

University of Wollongong

Research Online

Faculty of Business - Papers (Archive)

Faculty of Business and Law

1-1-2008

Categorisation of knowledge management processes in the development of sustainable enterprises

Rosemary Van Der Meer

University of Wollongong, rvdmeer@uow.edu.au

Sukunesan Sinnappan

Swinburne University of Technology, suku@uow.edu.au

Follow this and additional works at: <https://ro.uow.edu.au/buspapers>



Part of the [Business Commons](#)

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

Categorisation of knowledge management processes in the development of sustainable enterprises

Abstract

Sustainable development is a growing area of interest in organisations. Particularly those that have large energy demands for processing, use dwindling raw materials or produce a great deal of waste through production. Knowing those processes that can contribute to making an organisation more sustainable provides a great advantage both in terms of project implementation success and in measurable Triple Bottom Line returns. In previous research we identified that many of the Information Technology processes used to assist organisations in developing sustainable practices were more clearly suited as Knowledge Management processes (Van Der Meer and Sinnappan, 2008), however less empirical study has been done to categorise them meaningfully. In this study we have taken these Knowledge Management processes and categorised them according to the sustainable development practice where we identify they can be of service based on Waage et al. (2003). Through this we are hoping to develop a framework for organisations to determine what Knowledge Management processes are needed to achieve the particular sustainable development. We may also be able to judge what steps an organisation needs to take to develop further sustainable practices in other areas. Development of a framework for knowledge management tools in sustainable development would assist industries in determining the best processes for these sustainable projects. This framework also contributes to the body of knowledge on sustainable development and Information Technology.

Keywords

sustainable, development, enterprises, processes, categorisation, management, knowledge

Disciplines

Business

Publication Details

Van Der Meer, R. & Sinnappan, S. (2008). Categorisation of knowledge management processes in the development of sustainable enterprises. Proceedings of the 11th Australian Conference on Knowledge Management and Intelligent Decision Support (pp. 1-12). Ballarat, Australia: University of Ballarat.

Categorisation of Knowledge Management Processes in the Development of Sustainable Enterprises

Rosemary Van Der Meer
Deakin University
School of Information Systems
GEELONG. VIC. 3217
Australia
Telephone: 5227 2825
Fax: 5227 2151
Email: rosemary.vandermeer@deakin.edu.au

*Dr Sukunesan Sinnappan
Swinburne University of Technology
Locked Bag 218
Lilydale VIC. 3140
Australia
Telephone: 9215 7192
Fax: 9215 7070
Email: ssinnappan@swin.edu.au

Abstract

Sustainable development is a growing area of interest in organisations. Particularly those that have large energy demands for processing, use dwindling raw materials or produce a great deal of waste through production. Knowing those processes that can contribute to making an organisation more sustainable provides a great advantage both in terms of project implementation success and in measurable Triple Bottom Line returns.

In previous research we identified that many of the Information Technology processes used to assist organisations in developing sustainable practices were more clearly suited as Knowledge Management processes (Van Der Meer and Sinnappan, 2008), however less empirical study has been done to categorise them meaningfully.

In this study we have taken these Knowledge Management processes and categorised them according to the sustainable development practice where we identify they can be of service based on Waage et al (2003). Through this we are hoping to develop a framework for organisations to determine what Knowledge Management processes are needed to achieve the particular sustainable development. We may also be able to judge what steps an organisation needs to take to develop further sustainable practices in other areas.

Development of a framework for knowledge management tools in sustainable development would assist industries in determining the best processes for these sustainable projects. This framework also contributes to the body of knowledge on sustainable development and Information Technology.

* Corresponding author

Categorisation of Knowledge Management Processes in the Development of Sustainable Enterprises

Key Words: sustainable development, knowledge management, categorisation

1. Introduction

The research in this paper develops an initial framework between knowledge management processes and sustainable development processes carried out by organisations.

Sustainable development is a growing area of both interest and research for organisations [1,2]. Organisations with large demands on energy consumption, high use of non-renewable resources or large carbon footprints and landfill waste are beginning to examine their processes to determine if improvements can be made.

In previous research, we identified that one process that could be of advantage was the area of Knowledge Management (KM) [3]. Studying the literature available, we identified that a number of Information Technology (IT) processes that contribute to sustainable development can be more clearly identified as KM. However, there is little empirical work to provide meaningful categorisations of these processes in terms of sustainable development projects.

