SOLID WASTE REDUCTION MANAGEMENT

WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES

by

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QUOTATIONS

In general terms, Social Capital (socio-cultural capital, cultural capital) according to Hediger (2000: 484) refers to a "society's capability to deal with social, economic and environmental problems and be active in shaping the development of the overall system. It consists of socio-cultural values and norms, learned preferences, human capital and labor force, local knowledge of the environment, social competence and institutions, human health and life expectancy, as well as cultural, social integrity and social cohesion".

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"One of the most basic abilities of human beings is to classify and categorize objects and information into simpler schema, such that we can characterize the objects within the groups in total rather than having to deal with each individual object" (Hair et al, 1998: 467).

ABSTRACT

Sustainable development and the Triple Bottom Line integrated sustainability concept focus on the choices between the imperatives of economic efficiency, social development and environmental sustainability. Corporate governance is being imposed by stakeholders and corporate social responsibility is indicated as being the most important socio-environmental demand being made on contemporary leaders. The influence of **idealism** and **realism** on**,** and the reasons for **failure** of, solid waste reduction projects in terms of sustainability is the foundation of the theories postulated in this research.

It is the **objective** of this research to identify the motivational factors, with special reference to developing countries, of social capital, including management processes leadership and people management, that will augment solid waste reduction projects that are lethargic at starting, or deteriorating, to achieve sustainability. The **methodology** is to review the literature available to identify the augmenting (motivational) factors, and use analytical philosophical and empirical research to test formulated constructs using hypotheses. The criterion for the research sample is to obtain the opinions of environmental specialists in South Africa using a questionnaire. The technique employed is multivariate data analysis to identify the type of interdependent relationships, including cluster and multidimensional scaling analyses.

Hypothesis testing, in this research, leads to the conclusion that additional motivational factors are needed to support the economic imperatives to make the process sustainable. '**Reality'** is statistically significantly different to '**idealistic'**. The inference is that for **solid waste reduction projects to succeed leaders** from **government** and the **private sector** are required, through the use of **legislation** and taking into consideration the **value of waste**, to instil **economic** incent**i**ves. According to this research, personal values and belief systems have little to contribute to the process of sustainability. The **outcome** of this research provides a **strategy-benchmarking-model** that leaders can use to target and prioritise their efforts in respect of achieving success with waste projects. The contribution it makes to the knowledge base of the subject and responsible leadership is contained in its summation of the augmenting factors required, their relative importance, and the lessening of the complexity of approach to these projects.

KEYWORDS

Waste management; corporate governance; solid waste; sustainable development; ecosystem; municipal waste; developing country; producer responsibility; waste economics; environment; Triple Bottom Line; social capital; resource economics; belief systems; ethics; ecology; augmenting factors; corporate social responsibility.

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Dedicated to the memory of

two great philosophers:

Judge Kowie Marais and Christèlle Marais (née Human).

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1. CHAPTER 1: INTRODUCTION

This chapter contextualises the scope of the research including the various aspects of sustainable development being investigated. The importance of the various components of sustainability in terms of solid waste management forms the essence of this thesis.

Solid waste management of any kind (Scott, 1998) is a relatively recent phenomenon. The use of sanitary landfills did not begin until the early 1930s in Britain and during the 1940s in the United States. Before these years waste was dumped on any available land or water. Although recycling had been practiced for centuries it is only recently that solid waste management has become important. Recycling now forms a partnership with solid waste management, as the one cannot exist without the other.

Sustainable development has become a very important discussion point when planning any environmental waste project or policy. Ehrenfeld (1997) utilising the Brundtland Report, discussed at the 1992 Rio Environmental Summit, describes sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Hediger (2000: 481) points out that "sustainable development encompasses economic, social, and ecological perspectives of conservation and change". These three imperatives form the basis of environmental sustainable development and the foundation of this research.

1.1. Idea development and motivation for the study

Various industries in a typical developing country, such as South Africa (SA), together with the government of the day are faced with problems created by downstream discarded products or waste. The consequences are various including pollution, of water, ground or air, as well as a variety of social and economic problems. Waste degrades the social fabric of society. For example waste tyres are sold to unsuspecting vehicle owners with disastrous results when they fail causing fatal accidents and carnage on the roads. Stacks of waste tyres create major fire hazards and also provide breeding grounds for mosquitoes and rodents. A further social consequence is the

opportunity taken by poor communities to burn the tyres in order to recover and sell the steel content for a few cents per kilogram. Major air pollution results from this action. Many industries face similar problems and include commodities such as lead-acid batteries, oil, glass, paper, plastics of various descriptions, metals, building rubble, scrapped vehicles, containers, chemicals, cleaning aids and a host of hazardous and medical wastes. To a lesser extent, developed countries have similar problems.

With the emphasis on producer responsibility and the latest trend of increased free trade developing throughout the world various exporting companies are now faced with international environmental standards such as ISO 14000, Kyoto Protocol, Rio Declaration on Environment and Development and the Earth Charter. In many parts of the world, especially first world countries, imports are only accepted on the basis that the exporter conforms to some agreed environmental standard. This immediately forces producer responsibility onto industry and requires the exporting companies to deal with the downstream waste of their commodities. Another issue facing the ever increasing population of the world is the lack of landfill sites. Many residents refuse to accept these sites near their homes, the so called NIMBY (not-in-my-back-yard) effect.

Furthermore, industries wanting to take up their producer responsibility are suddenly faced with a host of social, economic and environmental issues. These range from **economics** such as the costs involved and who will foot the bill as well as creating incentives to recover the waste. Not all incentives are as simple as placing a deposit on a soft drink bottle and thus creating an incentive for the waste to find its way back to the dealer. Many wastes such as fridges, computers and tyres are of an uneconomical recyclable nature. It is also expensive to recover these commodities throughout the country.

The second aspect facing companies are **environmental** issues which are monumental in nature and include, pollution of resources such as water, air and soil, the depletion of the ozone layer by incineration of the waste and consequential health matters.

The third aspect is the **social** implication of dealing with waste. This ranges from the unwillingness of people to assist the process by separating waste at source, to refusing to fund the under-recovery of the commodity to pay for its disposal. Another example is where people often act against their better judgment or value systems by selling the commodity instead of scrapping it as waste. An example is the selling of waste tyres as second hand tyres resulting in vehicle

accidents. Another effect of people's behaviour is the making a tyre casing un-usable for further retreading by driving it to destruction. This prevents the re-use of a commodity, which is environmental best practice. Some people consider short term gain far more important than the social, health and safety concerns of fellow citizens or of the environment.

The latter day democratic rights of all stakeholders also create problems. An industry wanting to take up its producer responsibility is required to consult, and satisfy, a broad base of stakeholders when planning national environmental projects. In theory this is essential if democracy is to be maintained. The problem arises in that all participants arrive at the negotiating table with different agendas. People in general are very self-centred and few see the bigger picture. Industries often find it impossible to conform to all stakeholders' claims without endless sources of funds. Few people consider waste issues as their problem yet they often talk about the problems and have strong opinions. Most individuals handle waste in a selfish manner. Soon after extracting the most out of a commodity it is discarded in the easiest and cheapest of manner without further consideration.

The above synopsis of solid waste issues highlights the complications for industries wanting to take up their producer responsibility and the realisation of government that something needs to be done. These issues led to this research in an endeavour to discern the **motivational** factors that would **augment** solid waste reduction projects or processes, resuscitate ailing projects and provide guidance to prevent failure. Many failed projects can assist as reminders and provide the substance of research for the reasons of the failure. Other solid waste projects are successful and beg the question of what creates success. **Augment** in this sense is used to indicate 'enhance, boost, add to, bump up, expand, enlarge, supplement or instigate' a solid waste project. It refers to completed projects and those that are still to be created and installed. It is furthermore the theme of this research to specifically deal with **solid waste reduction management** (SWRM) projects. Hazardous and nuclear solid waste, where many other complicating factors arise fall outside the scope of this research. The last important topic included in this research is the issue of **sustainability**. When researching motivational factors it is the aim to identify those **imperatives** that will provide for sustainable projects. Complications are added to the understanding of sustainability as it has to conform to being acceptable in terms of the economical, environmental and social aspects for future generations. This research thus encompasses the concept of **sustainable solid waste reduction management** (SSWRM) and the identification of the augmenting motivational factors for sustainability.

The research as envisaged is of prime importance as industries face more pressure to take up their producer responsibility. There is also generally a lack of speedy progress with these types of projects. Private sector companies and governments are always frustrated at the slow progress made during the course of the project. Discovering the real motivational factors may assist in expediting progress. The relevance and implications of the topic is substantial as it deals with the social capital and sustainability of future generations in an environment of increasing world trade. Populations seem to grow unabated throughout most of the second and third worlds with least developed nations placing more pressure on the environment and social fabric of society.

A further theoretical extension of this research is the affect of **idealism** and **realism** on, and **failure** of, sustainability. Sustainability, as defined for the survival of the environment conforming to the three imperatives of economics, environment and social, is an idealistic approach in itself. It is related to an end result only being acceptable if, not only the environmental imperative is satisfied, but the economic and social imperatives are also met. It is therefore nature or the ecosystem that has to coexist with mankind. This research has more to do with the **roadmap** to sustainability and the separation of idealism and realism in terms of SWRM. If the causes for failure could be identified it would by implication provide the answers to sustainability.

