	-	-	-
	<i>Energy and paper reduction</i>		-	-	-	-
	Cradle to Grave					
	Delivered Product					
	Impact					
	Supplier EMS - memorabilia		0	1	2	
	Transformation		0	1	2	
	<i>Reclaimed materials</i>		-	-	-	-
	<i>Carbon neutral</i>		-	-	-	-
	<i>Closed loop</i>		-	-	-	-
	End of Life Recycling		0	1	2	
	Supplier EMS - marketing		0	1	2	
	Transformation		0	1	2	
	<i>Recycled materials</i>		-	-	-	-
	<i>Carbon neutral</i>		-	-	-	-
	<i>Biodegradable packaging</i>		-	-	-	-
	End of Life Recycling		0	1	2	
Score						

G.2 OrgX Score

Environmental Management System - Activity Set							
Environmental Aspect and Operating Procedures			Activities in Place			Score	
			None	Partial	Complete	Max	
Electricity						262	
	Lighting	Movement sensitive lights	0	1	2	1	
		Corridors	-	-	-	-	
		Bathrooms	-	-	-	-	
		Energy efficient bulbs	0	1	2	2	
		LED	-	-	-	-	
		Lower wattage	-	-	-	-	
		Natural lighting	0	1	2	1	
		Window design	-	-	-	-	
		Solar fibre optics	-	-	-	-	
		Timer switches	0	1	2	1	
		Corridors	-	-	-	-	
		Bathrooms	-	-	-	-	
		Meters	Weekly records	0	1	2	2
			Monthly records	0	1	2	2
	Public display of energy monitor		0	1	2	0	
	Individual (per building)		0	1	2	1	
	Office equipment		Automatic PC shut-down	0	1	2	1
		Energy efficient equipment	0	1	2	1	
		Computer monitors	-	-	-	-	
		Printers	-	-	-	-	
		Photocopiers/Scanners	-	-	-	-	
		Electronic projector screens	-	-	-	-	
		Individual on/off switches	0	1	2	1	
		Awareness raising	-	-	-	-	
		Domestic equipment	Energy efficiency ratings	0	1	2	1
	Washing machines		-	-	-	-	
	Dishwasher		-	-	-	-	
	Eco-kettle		-	-	-	-	
	Tumble dryers		-	-	-	-	
	Natural drying		0	1	2	0	
	Maximum hot water temperatures		0	1	2	2	
	Heating		Maximum hot water temperatures	0	1	2	2
			Timed heating	0	1	2	2

Gas and gas oil	Individual radiator thermostats		0	1	2	1
	<i>Awareness raising</i>		-	-	-	-
	Targeted heating locations – only heat those areas in use		0	1	2	2
	Local resourcing					
	Wind turbine		0	1	2	0
	Solar panels		0	1	2	0
	Supplier		0	1	2	0
	<i>Renewable sourcing</i>		-	-	-	-
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
	Meters					
	Weekly records		0	1	2	2
	Monthly records		0	1	2	2
	Public display of energy monitor		0	1	2	0
	Individual (per building)		0	1	2	1
	Domestic equipment					
	Heating	Reduction	0	1	2	1
		Maximum hot water temperatures	0	1	2	2
		Timed heating	0	1	2	2
		Individual radiator thermostats	0	1	2	1
		<i>Awareness raising</i>	-	-	-	-
		Targeted heating locations – only heat those areas in use	0	1	2	2
	Supplier		0	1	2	0
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
Water Usage	Meters					
	Weekly records		0	1	2	2
	Monthly records		0	1	2	2
	Public display of water consumption levels		0	1	2	0
	Individual (per building)		0	1	2	1
	Domestic equipment					
	Energy efficiency of washing		0	1	2	2
	<i>Awareness raising</i>		-	-	-	-
	Energy efficiency of dishwashers		0	1	2	2
	<i>Awareness raising</i>		-	-	-	-
	Push tap/movement sensitive		0	1	2	2
	Reduction of bottled water		0	1	2	1