The development of a framework between KM and sustainable development projects requires a categorisation of those projects. Categorisation of the sustainable development process is required to aid in decision making. By understanding the category of a sustainable development process, an organisation can better determine what the goal of that project is and make decisions on what is required to achieve that goal. Developing a categorisation also aids in developing relationships with other processes categories. Categorisation gives a better understanding of the sustainable development processes and their goals improving the ability to choose not only the sustainable development process but also what other processes, such as knowledge management can best aid the process.

To categorise the sustainable development projects, we first examined the literature for existing taxonomies. There is a scarcity of categorisation within the sustainable development literature. We determined that the existing categories available were unsuitable for categorising actual sustainable development projects. The categories in existence are more focussed on what is to be sustained or on categorising the issues in sustainable development.

We then examined the sustainable development projects described in the literature and found common themes that allowed us to build a new categorisation method for the sustainable development projects organisations undertake. These categories are then applied to the KM processes used in sustainable development projects identified in the previous research.

In future research, we aim to develop a framework of the KM tools that can contribute to sustainable development and test this framework through simulation modelling and case study analysis. This framework would assist industries in determining the best KM processes for their sustainable projects. By understanding how knowledge management improves the chance of a successful outcome from a sustainable development project, it reduces the risks of implementing these projects that may encourage manufacturing organisations to implement these projects because of the benefits to them and not because of legislative changes or social pressures. It could also help to implement a change in manufacturing attitudes to sustainable development projects. This framework is also significant in further research on the role KM has in decision making utilised in the implementation of sustainable development projects within the textile manufacturing industry.

2. Examination of Current Taxonomies

As part of the development of a conceptual framework to link between previously defined KM processes to sustainable development categories, the categories need to be defined. We first studied existing sustainable development categories and determined that they were not appropriate for our purpose. These previously defined categories were not suitable because their focus is more on what is to be sustained or on the arguments of sustainability. An explanation of each of the existing categories found, what they categorised and why that does not suit our research is outlined below.

There has been little work on specifying sustainable development or the types of sustainable development goals from any perspective. A search of the literature found four categorisation methods.

Parris and Kates [2] examined methods for categorising and measuring sustainable development. They outlined a set of categories for sustainable development as part of their research. They examined twelve other efforts to characterise and measure sustainable development [2]. One of these, the Environmental Sustainability Index [4] aggregated sustainable development into five categories.

Yosef Jabareen has developed two methods for categorising sustainable development. He first outlined a knowledge map for describing sustainable development [1]. This work was further refined into a conceptual framework by Jabareen [5]. As part of our research to match sustainable development categorisations to the knowledge management processes we identified in our earlier research, we'll examine each of these categorisations methods and determine why they are not fit for our purpose.

As part of their research, Parris and Kates [2] first developed a categorisation of sustainable development goals based on the literature they reviewed. This 2 by 3 taxonomy focussed on the sustainable development goals determined from the literature that defined or debated sustainable development.

What is to be Sustained	What is to be Developed
Nature	People
Earth	Child Survival
Biodiversity	Life Expectancy
Ecosystems	Education
	Equity
	Equal Opportunity
Life Support	Economy
Ecosystem Services	Wealth
Resources	Productive Sectors
Environment	Consumption
Community	Society
Cultures	Institutions
Groups	Social Capital
Places	States
	Regions

Table (i) Taxonomy of Sustainable Development Goals sourced from Parris and Kates [2].

Table (i) shows the taxonomy of sustainable development goals by Parris and Kates [2]. Under the title 'What is to be Sustained', they developed three categories of nature, life support systems and community. They defined these as:

- That nature is valued for its biodiversity and intrinsic qualities rather than for the utilities it provides.
- Life support systems are the resources and services provided to support the life forms of the planet.
- Community was defined as sustaining cultural diversity that makes communities distinctive [2].

Under the title 'What is to be Developed', they assigned three categories of people, economy and society. Based on the literature, these categories cover the basic arguments of what should be developed more in terms of length of time rather than environmental impact in sustainability. For example, the focus on development of people in terms of human development, life expectancy, education and opportunities [2].

The taxonomy developed by Parris and Kates is unsuitable for our purposes while it does look at what is to be sustained the focus is on broad concepts rather than specific goals. When examining the types of sustainable development projects carried out in manufacturing organisations, the focus is on what is to be sustained but in terms of the goal of the project implemented such as reducing the use of non-renewable resources. When they examine what is to be developed the focus is instead on length of sustainability rather than the environmental impact. If the taxonomy by Parris and Kates was to be used, we would find that most projects implemented fall only within the categories of nature or life support.