The last variable in this research plan is to compare 3rd to 1st world practices in terms of the topic, sustainable solid waste reduction management (SSWRM). Are the motivational factors augmenting the SWRM projects different for the two economies or not? This in itself is a complicated and extended variable and is only dealt with in terms of the opinions of waste specialists from within South Africa. It would justify a research project on its own if extended for example to investigating the practical issues resulting in failure of SWRM projects in the two types of economies. There are also second world countries, for example the former communist eastern European countries and least developed countries that have very poorly developed economies that could be included in any extension of the research project.

Solid waste reduction management requires management processes, skills and knowledge to make the execution sustainable. Certain management aspects of sustainable development could be more important than others. This research needs to add to the knowledge of prioritising the constituents of sustainable development and contribute in this manner to the understanding of the management processes leading to positive outcomes.

Scott (1998) signifies that the contemporary recycling ethos stands in contrast to the historical relationship between affluence and material recycling. The levels of domestic waste recycling have been dropping since the 1750s from a very high level of 80% to lows approaching 10% lately. It was only during the First and Second World Wars that recycling increased substantially because of the high priority placed on raw material recovery required by the war effort due to scarcities. This general drop in recycling percentages over time is in stark contrast to the general increase in the affluence of society that has been steadily improving over the past 300 years. The question is whether the diverging trend of affluence versus recycling is going to continue or if there is a change in the present mindset of society. It is now been noted by Scott (1998) that in less than a decade millions of North American households are beginning to recycle without the necessity to do so. This is unlike previous years of contemporary recycling by not being directly related to an economic crisis, war or resource scarcity. Is there a cultural shift commensurate with an evolution towards a sustainable society? According to Scott (1998) the above may indicate a change in some of the societies now living out their guilt of contributing to the environmental damage and providing gestalt to rectification. On the other hand by refusing to sign the Kyoto protocol on reducing harmful earth gasses the USA and Australia, by implication, indicate that the guilt factor has not yet extended significantly even for 1st world countries. It is the leadership and management processes leading to SSWRM that have yet to be uncovered.

A literature search highlights the components of waste management as envisaged at various levels of society. Yap (1999) reports various authors researching and understanding the scope of waste management challenges. Yap (1999: ix) notes that all the reports share a common message which says that "in order to achieve environmentally sustainable solutions where resources are scarce, there must be better research to inform policy, better education, broad mobilization and participation of the parties involved - the local communities, industry, educators and civil servants … The management of waste - household, institutional, commercial and industrial - captures the policy and planning challenges of sustainable development … Waste management issues frequently give rise to tensions, but also provide opportunities for creative solutions. At the national level, waste management issues create tension between economic development and conservation goals: at the community level, between waste generators and community residents and between the formal and informal economic sectors. At the level of the firm, waste management issues juxtapose regulatory compliance against profitability goals". Many aspects of waste management are mentioned without prioritising the crucial elements. The issues of profitability and economics are mentioned in the above quote. Yap (1999) also describes how

governments, managers and NGOs often grapple with the problems of waste management projects indicating that a large number of management disciplines are needed to progress the matter of sustainable development. This forms the theme of this research.

1.2. The research topic derived from preliminary reading

According to Holmes (1984) various attempts are made by donor fund agencies, aid facilitators and research officials to motivate governments, societies and companies in developing countries towards sustainable waste management. Most of these attempts fail, and many examples are available throughout the world. Abandoned installations, funded by and built with western and eastern expertise, are observed within developing countries. The major growth in population is a factor that is identified (Holmes, 1984) as contributing to the ever-increasing municipal waste generated and contributing to the socio-economic degradation. Most developing nations seem unable to pull themselves out of this downward spiral of poverty and environmental pollution. There seems to be a lack of initiative from governments, societies and companies operating in developing countries towards sustainable development. Civil unrest in many of these countries aggravates the problem, as sustainable development certainly has the last priority on their list of survival economics.

Preliminary literature research is used to identify the motivational factors that will augment SSWRM and refine the research. Therefore various aspects of waste management are considered in an endeavour to rationalise the directive thought process towards constructing a model as a guide towards better waste management and leadership.

Solid waste reduction management, being part of general waste management, needs to conform to the all-inclusive processes of **sustainable development. Integrated waste management** is defined by McDougal (2001a: 143) as “an overall approach to waste management; it combines a range of collection and treatment methods to handle all materials in the waste stream in an environmentally effective, economically affordable and socially acceptable way”. Hediger (2000) defines this as the mechanistic approach to the management process which at the same time, has to comply with the three major pillars of being **economically affordable, socially acceptable and environmentally friendly**. These three issues form the imperatives of sustainable waste management and are used in the hypotheses created throughout this research.

A consulting company in South Africa, The Palmer Development Group (1996) reports that waste management systems must provide economic benefits through the provision of an effective service that is affordable to those who benefit from the service. Analysis of this statement can by implication mean that the process does not contribute to sustainable development as the economic benefits might juxtapose the environmental goals. There is also the issue of those benefiting versus those actually bearing the costs. Therefore, the service has to be **economical** to the greater society to succeed in the long run without jeopardizing the environmental future of the ecosystem within which it operates.

The developed countries are rapidly moving towards a more environmentally conservative society. As a result, their governments and people are beginning to demand life cycle assessments of all commodities manufactured and sold, thereby moving them towards sustainable development. Progress has been made within these countries to reduce the impact of manufacturing, transportation, habitation and other pollutions within their environments. A realisation is taking place that ecosystem management has become all-important. Life cycle assessments are important factors to consider. Looking at developing countries we find a different scenario. Very little environmental sustainable development (Holmes, 1984 & Yap, 1999) can be found within these countries, as they are still grappling with survival economies. Large population growths and the increasing quantities of waste generated are all contributing to the major pollution that is taking place. Additional socio-economic problems are occurring as a result of these problems and include health, economic and life degrading situations. The question then arises; how can these trends be reversed towards SSWRM within the constraints of poor economies?

Increasing international trade and governance (O'Neill, 2001) is gradually highlighting the lack of integrated waste management strategies, within developing countries, in the preservation of their ecosystems. The globalisation of trade has recently resulted in certain standards and norms being set by the larger economy countries, forcing suppliers from the developing countries to conform to international standards. Examples (Bansal & Bogner, 2002) of such standards are the ISO 14000 series and other health and safety benchmarks. In an attempt to reduce their costs, international companies are moving manufacturing and services to less costly labour markets, which include the developing countries. This highlights the diversity and fluidity found within ecosystem management when comparing countries throughout the world. Manufacturing and trade do influence the ecosystems in which they operate. Standards on the one side versus economics and environmental issues on the other side, balance the scale of sustainable development. According to

Bansal & Bogner (2002) the implementation of an Environmental Management System, such as ISO 14000, will allow a firm to uncover ways in which to reduce its environmental impacts, while simultaneously reducing costs by increasing productivity. In addition, it would also co-ordinate the environmental activities of a company allowing it to achieve greater organisational efficiency and effectiveness. Another bonus is the preference for ISO certified suppliers by key customers. This is becoming an important issue for companies exporting to developed countries. Therefore, **environmental standards** are becoming important for sustainable development and require research in terms of its ranking in the scheme of management.

Recent developments in first world countries highlight the concerns that are being raised about the mounting municipal solid waste (MSW) problems. The **not-in-my-backyard** (NIMBY) syndrome that developed within wealthier nations of the world is contributing towards the movement of waste from these countries to developing countries. This NIMBY effect according to Rondinelli, Berry & Vastag (1997) is aptly demonstrated by a barge loaded with 3000 tons of baled garbage that was not allowed to dock in the New York harbour, and continued moving 6000 miles from port to port, over a period of 156 days before being off-loaded. The reduction of available landfill sites, which is the result of societal pressure and the NIMBY effect, creates a desire for wealthier nations to ship their waste to developing countries. These countries in return accept the waste for some financial gain. Fraud often plays a major role in this unsustainable practice, which is still continuing today. Many nuclear, hazardous, chemical and other wastes are still finding their way to developing countries. These include commodities such as used-clothing, second-hand vehicles and parts, and waste tyres. Due to less favourable economic conditions these items are then used in the poorer countries for their originally intended use. The above indicates the powerful role played by social aspects of nations and economic influences. Certainly, responsible **leadership** is required to route out the fraud, encountered within third world countries, entailed in the acceptance of waste in return for bribery.

Stricter environmental, safety and health **regulations** are contributing to shorter life cycles of commodities in developed countries. These goods are often still in good working order when dispatched and dumped in developing countries, where there is an economic demand for them. An example is the export of vehicles from Japan, after three to four years of use, because they cannot economically be refurbished to the high road regulation standards there, to African countries. The lack of corporate governance and incessant fraud within poorer countries assists the process of accepting other countries' second hand or waste products. The problem is not primarily the re-use

of commodities but rather the destruction of factories in the receiving country as new goods cannot compete with cheap imported used goods. A vicious cycle is created as the lack of jobs reduces the economic buying power of nations and they become more reliant on aid. The control of second hand goods is thus very important. It is in this respect that economics force the issue of sustainability and often in the wrong direction. These trends require reversal through incentives and better management of waste. Leadership, legislation and enforcement should also be ranked.

Product development work is currently being done (Fuller & Ottman, 2002) to create greener products and services. It is possible to include environmental, technical and economical aspects within the **product design** that often leads to solutions with the same or even lower cost. From the consumer's point of view resource and tax saving may eventually lead to increasing profits due to more goodwill towards the product, and the company in general. Manufacturing and marketing managers should become more responsible towards the world's ecosystems and practice a holistic approach during their product designs. The awareness of environmental aspects in product development has grown over the last decade and a trend observed in the literature (Powell, Craighill, et al, 1996) is the increasing integration of **Life Cycle Assessments** (LCA) in the product development procedure. The advantage of LCA is that it broadens the scope during the process of evaluating integrated waste management projects. The issue is thus how important is LCA?