Effluents	<i>Awareness raising</i>		-	-	-	-
	Cistern 'water bricks'/Half flush system		0	1	2	2
	Local resourcing					
	Rain water harvesting		0	1	2	0
	<i>Toilet system</i>		-	-	-	-
	<i>Gardening purposes</i>		-	-	-	-
	On-site pond		0	1	2	1
	Supplier		0	1	2	1
	<i>EMS</i>		-	-	-	-
	<i>Green Tarriff</i>		-	-	-	-
	Disposal					
	Weekly checks		0	1	2	0
	Monthly checks		0	1	2	0
	Management					
	Weekly records		0	1	2	0
	Monthly records		0	1	2	0
Wastes	Office					
	Electronic equipment		0	1	2	2
	<i>Refurbishment</i>		-	-	-	-
	<i>Auction</i>		-	-	-	-
	<i>Donation to charity</i>		-	-	-	-
	Plastic recycling		0	1	2	2
	Paper recycling		0	1	2	2
	Glass recycling		0	1	2	2
	Ink cartridge recycling		0	1	2	1
	Re-use of stationary		0	1	2	2
	Food		0	1	2	0
	<i>Composting</i>		-	-	-	-
	Domestic					
	Electronic equipment		0	1	2	2
	<i>Refurbishment</i>		-	-	-	-
	<i>Auction</i>		-	-	-	-
	<i>Donation to charity</i>		-	-	-	-
	Plastic recycling		0	1	2	1
	Paper recycling		0	1	2	2
	Glass recycling		0	1	2	1
	Re-use of stationary		0	1	2	2
	Food		0	1	2	0
	<i>Composting</i>		-	-	-	-
	Heating					
	Natural air-conditioning		0	1	2	1
	<i>Window design</i>		-	-	-	-
	Geothermal		0	1	2	0

Packaging Waste	Double glazing		0	1	2	1
	Cavity wall insulation		0	1	2	1
	Loft insulation		0	1	2	1
	Green roof		0	1	2	0
	Academic activity					
	Organic/biological disposal		0	1	2	0
	<i>Composting</i>		-	-	-	-
	Reduction of chemical usage		0	1	2	1
	Materials					
	Biodegradable plastic		0	1	2	1
	Recyclable cardboard		0	1	2	1
	Reduction					
	Demand upon supplier packaging disposal		0	1	2	0
	Demand upon supplier packaging material		0	1	2	0
Housekeeping and Site Appearance						
	Domestic					
	Energy efficient floor cleaning equipment		0	1	2	1
	Reusable cleaning cloths		0	1	2	1
	Reuse of furniture		0	1	2	2
	<i>Re-upholstering</i>		-	-	-	-
	<i>Auction</i>		-	-	-	-
	<i>Donation to charity</i>		-	-	-	-
	Environmentally friendly paint		0	1	2	1
	Energy efficient hand dryers		0	1	2	1
	Recycled toilet paper		0	1	2	2
	Cleaning Products					
	Environmentally friendly detergents		0	1	2	2
	<i>Washing liquid</i>		-	-	-	-
	<i>Bleach - toilet, etc</i>		-	-	-	-
	<i>Fabric cleaner</i>		-	-	-	-
	Reduction of aerosols		0	1	2	2
	Minimal use		0	1	2	2
	<i>Awareness raising</i>		-	-	-	-
	Natural polish		0	1	2	2
	Suppliers		0	1	2	1
	<i>EMS</i>		-	-	-	-
Fire						
	Prevention					
	Weekly checks		0	1	2	2
	Monthly checks		0	1	2	2

	Management		0	1	2	2
	Weekly records		0	1	2	2
Paper Usage	Office		0	1	2	0
	Default Double-sided printing facilities		0	1	2	0
	Default draft printing		0	1	2	2
	Departmental allowances for printing		-	-	-	-
	<i>Awareness raising</i>		0	1	2	2
	Departmental allowances for photocopying		-	-	-	-
	<i>Awareness raising</i>		0	1	2	0
	Departmental competitions		0	1	2	0
	Domestic		0	1	2	0
	Default Double-sided printing facilities		0	1	2	0
	Default draft printing		0	1	2	2
	Departmental allowances for printing		-	-	-	-
	<i>Awareness raising</i>		0	1	2	2
	Departmental allowances for photocopying		-	-	-	-
	<i>Awareness raising</i>		-	-	-	-
Solvent Emissions	Supplier		0	1	2	1
	<i>Eco-Products</i>		-	-	-	-
	<i>EMS</i>		-	-	-	-
	Domestic		0	1	2	1
	Reduction		-	-	-	-
	<i>Awareness raising</i>		0	1	2	1
	Environmentally friendly solvents		0	1	2	1
	Academic activity		0	1	2	1
	Reduction		-	-	-	-
	<i>Awareness raising</i>		0	1	2	1
Traffic	Reduction		0	1	2	1
	Local sourcing		0	1	2	1
	Video-conferencing		0	1	2	1
	Car pool scheme		-	-	-	-
	<i>Between geographic locations</i>		-	-	-	-
	<i>Regular schedules</i>		-	-	-	-
	<i>Departmental competitions</i>		-	-	-	-
	<i>Increased mileage reimbursement</i>		-	-	-	-