The second taxonomy method is the Environmental Sustainability Index produced by the World Economic Forum. The index provides a list of five components along with 20 core indicators for environmental performance measurement [4].

The five components or categories are:

- Environmental systems such as air and water quality.
- Reducing environmental stresses such as air pollution and waste consumption.
- Reduction in human vulnerability such as environmental health.
- Social and institutional capacity such as environmental governance, science and technology.
- Global stewardship such as collaborative efforts to reduce green house gasses [4].

The Environmental Sustainability Index does not work for categorising the sustainable development projects undertaken by manufacturing organisations as the categories are too broad. While the components of the Index do have some relevance to the sustainable development projects, the outcomes of most projects implemented would fall under the first two components with no relevance to the other three components.

Examining Jabareen's [1] knowledge map for describing sustainable development we find a set of seven metaphors based on an examination of the literature. The metaphors were developed through pattern recognition of themes identified with the literature [1]. These seven metaphors are used to improve understanding of the concept of sustainable development and increase understanding of the complexities in sustainable development [1]. However, we find that these metaphors developed from the literature examine domains of sustainable development debate rather than on the processes themselves.

Jabareen's knowledge map [1] describes the following metaphors:

- Ethical paradox – outlines the confusion of the two disparate words sustainable and development. Sustainable means to maintain something indefinitely while development means environmental modification that requires intervention and uses natural resources.
- Natural capital stock – looks at the discussion on natural assets, dividing these natural assets into three categories; non-renewable, finite capacity of renewable resources and capacity of natural resources to absorb emissions and pollutants.
- Fairness – examines the area of environmental, social and economic justice. Literature in this area attempts to achieve fairness of allocation of resources.
- Eco-form – looks at the increase in discussion on ecological design of urban spaces such as increased energy efficiency of human habitats.
- Integrative management – this is an integrative view of the aspects of social development, economic growth and environmental protection. These discussions propose that a more integrated approach is required to achieve sustainability.
- Global discourse – is used to describe discussions on the environment including ecological themes.

- Utopian – examines discussions on approaches that envision human habitats based on the concepts of sustainable development [1].

While the categories developed for the metaphor on natural capital stock could be used to categorise sustainable development projects and their goals, the other metaphors defined by Jabareen are more focussed at the issues of sustainable development rather than processes that an organisation might attempt to improve their sustainable development results.

Jabareen later further defined the metaphors into a conceptual framework on sustainable development utilising Patton's approach to hypothesising the relationships between concepts [5]. This conceptual framework maintained the same categories as provided in the metaphors with the exception that the fairness metaphor was changed to equity. However, the issues with Jabareen's categorisation described above still hold with the conceptual framework. The categories developed are a good framework of the theories discussed in terms of sustainable development throughout the literature. However, these categories do not work when defining the type of sustainable development project and its goal being undertaken by an organisation.

This lack of categorisation in terms of the types of projects being carried out and the goals of those projects has led us to examine the literature to develop a categorisation that can be used in these instances.

3. Development of Categorisation for Sustainable Development Processes

In order to be able to assign KM processes to types of sustainable development projects, the sustainable development projects must be categorised to show what the common themes of the projects are. The development of this categorisation allows us to more easily associate the sustainable development categories to other processes and thus aid us in decision making. The previous categorisations established in sustainable development are not useful in this circumstance as they focus on the issues and discussions of sustainable development rather than on the projects and the goals that are to be achieved.

To develop a categorisation along the lines of the sustainable development projects and their goals, we have reviewed the literature available. Using a grounded theory approach [6] we have grouped the projects along common themes based on the sustainable development goal. Grounded theory was chosen as we were using qualitative data sources [7]. The volatility of information and processes needed to be undertaken in achieving meaning categorisation was a further justification of adopting this methodology. It allows for the development of theories of process or sequence within organisations [8]. Our approach was similar to that of Gupta et al in their initial examination of KM literature to uncover common characteristics of KM practices [9]. Similar approach has also been suggested by Onion [10].

When reviewing the literature, we have looked at projects undertaken by businesses regardless of industry type. We have also have examined all project

types regardless of whether that initiative has included information technology as part of the process.

Our study of the literature found three common themes in the goals of sustainable development projects undertaken by organisations. These common themes are:

- To maximise the efficiency of processes that results in a reduction in consumption such as energy or fuel usage.
- Replacement of non-renewable or environmentally unfriendly materials.
- Improved waste management.