Looking at the societal aspects of sustainable waste management social capital (socio-cultural capital, cultural capital) in general terms, according to Pargal, Huq & Gilligan (2000) and Hediger (2000), refers to a society's capability to deal with social, economic and environmental problems and to be active in shaping the development of the overall system. It consists of socio-cultural values and norms, learned preferences, human capital and labour force, local knowledge of the environment, social competence and institutions, human health and life expectancy, as well as cultural and social integrity, and social cohesion. Indications are that **education and training** can improve the social capital of societies. Population growth is generally seen as a major threat to sustainable development. How then do people become involved in environmental issues? Present day ecosystem management requires stakeholder and public participation. Decision makers often give more weight to the misanthropic views of environmentalists and other undemocratic pressure groups that claim to speak for the public, than to sound assessments of the problem. It appears that common sense often has difficulty in prevailing as a result of the pressure groups that play a role in the environmental conservation decision-making process. Paul & Strout (1997) report that on

average, most healthcare facilities are doing less than they should in the area of source reduction and recycling, and will likely continue to do so until mandated by law. This is a typical indication that some **incentive** is required to initiate sustainable development. Businesses on their own seldom embark on sound environmental practices.

What role can managers play in the environmental affairs of businesses? Within the business environment Anshoff (1982) indicates that social objectives exert a secondary modifying and constraining influence on management's behaviour. Survival of employees often requires that, to remain employed, their values have to be modified when formulating their value systems. We find this equally applying to environmental issues. Recently, businesses have been reforming their harmful practices following **societal pressure** on the manner in which they conduct their business. Oligopolistic industries are specifically prone to these trends. These are industries with large capital investment, fixed production capacity, and largely homogeneous goods being produced. The cement manufacturers are a good example of an oligopolistic industry which has been criticized (Klee, 2002) for its practices. Furthermore, corporate social responsibility (CSR) is indicated (Hatcher, 2003; Kaplan & Norton, 2004) as being the most important socio-environmental demand being made on leaders today. On the contemporary leadership front, Hamann (2003) also emphasises partnerships between companies, governments and civil society as an effective and efficient strategy for dealing with corporate social responsibility (CSR). Contemporary **risk assessment** methods are also starting to be used, especially by regulatory agencies. The primary purpose of the risk assessment of solid waste management is to provide a technical base for setting environmental standards.

It is also important to focus on a **person's values** that direct the way they manage a business and waste. Rokeach (1968) indicates that a person's total belief system includes inconsequential beliefs, derived beliefs, pre-ideological beliefs about specific authority, and pre-ideological primitive beliefs, socially shared or unshared, about the nature of the physical world, society, and the self. All such beliefs are formed and developed early in the life of a child. With reference to belief systems in affluent societies we find (Wilson, 2000) an increasing number of citizens are able to ask themselves what they would like to do with their lives. This is in contrast with the scenario in developing countries where the basics of food, shelter and employment are still very high on the needs list. There are many examples (Wilson, 2000) of **workshops** held in developing countries with large numbers of stakeholders such as regional government, non-governmental organisations and other social institutions that turn out to be fruitless in developing waste

reduction projects. The major problems identified by Johnson & Wilson (2000) are, lack of funds, households not separating their waste, no recycling taking place, and owners of waste expecting to be paid for contributions made to recycling. Hypotheses such as 'workshops could be an intervention mechanism for waste management improvement' were not supported, as neither local government nor society had the means to progress the project and generate sustainable development. Can the values of people regarding waste management then be changed? It is indicated by Guth & Tagiuri (1965) that values are acquired **very early in life** and that they are transmitted to a person through his parents, teachers and other significant persons in his environment who in turn, acquire their values in a similar fashion. Child-rearing practices are expressions of a family's values, and of the values of the social group to which the family belongs. The forming of personal values develop early during a person's life and most people have difficulty in identifying these values until they come face to face with situations that force them to recognize the values present in their make-up. This particularly develops during their working lives.

Loyalty is also considered an important value to be practiced by a professional. This plays off against a person's belief system. McCuen (1998) reasons that if the corporation (which could be any association) operates at a level higher than the individual in terms of the value systems, there is conflict that can be easily resolved. The corporation must either convince the individual to operate at the same higher level or be dismissed. In contrast, if the individual operates at a higher belief system level than the corporation, two options unfold which are either to compromise his/her principles and operate at the same lower level as the corporation, or resign. This refers importantly to waste management within any business.

Specific oligopolistic markets, identified as large manufacturing operations with few large competitors, also often contribute to waste problems. These include commodities typically found in these markets with low margins and fierce competition. These particular products create major pollution problems due to their waste often being used for the original intended purpose instead of being recycled into some other useful product or energy. An example is waste tyres that continue to be used on vehicles causing disastrous accidents. The high recycling cost of these commodities often prevents recovery and leads to other health and environmental problems, including fires or insects and vermin breeding in the waste. There are often insufficient funds available for proper waste management systems. The identified delimitation of low-value waste and high recycling

cost economic factors are important, as these contribute to the waste generation problem, and highlight the requirement for special leadership skills and strategic plans to deal with this risk.

A typical market, consisting of local manufacturing operations as well as large scale imports, often at dumped prices, gives rise to waste problems. A typical hierarchy of production, sales and marketing is required as a benchmark for more research. Other aspects influencing such research are the socio-economic problems associated with some markets. These include aspects such as fraud, theft and bypassing of the usual economic structures by well-organised organisations. Also to be considered are the abuses of health, safety and economic factors, required by good governance, but avoided by some unscrupulous operators. Most developing countries have emerging markets with small-size financial markets. There are, however, some aspects within the socio-economic structure of South Africa that could assist in finding answers to the waste management problems of both developed and developing countries (1st and 3rd world countries).

The problems surrounding landfill site location requires insight. Municipal solid waste (MSW) is internationally on the increase. Some countries are achieving success in reducing the inevitable part of MSW that needs to be disposed of in landfill sites. The numbers of landfill sites are reducing for various reasons. Examples are the lack of suitable land, and communities preferring not to live close to such sites. Wilson, McDougal & Wilmore (2001) describe how waste managers of the EU endeavour to create sustainable development by analysing the practical aspects of municipal waste management. This includes reduction programmes through source separation, recycling, incineration and landfill. These are major economic issues that require research.

There is also a major problem surrounding the trade in waste products such as scrap tyres. Economic pressures, within developing countries, compel people to use waste products for their original purpose instead of re-using it in new commodities. Traders are quick to cash in on adversity and create a flow of waste products from first world countries to developing areas. The management of waste in developing countries is a major problem. Many examples (Holmes, 1984) have been documented. Researchers are still endeavouring to determine interventions that will bring about successful waste management in developing countries.

There are, however, a small number of projects within some communities that are succeeding in reducing the waste burden. Examples of these (Holmes, 1984; Colon & Fawcett, 2005) are the

MSW clearance systems, which have been devised by small non-governmental organisations (NGOs), in Madras, India, organising the communities to take charge of their MSW problems.

The problem of environmental sustainable development could be analysed by formulating three questions:

- Why are so many solid waste reduction projects failing, as also supported by Yap (1999), or even not getting off the planning boards, especially in the developing countries?
- What are augmenting management factors that would guarantee success in terms of sustainability?
- Is state of the economy in a specific country, the determining factor?

The above issues guide this research in obtaining the views of specialists in waste management regarding the range of motivational factors and priorities in formulating policy to be used by governmental, NGO and private enterprise leaders. There must be reasons why some countries seem to be more successful in dealing with solid waste than other societies. The need for a review of the approach to SWRM projects, to make them sustainable, is an essential research topic.

1.3. The research problem, question or hypotheses

The preliminary investigations and literature consulted as noted in preceding paragraphs, lead to the formulation of the research problem and objectives of this research.

The **research problem** is that many solid waste reduction management projects in 3rd and 1st world countries do not progress beyond the drawing board or fail in terms of sustainability. This is especially true in third world countries.

Therefore the **objective of this research** is to identify the motivational factors of social capital including management processes, leadership and people management that would augment solid waste reduction management (SWRM) projects that are lethargic at starting, or deteriorating, to achieve sustainability, with special reference to developing countries.

Finally it is the **goal of this research** to use the results of the identified motivational factors in constructing a strategy-benchmarking-model that can be used by governmental, NGO and private sector leaders to augment SWRM projects towards sustainability.