		<i>Parking incentives</i>	-	-	-	-
		<i>To/from home and work</i>	-	-	-	-
		Reduction of parking spaces	0	1	2	1
		<i>Reintroduction of natural environment</i>	-	-	-	-
		Management				
		Parking permits	0	1	2	2
		Parking charges	0	1	2	2
		Alternatives				
		Car-free zones	0	1	2	0
		Public transport	0	1	2	2
		<i>Park n Ride</i>	-	-	-	-
	Legioneliosis					
		Prevention				
		Weekly checks	0	1	2	2
		Monthly checks	0	1	2	2
		Management				
		Weekly records	0	1	2	2
		Monthly records	0	1	2	2
	Company Cars					
		Reduction				
		Amount of vehicles in fleet	0	1	2	0
		Annual service and MOT	0	1	2	2
		Mileage records per use	0	1	2	0
		Hybrid vehicles	0	1	2	0
		Alternatives				
		Cycling	0	1	2	1
		Carbon offsetting	0	1	2	0
		Supplier	0	1	2	1
		<i>Local provider</i>	-	-	-	-
		<i>EMS</i>	-	-	-	-
	Community					
		Employees				
		Environmental Working Group	0	1	2	2
		<i>Resources</i>	-	-	-	-
		<i>Representation</i>	-	-	-	-
		<i>Regular schedules</i>	-	-	-	-
		<i>Official Reporting Channels</i>	-	-	-	-
		Induction	0	1	2	1
		<i>Course for specialist roles</i>	-	-	-	-
		<i>Training</i>	-	-	-	-
		Social activities	0	1	2	1
		<i>Seasonal competitions</i>	-	-	-	-
		<i>Local regeneration events</i>	-	-	-	-
		<i>Energy and paper reduction competitions</i>	-	-	-	-

Life Cycle Assessment	Local community		0	1	2	1
	Advertising		0	1	2	1
	<i>Policies</i>		-	-	-	-
	<i>Social activities</i>		-	-	-	-
	Partnerships		0	1	2	1
	<i>Work experience</i>		-	-	-	-
	<i>Funding</i>		-	-	-	-
	<i>Biodiversity projects</i>		-	-	-	-
	Students		0	1	2	1
	Student Action Group		0	1	2	1
	<i>Resources</i>		-	-	-	-
	<i>Representation</i>		-	-	-	-
	<i>Regular schedules</i>		-	-	-	-
	<i>Official Reporting Channels</i>		-	-	-	-
	Induction		0	1	2	1
	Social activities		0	1	2	1
	<i>Seasonal competitions</i>		-	-	-	-
	<i>Local regeneration events</i>		-	-	-	-
	<i>Energy and paper reduction</i>		-	-	-	-
	Cradle to Grave					
	Delivered Product					
	Impact					
	Supplier EMS - memorabilia		0	1	2	0
	Transformation		0	1	2	0
	<i>Reclaimed materials</i>		-	-	-	-
	<i>Carbon neutral</i>		-	-	-	-
	<i>Closed loop</i>		-	-	-	-
	End of Life Recycling		0	1	2	0
	Supplier EMS - marketing		0	1	2	1
	Transformation		0	1	2	1
	<i>Recycled materials</i>		-	-	-	-
	<i>Carbon neutral</i>		-	-	-	-
	<i>Biodegradable packaging</i>		-	-	-	-
	End of Life Recycling		0	1	2	1
Score						150

Appendix G

Summary of Environmental Development

Aspect	Baseline Activities	Final Activities
Electricity	Some stickers on light switches with 'Turn Off' instructions.	Installation of movement sensitive lighting in some corridors. Higher staff awareness of turning equipment off. For the years 2006-2007 and 2007-2008 OrgX electricity increased by 3.8% (Gibbs, 2008c). New building has been designed with a wind-turbine. A 30 minute automatic shutdown procedure has been installed on all student access computers. Implementation of a Carbon Management Initiative with government body. Installation of sub-meters in new builds and during old build renovations.