These common themes form the basis of our categories on sustainable development projects and their goals.

The category on improving process efficiency to reduce consumption was found in projects where the goal was to improve the processes of the organisation but as a result of that improved efficiency, there was a reduction in the consumption of energy, fuel or water usage. These process improvements are not about the replacement of one consumable for another, for example switching from coal-generated power to solar power. Instead these are where the improved process means they use less of that consumable material in the process.

The types of projects we found this theme in include the implementation of software to turn off PC's, printers or even VOIP phones to reduce energy consumption as undertaken by HSBC, Extreme Networks and the World Wildlife Fund [11-13]. PC's, printers and VOIP phones in most office places are utilised heavily throughout the day. However, during late night periods, weekends or public holidays, the majority of these devices are not required. Various software tools automatically shut down the majority of the specified devices during these periods of inactivity, thus reducing the energy consumption required to keep them operating.

Home Depot has implemented a new electronic ordering system that reduces the amount of transportation required to deliver goods to stores with the benefit of reducing the amount of fuel consumed [14]. The World Wildlife Fund has implemented processes to promote teleconferencing, reducing the amount of international travel required by staff which has lead to a reduction of fuel usage by their staff [11]. Weirton steel implemented a system of computerised sensors to better control production machinery. This has meant a \$12 million annual saving on fuel usage and has the benefit of also reducing emissions [14].

We defined the category of replacing non-renewable or near non-renewable resources or environmentally unfriendly resources from projects where the goal was to replace the raw materials used in the development of the organisations products. These resources are replaced with other resources that are more 'green', meaning that in production they emit less pollutants or that the resource is one that is easily renewed.

Examples of the types of projects that developed this category found in the literature include the development of a 'green' materials database by the Alliance for Environmental Innovation. The 'green' database is used to show options for selecting materials that are less environmentally damaging [14]. Interface Inc has

implemented renewable energy policies including the implementation of solar panels that have produced the first solar-made carpet [15]. The use of solar energy has replaced much of their use of fossil fuels in their production line for their plant in LaGrange, Georgia [15].

Our third category found in the literature examination is that of waste management. Projects that developed this common theme looked at methods to reduce the amount of waste produced. This could be through production by improving processes or implementing recycling methods within production. It could also include reverse logistics or closed-loop production methods that not only recycle waste from production but also the product once it is no longer needed by the customer.

Within the literature we found many examples of sustainable development production with this goal. One example is the closed-loop recycling developed by Interface Inc. Any materials left over from the production process are recycled. However, customers are also contacted about their use of Interface's product, carpet tiles. When customers no longer need the product because of wear or changing fashion, Interface collect the carpet tiles and ensure they are recycled rather than used as landfill [15]. Other examples of these projects include:

- Environmental improvements by SC Johnson Wax to reduce 200,000 tonnes of waste from its process [16].
- Reduction in DVD and CD packaging by Wal-Mart to reduce waste [17].
- XEROX remanufactures or recycles 98% of their equipment [14].
- Estee Lauder implemented a reverse logistics tracking process to reduce the volume of destroyed products, thus reducing landfill. This process also had the benefit of saving them \$30million in one year [14].

With the development of these three categories, we can now better understand the goals of the sustainable development projects. This understanding allows mapping the categories to other processes to determine if those processes could also be effective in the project. This understanding can aid in decision making throughout the process.

4. Development of a Framework of Knowledge Management Processes in Sustainable Development Projects

In a previous study, we examined how IT and in particular KM can be part of a sustainable development solution [3]. When examining these IT processes that were seen as being part of an organisation sustainable development process, we identified that many of the processes could be identified as KM processes, as outlined in Table (ii). These processes were identified as KM as they bring together information that can then be used by the organisation for better decision making within the project.