In other words it is to find a solution to the incapacity of countries, particularly developing countries, to solve their mounting municipal solid waste problem towards sustainable development. What is required is to identify a road map or benchmark that can be used by project leaders to show the way to successful sustainable development. Issues that require identification during this research are:

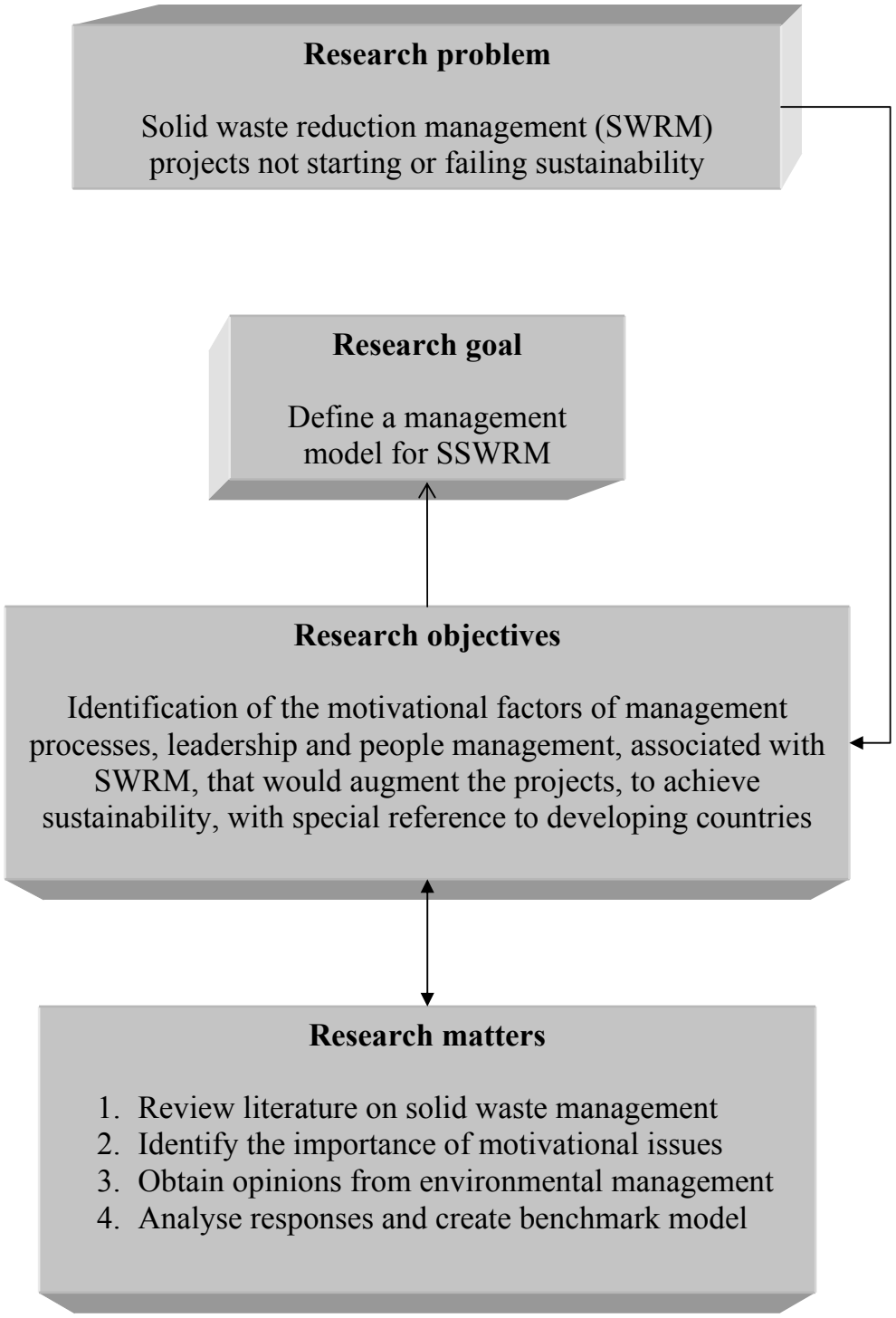
- Identification of the factors prohibiting or promoting sustainable development,
- Identifying the role players such as the responsible person, leader and/or organisation that should instigate the process of sustainable development,
- Provide guidelines and methods to augment and facilitate the SWRM project.

Looking at business practices Ehrenfeld (1997) focusing on environmental concerns, confirms that a number of alternative systems of thought are emerging in recent years. These thoughts represent a succession of worldviews, each moving closer to a unity of man and nature. The fact that so much pollution is taking place possibly indicates that most businesses consider generating profit, more important than catering for environmental sustainable development. It can be argued that businesses in general subscribe to **frontier economics**. Of late many individuals, followed by governments and politicians, wanting to preserve their representative votes, are relating to **externality control.**

Holmes (1984) and Yap (1999) imply that the lack of proper economic infrastructures and markets within developing countries remain the major stumbling blocks towards sustainable waste management. There are, however, indications that some projects are succeeding within poor nations despite the lack of strong economics and markets. There might be other socio-economic factors that require identification, to assist and clarify the motivational factor(s) that would augment a sustainable waste management programme within developed and developing countries.

In figure 1 the **problem**, **objectives** and **goal** of this research are summarised. The motivational factors, to be identified, to satisfy the objectives of this research will be used to construct a management model that would be useful for government and private enterprise leaders when dealing with solid waste reduction projects in making them sustainable. Hypotheses are required to measure the importance of the three imperatives of sustainable development (environmental, social and economic) in the opinion of environmental specialists. Identification of the motivational factors is to be identified from literature and ranked through research of expert opinions. These answers will lead to the construction of the required management strategy-benchmarking-model to reach the goal of this work.

Figure 1: Research problem, objectives and goal



1.4. Research design and methodology

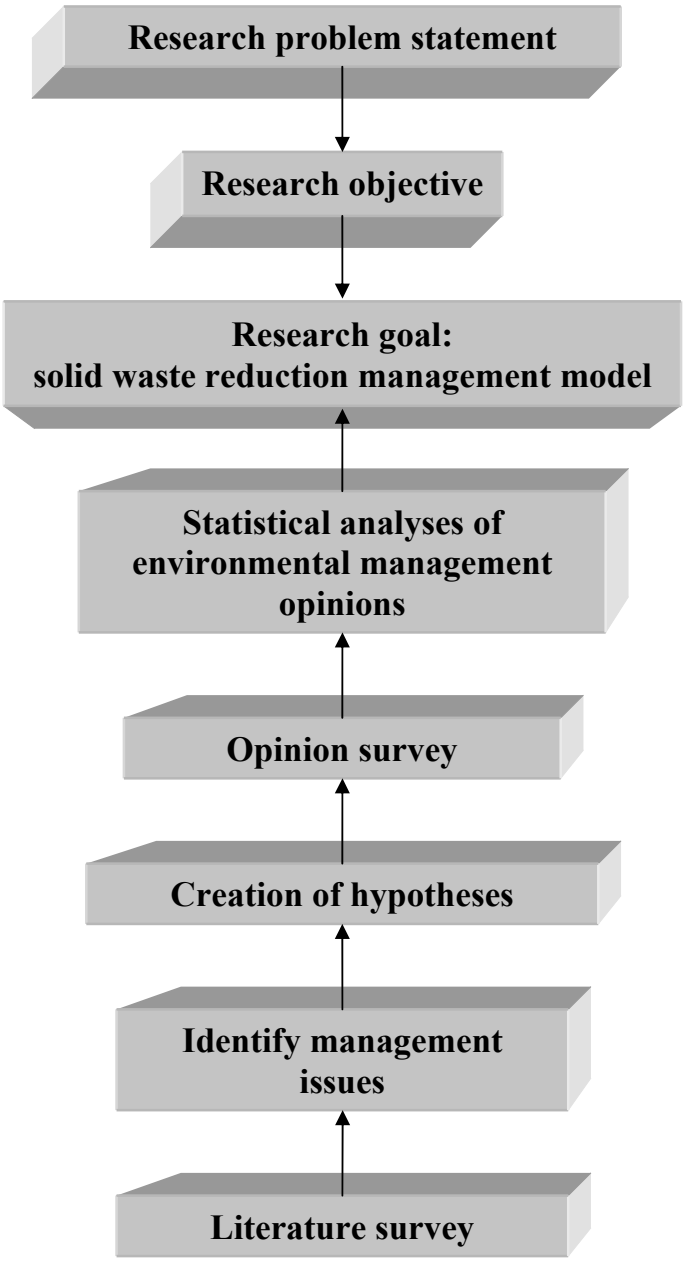
Inferences made, as per paragraph 1.1, indicate the fertile research ground available within solid waste reduction management in achieving sustainable development. The process for this research is to evaluate the literature available in search of sustainable motivational factors and generate theories to be tested as hypotheses. Questionnaires as research instruments are to be sent to specialists in the field of environmental management within South Africa (SA) and thereafter statistically analysed.

This research includes the exploration of motivational factors that will lead waste reduction management projects to sustainability. The following guideline is to be used during the literature research within the aspects of sustainable solid waste reduction management to identify the motivational factors:

- To what extent economic pressure overrides personal beliefs in terms of waste disposal initiators, especially within businesses,
- The dominant inherent belief systems of the typical waste owner in the absence of reasonable economic pressures,
- To analyse and interpret a priori of economic values versus personal values,
- To discover what aspects would support a strategic management model that would encourage more recycling of a low value commodity within a legislative vacuum.
- To analyse the environmental and resource economics (Blignaut & de Wit, 2004) pertaining to the above subject.

The theories being developed in this research are based on sustainable development in the managerial format of the “Triple Bottom Line” (Klee, 2002) used by international businesses. In figure 2 the research design and methodology are outlined.

Figure 2: Research design and methodology process to be followed



1.5. Outline of remainder of thesis

Societies are degenerated by the waste they create by failing to recycle or dispose of it in an environmentally sustainable manner. Paragraphs 1.1 and 1.2 indicate that many SWM reduction projects fail or never leave the drawing board. This particularly applies to developing countries.

This research aims to identify the determinants that would augment the waste management process and maintain sustainability if applied in any country. It is planned to indicate what the problems are, who should be taking responsibility for them and what management benchmarks are available.

The importance in solving the inability of countries to move towards sustainable development is of great magnitude as it would breathe new life into job creation and promote the economic multiplier effect. The social lives of people will improve. It should therefore make a substantial contribution to environmental management and leadership theories, especially in the field of solid waste management and environmental sustainability. Ultimately, corporate governance is addressed in the process.