Aspect	Baseline Activities	Final Activities
Water	No initiatives.	Installation of push-taps on all faucets. Potential development of rainwater harvesting to supply 'lake' feature at new build. Installation of 'water bricks' in all on-site toilets. For the years 2006-2007 and 2007-2008 OrgX water consumption was reduced by 5.5% (Gibbs, 2008b).
Gas and Gas Oil	No initiatives.	For the years 2006-2007 and 2007-2008 the Campus gas consumption increased by 4.6% (Gibbs, 2008a). New condensing boilers have been fitted within the nearby site to reduce the use of gas consumption. Computer systems to monitor equipment operations. Timer systems to control heating equipment when not required.
Fire and Solvent Emissions	Meets legal requirements. Ventilation and signs when solvents used.	Meets legal requirements.

Aspect	Baseline Activities	Final Activities
Paper Usage	General encouragement to reduce usage.	Increase of online academic content/materials through Virtual Learning Environments. Online coursework submission (partial). General increase of personal reductions. Usage for the period July 2007 to June 2008 is 2,785 reams of A4 paper, and 51 reams of A3 paper. This is equivalent to 173 trees: with tree dimension of 6-8 inch diameter and 40ft tall (calculations derived from ?).
Company Cars	No initiatives	Car pool whiteboard. General increase of car pool promotion.
Waste	White paper recycled.	Recycling of cardboard, batteries, electronic equipment, food waste and kitchen waste through external contractors. Recycling of old furniture to other owned properties, local schools or charities. Larger paper recycling facilities. Dedicated member of staff for recycling collection. Some departments have purchased their own recycling bins. All office bins to be removed and replaced by centralised recycling stations.

Aspect	Baseline Activities	Final Activities
Packaging Waste	Plastic recycling.	Cardboard recycling. Conference packs contain environmentally friendly items. Reduction of OrgX brochures being distributed in plastic packaging. More council recycling bins.
Products	No initiatives.	General efforts to reduce hard-copy brochures. Staff demand for less hard-copies of University materials.
Community	Voluntary staff membership to Campus EWG.	Formalised EWG. Student and employee engagement through planting, pumpkin and hamper activities; raised funds to install five bat boxes onsite aiding the local BAP. Onsite tree planting project implemented in conjunction with the OrgX(b) alumni development funds, local council and community volunteer group; all plants were indigenous to the area. Compulsory staff development day; including an environmental workshop and the development of a student eco-art competition where the winner won /50 of book tokens for their 'recycled' sculpture.

Aspect	Baseline Activities	Final Activities
		<p>Environmental Agenda developed through TS workshop. Development of EWG web-page. Potential installation of a pond onsite from an employee donation. Fairtrade accreditation. The group developed an Environmental Awareness Day in March 2008, raising funds for a birdbox webcam. EWG stall at freshers week. The group has developed an Environmental Awareness Day in March 2008, raising funds for a birdbox webcam. This was complemented by the attainment of funds to improve the sites indigenous environment.</p>
Housekeeping and Site Appearance	No initiatives	<p>Purchase of recycled paper toilet rolls. Purchase of recycled paper towels for bathrooms. 10,000 funding used to re-establish indigenous habitat of site boundaries.</p>
Legionellosis	Legislative requirements.	<p>Computer system to allow external contractors to monitor site tests.</p>

Aspect	Baseline Activities	Final Activities
Transport	Rare use of on-site video-conferencing facilities. Reduced fees at local bicycle shop.	Increased use of video-conferencing facilities (personal choice). Increase of car pooling promotion. Site is a specific destination on local Park and Ride scheme, with reduced fares. Reduction of parking permits.
Biodiversity	No initiatives.	Tree Planting project - indigenous trees and shrubs planted onsite, birdbox webcam. Wildlife pond - in conjunction with Local Authority. Installation of bat boxes.
Management Policies	set by OrgX(b).	Formalised OrgX EWG - all departments must be represented and all members must report updates within each departmental meeting.

Table G.1: Final Environmental Audit

Statistics for energy, water and gas consumption provided by OrgX(b) Energy Manager.