Sustainable KM Implementation	Researchers	Firms Involved
Maximising efficiency with sensors to adjust equipment and reduce power usage.	Waage, Shah and Girshick; Sheats; Parkinson [14,18,12]	XEROX, Celestica, Weirton Steel Corporation, Toyota Prius, HSBC, Interface, CH2M HILL, BiosGroup
IT systems that capture information about how ecological systems work, that can then be used to build better businesses.		
Tracking and integrating different types of information related to dynamics within environmental, social and economic systems that affect the business.	Waage, Shah and Girshick; Gedda; M2PressWIRE 2007; Jimenez-Gonzales et al [14,19-21]	Ecos Technologies, DuPont, City CarShare, Hewlett Packard, Conservation International and Intel, Lawson Software, GlaxoKlineSmith
Improving logistics tracking for reverse logistics and improved supply chain management to reduce waste.	Waage, Shah and Girshick [14]	Estee Lauder, Home Depot, Interface, Ecos Technologies, Natural Logic Greenware, Ecostream
Tracking and enabling compliance with regulations.		
Capturing sustainability information flows.		
Creating 'green chemistry' and sustainable materials quality databases and services.		
Changes in software to allow the managing of sustainable development efforts.		

Table (ii) Sustainable KM processes identified in previous research [3]

In this new research, our goal has been to develop a framework that links the KM processes to categories of sustainable development projects. The first step was the development of categories of sustainable development projects based on a study of the literature. The common themes to the projects reviewed became our categories:

- Maximising process efficiency to reduce consumption.
- Replacement of non-renewable or environmentally unfriendly resources.
- Improved waste management.

Having established the categories, we then reviewed the projects that were undertaken using KM processes from our previous study. We examined the goals of these projects to assign them to the sustainable development categories. This allowed us to develop a framework of the KM processes from those projects to the sustainable development categories. The resulting framework is outlined in Table (iii).

Sustainable KM Implementation	Sustainable Development Categories	Researchers	Firms Involved
Maximising efficiency with sensors to adjust equipment and reduce power usage.	Maximizing process efficiency to reduce consumption	Waage, Shah and Girshick; Sheats; Parkinson [14,18,12]	XEROX, Celestica, Weirton Steel Corporation, Toyota Prius, HSBC, Ecos Technologies, Natural Logic, Estee Lauder, Home Depot, Timberland, Unisys
Capturing sustainability information flows.			
Tracking and enabling compliance with regulations.			
Facilitating sustainability-oriented supply chain system decision making.			
Creating 'green chemistry' and sustainable materials quality databases and services.	Replacement of non-renewable or environmentally unfriendly resources	Waage, Shah and Girshick; Gedda; M2PressWIRE; Jimenez-Gonzales et al; Sheats; Parkinson [14,19-21,18,12]	Ecos Technologies, DuPont, City CarShare, Hewlett Packard, Conservation International and Intel, Lawson Software, GlaxoKlineSmith, Interface, CH2M HILL, BiosGroup
Tracking and integrating different types of information related to dynamics within environmental, social and economic systems that affect the business.			
IT systems that capture information about how ecological systems work, that can then be used to build better businesses.			
Improving logistics tracking for reverse logistics and improved supply chain management to reduce waste.	Improved waste management	Waage, Shah and Girshick [14]	Estee Lauder, Home Depot, Interface, Ecos Technologies, Greenware, Ecostream
Changes in software to allow the managing of sustainable development efforts.			

Table (iii) Framework of KM processes by sustainable development categories

The use of this framework allows organisations undertaking sustainable development projects to assess KM processes that could more likely provide assistance in their project. These KM processes reviewed are from projects carried out successfully by other organisations. This reduces the risk somewhat in utilising the same or similar KM processes for an organisations own project, knowing that it has been proved successful in a previous development. By reducing some of the risk, organisations may be more inclined to implement the sustainable project rather than dismiss it until legislative or social pressures make the project mandatory.

However, this framework is only in its early stages. The categorisations developed and the framework must further be tested to show whether they are viable. A testing method is to be established to show that these KM processes can and do aid organisations in sustainable projects.

Another issue is the development of the sustainable development categorisations. When developing a categorisation based on language and

terminology, the categories are determined according to the perspective of the researcher [22]. There is also the issue that in sustainable development projects there may be overlap between categories for a projects goal. Further testing of the categorisations is to be undertaken in the future to determine their viability.

5. Conclusions

This paper has shown that the available taxonomies on sustainable development are not suitable when categorising the goal or outcome of a sustainable development project. Instead a new categorisation needed to be established that focuses on the sustainable outcome of the project if we are to best understand those projects and their purpose. We also need this categorisation if we are to be able to develop relationships between the sustainable development project outcomes and any processes that may aid in the implementation of that project.

The project has examined the literature available on sustainable development projects to develop a set of categories to be used to describe the goals of these sustainable development projects. However, these categories are based on the literature available that describes sustainable development projects being undertaken by organisations. The categories developed are based on the perceptions of the researchers and should be further tested within organisations. Further research in this area includes extending the framework to cover other KM initiatives outside the scope of IT. The use of the categories developed is also being used in research on the role of KM in decision making of sustainable development projects implemented by textile manufacturing organisations.