It is with this apparent lack of success, by especially developing countries, to embark on MSW reduction programmes that a literature search is done in order to identify, inter alia, the leadership and belief systems that would promote the reduction of MSW in those countries. The literature search is done in a systematic manner by firstly obtaining insights from a universal waste management perspective and then looking at waste management analysis systems followed by business practices within the waste management environment. The search is then drawn closer to the socio-economic aspects of waste management including social behaviour, economics, and consumer buying behaviour, social concerns, legislation, environmental levies and education of particularly those within developing countries. The focus is also drawn to leadership aspects such as personal and corporate belief systems. It is also an attempt to categorise the various aspects and indicate their relationship. This should lead to the appreciation of all the other associated socio-economic issues, which include safety, health, and lack of foreign investment and intellectual property development problems resulting from inferior waste management.

Sustainable waste reduction management evolves from management principles and imperatives that are economically sustainable, environmentally friendly and socially acceptable. This study of

the imperatives will enlighten leaders to the relative weight of each contributing factor to the success or failure of environmental SWM projects. It is not the intention to create a mathematical model but to ascertain which important imperatives require the focus of management and leaders dealing with SWRM projects.

A questionnaire will be used as the research instrument and is to be sent to the senior environmental managers or specialists of large organisations of consulting and operating companies dealing in waste management within South Africa. These environmental specialists have an understanding of the underlying principles of sustainable development and have experience with SWM projects. The views thus obtained will be more informed than would have been the case by sending the questionnaires to general managers or government officials not directly concerned with waste management.

Paragraph 1.3 is an introduction to the scope of this research and refers to the evaluation of the three aspects of the Triple Bottom Line in terms of waste management being environmentally sustainable, economically feasible and yet socially acceptable.

A review of the literature surrounding waste management is done, and described within chapters 2, 3 and 4. **Although it might seem that a host of often non-related matters are noted the consistent premise throughout the searches is the motivational factors that would augment solid waste reduction management.** It is also not always possible to compartmentalise the items into separate chapters as many aspects relate to some of the imperatives in the same context. Examples are social, economic and political issues, which are often interlinked. Important aspects are bold printed to emphasise their importance.

Various management techniques are analysed within Chapter 2 in an endeavour to evaluate management and project management approaches to waste management. This deals with the **environmental** and by inference, some of the environmental imperative part of the Triple Bottom Line.

Chapter 3 is a review of corporate and managers' belief systems towards solid waste management. Other aspects influencing sustainable waste management are also developed in an effort to understand the ethics versus business profit motive evolving within the firm. The **social-capital** of dealing with solid waste reduction management is reviewed.

The **economic** aspects of sustainable solid waste reduction management as a construct of the Triple Bottom Line are discussed in Chapter 4. It is difficult to look at economics in isolation as the socio-economic issues always arise in the process.

Chapter 5 contains the **research design and methodology** outlining hypotheses, within the constructs developed, to evaluate the motivational factors identified during the literature survey. All of the above chapters form the contrapuntal aspects within the balance and roll-play of environmental, social and economic aspects of sustainable development. The sustainable motivational factors require answering by means of theories, hypotheses, statistical analyses and modelling.

Chapter 6 contains the **results** of the research questionnaire and the analyses together with the management model developed. Chapter 7 forms the **conclusion** of the research including notice of **bias** possibilities and **proposals for further research**.

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2. CHAPTER 2: ENVIRONMENTAL MANAGEMENT OF WASTE

The understanding of sustainable solid waste reduction principles requires insight into present waste management practices. From this some motivational factors can be identified. The objective of this research is to identify the motivational factors that would augment SWRM projects towards sustainability. These motivational factors are identified in terms of the three imperatives of sustainable development which are described in chapters 2, 3 and 4. This chapter deals with some of the literature available on the first imperative which is **environmental** friendliness or acceptability of a project or process. This chapter also describes various internationally accepted waste management perspectives on sustainability and ecosystems. Various waste management analyses systems found in literature are evaluated in an endeavour to understand their environmental contribution to sustainability. Motivational factors are highlighted as identified in the following chapters.

2.1. Universal waste management perspectives

Studies recently done (Yap, 1999) in African countries quote examples of major problems experienced with municipal solid waste management in the Zambezi valley, the cities of Blantyre in Malawi and Kitwe in Zambia. These research findings provide a bleak picture of solid waste management failures that can lead to pessimism for the future of the region. Serious social consequences, due to improper solid waste disposal, lead to tragedies such as the Black Death which occurred in Europe not many centuries ago. It was not until the 19th century that sanitary laws were passed in Europe prohibiting the dumping of solid waste into ditches and water bodies

As another example Tillman & Sandhu (1998) compared their study of solid waste management disposal programmes in Alabama, USA with similar programmes used by other USA states. The decreasing number of landfill sites available as well as the increasing volume of municipal solid waste (MSW) generated in the states leads to problems. Several states are mandating recycling, to assist in decreasing the volume of waste intended for disposal, and thereby reducing landfill operational costs. Incineration of waste is not a very popular disposal process due to possible air pollution. It is predicted that landfills will become more expensive in future due to the diminishing availability of space and stringent environmental standards. Some costs are rising annually by

25% to 40%. Residents and municipalities are seeking inexpensive means of waste disposal. The states of California, Florida and Wisconsin are among the leaders in recycling, each diverting approximately 40% of their total waste stream from disposal to recycling and other uses. Some management of waste is therefore starting to make a difference to the volumes dumped in landfill sites in 1st world countries. The situation is not that good in 3rd world countries.

2.1.1. Integrated waste management

Integrated waste management is defined by McDougal (2001a: 143) as "an overall approach to waste management, it combines a range of collection and treatment methods to handle all materials in the waste stream in an environmentally effective, economically affordable and socially acceptable way". Thus waste management needs to be extended and superseded by an integrated approach to waste management where economic and environmental concerns are added to the system. Eventually an integrated waste management system can itself become part of a **resource management system**. McDougal (2001a) defines the evolution of waste management as:

- step one being waste management dealing with public health issues which is then extended,
- step two is to optimize the waste management practices known as integrated waste management, and thereafter,
- as a third step, optimization of resources included to form the integrated resource management process.

These integrated waste management philosophies are idealistic in terms of reaching the ultimate goal of satisfying all three of the sustainable factors.

Tools such as **life cycle inventory** (LCI), being part of life cycle assessment (LCA) are used to measure waste management progress. LCA will be expanded in paragraph 2.2.2. The LCI of solid waste starts the moment a material becomes waste and ends when it ceases to be waste by becoming a useful product, residual landfill material or an emission to either air or water. The usefulness of LCI in waste management is in assessing environmental efficiency with progress.

Much progress is demonstrated (Tillman & Sandhu, 1998) with integrated waste management in developed countries. The state of California has an extensive framework of solid waste legislation that began in 1986. They annually provide more than $20 million to fund private recycling programmes and in the process save $54 million in avoided disposal cost. As another example of

waste management, which indicates the power of good economics, Florida imposes an advanced **disposal fee** on certain containers and utilizes these funds to provide **low interest loans** to companies wishing to purchase equipment for recycling purposes. The recycling obstacles identified include behavioural variation, where individuals do not want to comply with **regulation**. There are also problems with understaffing and under funding of agencies responsible to carry out successful programmes. The importance of **political support** for a government programme that seeks to change the behaviour of a large number of people is highlighted. The mass media is a well-established factor that influences both the public and government policy. Tillman and Sandhu (1998) point out that new integrated waste management programmes require intelligent and **aggressive implementers**. They should be persistent enough to develop new **standards** and **regulations**, and willing to enforce them as a regulator, in spite of resistance from both politicians and the public. This is a crucial aspect of waste management and success depends on government officials choosing the correct moment to **enforce waste legislation**. The importance of promotion and **education** seems to be the most difficult part of proposed programmes, as a change in the conventional attitudes and throwaway behaviour of consumers is needed. Every effort should be made to curb costs and increase public participation. The authors suggest that surveys should be sent to participants to obtain feedback on how a programme is perceived by the public and ideas obtained for improvement. Tillman & Sandhu (1998) summarises that changes need to occur in the state government, education system and economy before a mandatory recycling programme can realistically be implemented.

Salvia, et al (2002) describe how a **sensitivity analysis** could be performed to evaluate the influence of land filling fees on the choice of waste processing technologies. This is in order to foster waste management strategies, which are environmentally sustainable, economically affordable and highly effective. The results indicate the key role of separate collection processes and the mechanical pre-treatments in the achievement of **legislative targets**.

Future waste management plans need to take cognisance of the **type of commodity** being addressed. Various studies have been done looking at specific commodities and their unique integrated waste management problems. Examples of the associated used tyre disposal problems are quoted by Ferrer (1997) who researches the material flow from the raw materials stage through to the manufacturing of tyres. He concludes that retreading of tyres creates the best solution for the reuse of used tyres, and that the burning of waste tyres in electric plants and cement kilns, utilising the economic value of heat within tyres, seems to be the best method of eliminating the

growing problem of waste tyres. Again the consideration of economics in plans seems to be important.

In dealing with the **strategic approach** to waste management there has to be a client, owner and supplier perspective. This also relates to investigations, studies done, and problems experienced. Checkland (1981: 294) in his book *Systems Thinking, Systems Practice* defines the **client** as "somebody who wants to know or do something and commissions the study. The implication is that the client can cause something to happen as a result of the study. The decision-taker, the 'supplier', is the role player in a human activity system who can alter its content (its activities) and their arrangement within the system (subsystem) and who can decide resource allocation within the system. The problem **owner** is the one who has a feeling of unease about a situation; either a sense of mismatch between what is and what might be or a vague feeling that things could be better, and who wishes something were done about it. The problem owner may not be able to define what he would regard as a solution, and may not be able to articulate the feeling of unease in any precise way". Waste management is the result of precisely this interplay of the waste owner, the public, knowing something is wrong but being unable to correct the situation and solve the waste problem. The existence of a client in terms of MSW is normally the general public or government who wishes to solve the accumulation of waste, but is unable to commission the study and work. There-in lies the inability in many developing countries (Holmes, 1984) to realise they do have a problem.

On the positive side, Yap (1999) refers to extended analyses done in developing countries with reference to recycling of recoverable materials. These include **valuable constituents** of the waste streams, specifically paper, plastic, glass and metal being funded predominately by foreign aid. The problem is the re-integration of recovered material into the production or consumption loop. There are so many ways to collect and process recyclables and the viability of such projects depend on many variables, which make it difficult to compare them in terms of cost, performance or environmental impact. It is indicated (Yap, 1999: xiv) that the **role of government** becomes all the more important in creating the right environment for all viable **multi-material recovery systems**. Integrated solid waste management systems require strategic planning and a system that "encompasses the control of generation, storage, collection, transfer, transport, processing and disposal of waste in a manner that is in accord with the best principles of public health, economics, engineering, conservations, aesthetics and other environmental consideration".

2.1.2. Sustainable development

Ehrenfeld (1997) utilizing the Brundtland Report, which was discussed at the 1992 Rio Environmental Summit, defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The author discusses the evolution of environmental policy frameworks, demonstrating that industrial ecology is different from the more established modern economic capitalistic democratic ideals on which advanced modern societies rest. Tracing the evolution of environmental management frameworks over the past several decades indicates its paradigmatic character. The author explains a **paradigm** as a framing set of concepts, beliefs, and standard practices that guide human action. He signifies that every day our social life consists analogously of a paradigmatic set of activities. On the other hand Hediger (2000: 481) defines sustainable development as "encompasses economic, social, and ecological perspectives of conservation and change". Hediger further points out that the general definition for sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The author then provides a more precise definition as developed by the World Commission on Environment and Development (WCED) as a "process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations". This last reference seems to favour the importance economics play in the process. Is it more important than the social and environmental factors?

According to Ehrenfeld (1997) there are some fundamental principles of **sustainable development** that require review from an ecological and economic perspective. There are different paradigms for sustainability that are referred to as weak and strong sustainability principles. Weak sustainability requires that the welfare potential of the overall capital base remains intact. Strong sustainable development requires that the adverse impact on the quality of air, water, and other natural elements be minimized so as to sustain the ecosystems overall integrity. Excessive population growth in developing countries hampers the introduction of sustainable development programmes for waste management.

McDougal (2001a) expands on sustainable solid waste management as integrated waste management, which requires systems that are safe and sustainable. He indicates that the UK

government defines sustainability as ensuring a better quality of life now and for generations to come. Sustainability could be thought of as a triangle, with the three elements being environmental effectiveness, economic affordability and social acceptability. Sustainability is about balancing these three elements, and a stable balance requires all three of these elements to be considered equally. The problem lies in finding this balance. Social acceptability often overrides environmental effectiveness and economic affordability.

Many participants are less inclined to assist a waste management programme to its logical conclusion for selfish reasons. Economic affordable waste collection systems require funds to manage and operate them and donations alone will not suffice. A fine balance exists in deciding what type of funding to utilize and measuring the resultant success of the programme. Kulshreshtha & Sarangi (2001) point out that market generated **deposit-refund systems** are almost absent in developed worlds, whilst still being quite popular in developing countries. The reasoning is that in developed countries, cheaper technology and the convenience of disposable (single use) containers makes it possible for firms to move away from the voluntary deposit-refunds systems of the 1960s. Increased environmental concerns however, led to the subsequent introduction of mandatory deposit schemes in many parts of the world. These authors suggest that the product side of the market, especially with issues relating to the market structure, require further study, indicating that it would be noteworthy to study the different aspects of oligopolistic markets and their welfare implications. Results of price and quantity competition in the product and recycling market, or a perfectly competitive recycling market within an oligopolistic product market are possible extensions to further studies. They do indicate that often firms brand their own packaging, thereby exercising monopsony power over buying back their packages. The various economic factors that need to be considered are issues such as the size of deposit-refund schemes, monopolistic or oligopolistic markets, marketing of packaging and other applications for waste products other than **recycling** e.g. re-use of the waste for other applications. The role of hustling in the recycling of waste definitely plays a major role. **Hustlers** are those people, often poor, who collect waste and return it to depots for a refund.

The above leads to the role marketing, and indirectly economics, play in sustainable development. Fuller & Ottman (2002) demonstrate how sustainable **product design** could counter ecosystems degradation. The general decline in ecosystem quality is linked to marketing. Marketing strategies facilitate consumption, which include product manufacturing, distribution and consumer use, thereby increasing the generation of waste and degradation of the ecosystem. Competitors will

devour firms practicing unsustainable product design. Manufacturing and marketing managers should become more responsible towards the worlds' ecosystems and practice a holistic approach in their product designs. This is mainly true in developed countries as most citizens in developing countries are not too concerned about environmental issues. Only economic factors will change their minds.

The dogmatic approach of environmentalists (Thrower & Martinez, 2000: 68-69) often leads to diverging opinions about the approach to sustainable development. It is difficult to reach consensus. "Environmental policy issues often cannot be resolved, owing to differences between anthropocentrisms who adhere to neoclassical economic principles and biocentrists who argue in favour of a broad conception of sustainable development. The problem is that proponents of continued industrial development, on the one hand, and members of the public who consider themselves environmentalists, on the other hand, approach sustainability from diametrically opposed perspectives. Neoclassical economists contend that virtually all-individual and social choices can be quantified. Environmentalists are troubled by neoclassical economists' presumption of relative certainty in evaluating individual and social choices. Meaningful public participation is provided through adaptive management principles that bridge the gap, to the extent possible, between anthropocentric and biocentric perspectives". This research endeavours to exactly ascertain the cementing process between the above views and realism. The contention is that economic aspects overrule the social and environmental imperatives of any project and that proper construction and execution leads to sustainability in terms of the last two imperatives.

Looking at the practical aspects Wilson, McDougal & Wilmore (2001) describe how waste managers of the EU endeavour to create sustainable development by analysing the practical aspects of municipal waste management. It includes **reduction programmes** through source separation, recycling, incineration and landfill. Leach, Bauen & Lucas (1996) prove that despite a propensity for waste management techniques to rather recycle, the incineration of paper proves to have the lower environmental cost under some circumstances. This indicates the problems often experienced with technology choices versus policy decisions on the sustainability of waste within cities. Sustainable development in the environmental sense is the culmination of a present and future practice that would be economically viable, environmentally sound and socially acceptable. In the business world it is referred to as the **Triple bottom line** containing the three **imperatives** of social equity, environmental quality and economic prosperity. Where does idealism and realism fit into these equations?

Idealism is described by the Oxford dictionary (*Compact Oxford English Dictionary of Current English*, 2005: 500) as "(noun) the belief that ideals can be achieved, even when this is unrealistic … (art or literature) the representation of things as perfect or better than in reality". The opposite of idealism is **realism**. This is defined (*Compact Oxford English Dictionary of Current English*, 2005: 852) as "(noun) the practice of accepting a situation as it is and dealing with it accordingly … (art or literature) the representation of things in a way that is accurate and true to life … (philosophy) the theory that abstract ideas have their own existence independent of the mind … Often contrasted with nominalism". **Realism** is the underlying theme or foundation of this research, as environmental sustainability and its variant descriptions, lean towards idealism. There should be in practice other routes to follow that would bring society closer to the ideal situation in terms of environmental issues.

This research deals with the realities of querying the reasons why SWRM projects succeed or fail. A SWRM project is successful if it complies with the requirements of sustainable development or the Triple Bottom Line. In the quest to identify reality on the ground, this requirement borders on 'idealism' as very few projects have an equal weighting of the three requirements or imperatives of sustainable development.

2.1.3. Ecosystem management

Ecosystem management should be evaluated as part of waste management. Ecology is defined by the *Oxford Dictionary* (*Compact Oxford English Dictionary of Current English*, 2005: 315) as "the branch of biology concerned with the relations of organisms to one another and to their surroundings". Chertow (1998) writes that a natural ecosystem tends to evolve in such a way that some organism will use any available source of useful material or energy in the system. The stumbling blocks in successful ecosystem management often arise from divergent objectives set by business, its managers and the ultimate influence on the world's ecosystems.

The problems lie within the value systems of people and their **forced** actions within an employment relationship. As a typical example Steel & Weber, (2001: 119) write "the emergence of the United States as a post-industrial society has led to an increasing array of social and political problems which confound federal agencies' ability to implement effective policy decisions.