Our research has then attempted to develop a relationship between KM processes, from sustainable development projects identified in earlier research, and the sustainable development categories. This has been done to develop a framework showing KM processes involved in successfully implemented sustainable development projects. The use of this framework, once empirically tested, could be an aid to decision making in sustainable development projects and assist in the successful implementation of those projects.

The benefits of establishing this framework are the possibility of reducing the risk of implementing sustainable development projects. This could allow organisations to undertake these projects for the benefits to the organisation and world rather than only implementing these projects when forced by legislative or social pressures.

References

- [1] Jabareen, Y. 2004, A Knowledge Map for Describing Variegated and Conflict Domains of Sustainable Development. *Journal of Environmental Planning & Management* **47**(4), 623-642.
- [2] Parris, T.M. & Kates, R.W. 2003, Characterizing and Measuring Sustainable Development. *Annual Review of Environment & Resources* **28**(1), 559-586.
- [3] Van Der Meer, R. & Sinnapan, S. 2008, The Role of Knowledge Management in an Organisation's Sustainable Development. *Proceedings of Knowledge Management International Conference (KMICE08)* at <<http://www.kmice.uum.edu.my/kmice08/intro.asp>>
- [4] World Economic Forum 2005 *Environmental Sustainability Index*. at <<http://sedac.ciesin.columbia.edu/es/esi/>>
- [5] Jabareen, Y. 2008, A New Conceptual Framework for Sustainable Development. *Environment, Development and Sustainability* **10**(2), 179-192.
- [6] Strauss, A. & Corbin, J. 1997, *Grounded Theory in Practice*. Thousand Oaks, California.
- [7] Martin, P.Y. & Turner, B.A. 1986, Grounded Theory and Organizational Research. *Journal of Applied Behavioral Science* **22**(2), 141-157.
- [8] Glaser, B.G. & Strauss, A.L. 1967, *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine de Gruyter: Chicago.
- [9] Gupta, B., Iyer, L.S. & Aronson, J.E. 2000, Knowledge Management Using The Grounded Theory Approach: Developing A Richer Understanding of Current Practices. *31st Annual Meeting of the Decision Sciences Institute*, 393-395.
- [10] Onion, P. 2006, Grounded Theory Application in Reviewing Knowledge Management Literature. *Postgraduate Research Conference 2006* at <http://www.lmu.ac.uk/research/postgradconf/papers/Patrick_Onions_paper.pdf>
- [11] Collett, S. 2008, World Wildlife Fund. *Computerworld* **42**(8), 40-40.
- [12] Parkinson, G. 2007, Office Clean-up. *Bulletin with Newsweek* **125**(6562), 27-27.
- [13] Audin, G. The Greening Of VOIP. *Business Communications Review* **37**(12), 40-45.
- [14] Waage, S., Shah, R. & Girshick, S. 2003, Information Technology and Sustainability: Enabling the Future. *International Journal of Corporate Sustainability* **10**(4), 2-81 - 2-96.
- [15] Anderson, R. 2004, Climbing Mount Sustainability. *Quality Progress* **37**(2), 32-37.
- [16] Azap, A. & Pe, S. 2000, Indicators of Sustainable Development for Industry: A General Framework. *Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers Part B* **78**(4), 243-261.
- [17] Ault, S. 2007, Retailers Think Global. *Video Business* **27**(35), 30-30.
- [18] Sheats, J. 2000, Information Technology Sustainable Development and Developing Nations. *Greener Management International* **33**.
- [19] Gedda, R. 2007, Green-eyed CIOs Lift Business Acumen. *ComputerWorld*, 1-1
- [20] Lawson to Help Companies Use Information Technology to Manage Green and Social Responsibility Initiatives; *M2PressWIRE* 06 March 2007.
- [21] Jimenez-Gonzalez, C., Constable, D., Curzons, C. & Cunningham, V. 2002, Developing GSK's Green Technology Guidance: Methodology for Case-Scenario Comparison of Technologies. *Clean Technologies and Environmental Policy* **4**(1), 44-53.
- [22] Rosch, E. 1978, Principles of Categorisation in Rosch, E. & Lloyd, B. (eds), *Cognition and Categorisation*, Lawrence Erlbaum Associates, Hillsdale.