As a post-industrial society, the US faces many policy problems that are highly technical and increasingly scientific in nature. The concern is that the relationship between participation (democracy) and scientific expertise (technocracy) is mutually exclusive in character. The concept of **ecosystem management** (EM) developed, which is the key that deciphers the relationships within nature, and between humans and nature. Central to this effort are innovative, decentralized institutional arrangements which delegate or share significant authority with private citizens, programme managers within existing bureaucracy, or other agencies with similar jurisdictional and policy concerns. Therefore EM devolves and shares authority with local citizens and other stakeholders to reinvent the existing model for managing the environment. EM is therefore a very powerful management tool in environmental and natural resources management, which empowers government and the private citizens to plan future environmental systems, maintaining a good balance between democracy and technocracy". The contention of this research is that EM will only succeed if the economics of the project work for the citizens and their government. Subsidies or grants do not lead to the success of EM in the long term. On the other hand, companies and their employees have an effect on the ecosystem. Their actions determine the future. Corporate core values should, according to Lencioni (2002), be integrated into every employee related process. Employees should be constantly reminded that core values form the basis for every decision the company makes. After a company has embedded its values into its systems, it should promote those values at every turn. This is the firm influencing the individual.

Government regulations are often required to keep ecosystem management on the 'correct' path. As for an example, the UK is instituting new regulations under the label of 'Best Value' (Adams, Phillips & Morris, 2000: 221), whereby local authorities are obliged by law to consult local people on their services, review and report on how they perform against targets, and embrace quality within their services. This indicates the trend towards the involvement of communities to enhance the services delivered by authorities to improve ecosystems. It is with the above in mind that a **systems approach** to ecosystem management is required. More than 20 years ago Checkland (1981: 14) indicates that within sciences there are problems of methodology as we move from restricted sciences (e.g. physics) to the unrestricted sciences (e.g. biology). Complexity, in general and social phenomena in particular, poses difficult problems for science. "These are frequently problems of the teleological ("evidence of design and purpose in the natural world": *Compact Oxford English Dictionary of Current English*, 2005: 1065) kind, concerned with ends and means …. There will thus never be a single (testable) account of a human activity system, only a set of possible accounts". Systems thinking can assist in dealing with real world waste problems within

Ecosystem Management. "The development of soft systems methodology showed us that a means of putting on different kinds of thinking caps was crucially needed. The formulation of route definitions, the building of systems models implied by them and the comparison of these models with the real world constitute an attempt to do this" (Checkland, 1981: 220). These concepts are still valid today. The approach of this research is the development of a systems model that relates to **the real world** practice of SWRM projects to achieve sustainability.

2.1.4. Summary of waste management perspectives

McDougal (2001a) suggests that environmental sustainability is visualised as a triangle with the three elements being environmental effectiveness, economic affordability, and social acceptability. Sustainability is about balancing these three elements, and a stable balance requires all three of these elements to be considered equally. The problem lies in finding this balance. In real life it is found that what could be socially acceptable is often not environmentally effective or economically affordable. Policy-making relating to managing ecosystems involves complex issues (Steel & Weber, 2001) in which substantial amounts of technical and scientific information are critical to the decision-making processes. Over the past decade there is a noticeable growth in distrust of government and increasing public demand for citizen involvement in governance. The concern is that the relationship between participation (**democracy**) and scientific expertise (**technocracy**) is mutually exclusive in character. The major problem arises that too much emphasis on science and expertise as the ultimate determinants of policy outcomes, risks the erosion of democracy, and on the other hand, too much democracy (direct involvement of citizens in policy making and implementation) may relegate technical and scientific information to a peripheral role. The question is; can technocracy and democracy be reconciled in practice. Is there a middle road? Tilman & Sandhu (1998) indicate that new integrated waste management programmes require **intelligent and aggressive implementers** who are persistent enough to develop new **standards and regulations**, and be willing to enforce them in spite of resistance from both politicians and the public. The play-off of politicians always wanting to please the voters often leads to watered down solid waste management projects being launched. This is due to democracy requiring all to be consulted resulting in distortions taking place during the planning and implementation phases of projects. The answer is sought in the relationship of the three pillars of the Triple Bottom Line.

The **value systems of businesses** play a role as motivational factors. Governments, companies and their employees have an effect on ecosystem management and their actions determine the future outcomes. The stumbling blocks in successful ecosystem management often arise from divergent objectives set by government, business, its managers and the ultimate influence on the world's ecosystems. The problems lie within the value systems of people and their **forced actions** within an employment relationship. According to Guth & Tagiuri (1965: 129) "Businessmen are seldom self-conscious and articulate about their values, although they feel uncomfortable when these values are violated, and at ease when they are fulfilled. In addition, they often do not clearly perceive the strategy that underlies and guides their business and corporate actions. The manager could benefit by paying more attention to the operation of his values ... In addition, he may be better able to analyze the relationship and inter-dependence between values and strategy". Businesses in the past solely concentrated on profits regardless of harm to the environment or sustainability. This approach is changing. Government regulations are often required to keep ecosystem management on the correct path. Ethical and moral underpinning (Ehrenfeld, 1997) of the economic actions omits concerns for the world. Sustainability means independently maintaining stocks of human and natural capital. A policy strategy is required to ecologise an economy or otherwise an economy should be based on functionality. **Moral and ethical transformation** is required to instil environmental concerns. Technological realism is required as a precautionary principle to handle uncertainty, as well as life cycle framework development, through product policy formulation. There is a strong undertone of economic requirement or fulfilment in the latter.

The real reason for the failure or non-starting of SWM projects requires more research. Many direct causes have been identified, such as government or society not being able to organise themselves or that the level of sophistication is inappropriate to the application. Many of the reasons given are results of a fundamental problem that prevents the SWM project from being successful. The essence of this research is also to identify the primary cause for failure. Scott (1998) indicates the importance of waste as a resource and that one person's garbage could be another person's treasure. Waste as defined by some users, as not being useful to them, could be a resource to the next person or industry. Municipal waste management departments should rather be termed 'departments of resource recovery and solid waste management'. This would improve the profile of these departments. Similar **status** is given to waste collection departments in cities like Singapore, which has one of the most successful city cleaning operations in the world. In this instance an enhancement of the departments' profile provides the impetus for a broader strategy.

Major issues surround solid waste projects and poor management affects society. Scott (1998) summarizes the public's concern over solid waste management landfill facilities. This has an impact on all three issues of the Triple Bottom Line. Many examples (Scott, 1998) exist of the significant problems being experienced by countries in setting up **new landfill sites**. The following problems are encountered when states endeavour to find new landfill sites:

- Environmental impacts such as general eco degradation,
- Health and safety hazards including pollution of ground, water, and air,
- Social impact, which include nuisance problems such as noise, odours, dust etc,
- Economic impacts of lower property values and increasing strain on roads,
- Emotional impact of the trauma of the sighting process,
- Procedural objections, lack of public participation and perceived unfairness.

Good solid waste management **is not simply an end-of-life treatment of waste**. Many developing countries only endeavour to deal with solid waste once it ends up on dumps. These dumps are often near urban housing or rivers. The waste management process needs to start early during the life of the commodity. This includes the internationally accepted **4R principles** of **reduce, re-use, recover and recycle** over the lifetime of the commodity (Palmer Development Group, 1996). In addition it also means controlling pollution and the management of the waste during its life cycle.

2.2. Waste management analysis systems

Two types of non-hazardous waste are generally studied. These are ordinary trash from homes and businesses, which is called municipal solid waste (MSW) and the extensive outpouring of manufacturing processes, generally classified as non-hazardous industrial waste. It is the **reduction management** of this waste that requires research. Using analysis and support systems assists the waste management development process. In this context a review of the issues at stake is required in order to research their contributions to the Triple Bottom Line. The relationships between economic, social and environmental imperatives are sought. Various waste management systems can be used to analyse these relationships and recommend action. The following are highlighted.

2.2.1. Industrial ecology

Can industrial ecology be used as an instrument to design sustainable waste management projects? This is a method whereby the social needs of inhabitants and the economies that create sustainability are harmonized whilst at the same time the ecology is respected. Ehrenfeld (1997: 87) defines **industrial ecology** as "a new system for describing and **designing sustainable economies**. Arising out of an ecological metaphor, it offers guidelines to designers of products and the institutional structures in which production and consumption occur, as well as frameworks for the analysis of complex material and energy flows across economies… For some, it is a new powerful analytic framework, capable of capturing the systematic and dynamic characteristics of social economic systems. The paradigmatic structure of current dominant social systems relates the social world with the natural world through items such as products, product development, corporate strategies and practices, institutional structures and dominant social paradigm, including free market frameworks." Ehrenfeld (1997) utilizes the practical framework developed by Tibbs (1992) that defines the set of 7 elements for an industrial ecology system. These include improving the metabolic pathways, creating loop-closing industrial eco-systems, dematerializing industrial output, systematic use of energy, balancing industrial input and output, aligning policy to long term industrial system evolution and creating new action co-coordinating structures, communicative linkages and information. Ehrenfeld says the challenge is then in constructing a new paradigm for sustainability, and not just dealing with the realities of the natural world, but the challenge of a profound shift in human understanding and values. The sustainable paradigm is a balance between man and the rest of nature.

Industrial ecology, as described above, seems to encompass a complex socio-economic approach to waste management. What it might be addressing is the impact life cycles of products have on waste management. This research focuses on the major impact economics have on ecosystems and sustainability. Chertow (1998) defines industrial ecology as being based on the principle that environmental protection and economic prosperity are both desirable ends. Chertow refers to the definition used by Graedel & Allanby (1995: 9) “Industrial ecology is a systems view of industrial operations in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product, and to ultimate disposal. Industrial ecology focuses on all human activity and how it connects to the bio-physical environment from which we obtain resources and into which we place our waste”. The theory being developed in this

research is that **applying correct economics will lead to sustainability and that the social and environmental factors will fall in place**. Failure is inevitable without the correct economics in place. Correct economics also means concern for the universal system and not just a few individuals or a government.

Ehrenfeld (1997) says that sometimes the whole ecological system breaks down and paradigmatic changes come abruptly as in the French Revolution. He also indicates that for some, signs of persistent ecological breakdown indicate an inability to work out the problems of everyday activities. **Frontier economics** describe the environmental neglect that is most often encountered in developing countries. This aspect will be fully developed in chapters 3 and 4. The neglect found in this regard can also be ascribed to failure of economic policy, political leadership and value systems within populations. Industrial ecology, as described above, generally operates well within developed countries. It is important to find the middle road to the above three paradigms. It appears to lie between externality control and resource management in terms of obtaining sustainable waste management.

On a technical aspect Chertow (1998: 8) points towards an important aspect of waste in that it can often be utilized by another enterprise as a feedstock. Waste is not a waste but a still-to-be-used raw material. The quantity of waste being disposed of can decrease for two reasons. Firstly, because less is generated or secondly because the same or more waste is generated but more reclaimed. **Waste prevention** provides much bigger gains than recycling because no material or energy is required to make that which does not need to be produced. When describing waste practices, one has to be mindful to differentiate between waste generation and waste disposal including waste retrieval. The first refers to the overall amount of waste created and the second to the total amount less what has been reclaimed, for example, by recycling. Therefore waste disposal is the net waste discarded in landfill sites. Chertow (1998) notes a strong correlation between public response and legislative action with many types of waste. The same relation exists with industrial practices. It is therefore indicated that only **legislation** changes the propensity of the public and industry to continuing dumping instead of reducing or recycling waste. **This indicates that many experienced researchers predispose legislation as the final means of obtaining successful industrial ecology and integrated waste management.**

2.2.2. Life cycle assessment

Life cycle assessment (LCA) plays a major part within waste management as it deals with the consumption of a commodity or service throughout its life from cradle to grave. Tools such as **life cycle inventory** (LCI), being part of life cycle assessment (LCA) are used to measure waste management progress. The three pillars of environmental sustainability are severely influenced by LCA outcomes and are therefore important to consider within this research. This type of analysis is also of great value to a responsible producer in planning a reduction of the impact the life cycle of its products or services have on the environment.

According to Nielson & Wenzel (2002: 247) "significant environmental improvements can often be achieved by integrating environmental properties as an optimization parameter in product development, together with more traditional values such as production cost, functionality, aesthetics etc". Nielsen & Wentzel (2001) also signify that quantitative Life Cycle Assessment (LCA) methods are used to identify environmental hotspots in a reference product's life cycle and are used to select new environmentally optimized solutions for a developing product. The environmental performance of a product or a service is determined by the sum of all impacts throughout its life cycle. The Life Cycle Assessment evaluates the environmental effects of a product from the raw material extraction process, through production, to transport, to use, and finally disposal. They also confirm that the most significant environmental impact of a product appears in the use-stage, although raw material extraction and disposal contribute significantly to certain impact categories. It is a widespread impression that environmental improvements are associated with increased production costs. It is however often possible to include environmental, technical and economical aspects within the product design. This can often lead to solutions with the same or even lower cost, due to resource and tax saving, and may eventually lead to increased profits due to more goodwill from the consumer's point of view towards the product, and the company in general. The awareness of environmental aspects in product development has grown over the last decade. A noticeable trend in the literature (Nielsen & Wentzel, 2001) is the increasing integration of Life Cycle Assessments in product development procedures.

LCA investigations are available for examining the **imperatives** of environmental sustainability being the three imperatives of environmental, economic and social impacts. Two LCA studies done on tyres illustrate the outcome and usefulness of this approach. In the first example

Continental (1999) constructs a Life Cycle Assessment of passenger car tyres, quantifying the material and energy usage during the different stages of a tyre's life (life cycle inventory analysis). They also describe the interaction with the environment, which is the impact assessment and interpretation. The results indicate that the use-phase by consumers of a tyre exceed the environmental impact of the acquisition phase of raw materials, transport or production by a factor of more than 9 times.

The four factors assessed are:

- cumulative energy input,
- global warming potential,
- acidification potential and,
- nitrification potential.

They calculate that the largest potential for reducing the impact on the environment, in this instance, is therefore during the use of a tyre. Reducing the rolling resistance of a tyre would reduce the vehicle's fuel consumption and thereby have less of an impact on the environment than recycling the rubber of the used tyre. In another related study the researchers van Beukering & Janssen (2001) construct the life cycle of a tyre. It starts from production, through the manufacturing and consumption stage, followed by waste collection and then the final destination of the waste or recycling phase. It is proposed that tyres could be reused for retreading, as well as part worn tyres fitted to vehicles as second hand tyres. During the final destination stage various options are identified such as illegal dumping, indirect burning, land filling, granulating, energy recovery and chemical processing. Various difficulties are indicated, such as the extended use of retreadable tyres having competition from cheap new non-retreadable tyres, the poor reputation of retreaded tyres and the widespread use of second hand tyres. Bigger quantities of reusable tyre imports also increase the waste burden due to the short life span of these reusable tyres. There is also an increased risk of accidents that may result from driving on worn tyres. These two examples illustrate that economics determine the course of action and consumption patterns of commodities whereas the social and environmental impacts follow more as a result. Getting the economics right automatically improves the other two imperatives. The question arises as to what the correct economic processes are. In this sense it must be correctly applied for the ecological system and not just for a specific person or company. In the cases above it is certain that tyres designed to last longer or having less rolling resistance would attract customers and automatically push the Triple Bottom Line of the company in the environmentally 'correct' and sustainable direction.

Some researchers are endeavouring to improve LCA calculations. Azapagic (1999) indicate that Life Cycle Assessment (LCA) is gaining wider acceptance as a method that enables quantification of environmental interventions and evaluation of the improvement options throughout the life cycle of a process, product or activity. Various analytical tools are available to conduct a LCA study. Finding the correct quantitative data for the various stages is often a major problem encountered by researchers doing Life Cycle Assessments. Many assumptions are required during the construction of the life cycle models. Steen (1997) describes Life Cycle Assessments that are normally made without quantitative estimations of accuracy or precision. Sensitivity and uncertainty analyses are recommended, but the methodology is not very well developed. ISO 14040 refers to a requirement for sensitivity analyses. It is therefore important to note (Steen, 1997) that Life Cycle Assessments require codes of practice, and that **sensitivity and uncertainty analyses** are required.

There is a potential for using life cycle analysis during **local authority waste management decisions**. These are important as local authorities have major impacts on waste management practices. Powell (2000) writes that increased levels of environmental knowledge and understanding are required to make effective use of life cycle analysis in the local authority decision making process. The European Union is therefore forcing its members to move up the waste hierarchy of management options away from land filling and towards energy recovery, recycling and reuse. The major advantage of LCA is that it broadens the scope during the process of evaluating integrated waste management projects. It assists in preventing a narrow view during project evaluation phases. Powell, Craighill et al (1996: 97) notes that "the financial cost of recycling schemes failed to account for external costs and benefits such as environmental pollution, road congestion and accidents. Results of studies in the UK show that the curb-side collection scheme has a lower external cost than the bring scheme, but this is of less importance than the benefits to be gained within the manufacturing system by using secondary materials". It is therefore better to arrange collection programmes as it has less impact on the environment as a whole.

Walls and Palmer (2001) suggest that many policy makers are using product Life Cycle Assessments to formulate environmental policies. Single analysis instruments can solve multiple problems and that alternative ways are required to reach social optimum results. It is therefore concluded that product Life Cycle Assessments have a limited role during analyses to generate environmental policies if social issues are the main concern.

Yap (1999) summarizes the United Nations' Environmental Capacity Enhancement Project (UNEP) definition of cleaner production, whereby an objective is created to minimize and prevent the short and long term risks to humans and the environment. This is in practice similar to other terms such as waste reduction, waste minimization and clean technology. This leads to projects quoted such as the STAR (Systems and Technologies for Advance Recycling) used in the USA to bring companies together and then to identify a change in attitude and to create opportunities for process synergies. Many examples (Yap, 1999: 167-169) are quoted that indicated major benefits of cleaner production approaches:

- cement factories burning scrap tyres as supplement to their fuel,
- polish fisheries reducing water consumption and emissions,
- coconut manufacturers in the Philippines reducing energy and waste, and,
- the Bata Shoe Company in Malawi reducing operational costs,
- Sasol and Mercedes Benz in South Africa reducing operational costs through cleaner production strategies.

These examples all indicate that **cleaner production methods** form part of life cycle assessments. They are driven by economic incentives, making the production facilities more cost effective and at the same time, improving the burden placed on the environment by means of reducing waste emissions and raw material consumption.

Comprehensive economic analysis of the marginal benefits and cost of waste reduction and recycling is important. A thorough analysis of the efficiency of various policy options is required. Rudolph (1995) also points out the necessity of an analysis to understand the incentives creating the problem. The problems are imbedded in the **behaviour of consumers and producers**. It is important to consider the complete economic system embedded in the life cycle of products including cost to recycle products into raw materials versus the cost of using virgin raw materials. Throughout his dissertation Rudolph (1995) demonstrates the interplay between manufacturers, consumers and recyclers that revolves around the willingness of parties to submit to the offer and buy situation. For example consumers will separate packaging as long as the marginal benefits of doing so exceed the marginal cost. Examples are quoted of the used newspaper glut that resulted during 1999 on the East Coast of the USA, due to failure in the life cycle of resources such as recyclable paper. Many recycled products are often more expensive than the virgin substitutes. This might also be as a result of longstanding government subsidization of virgin material

industries. Again economics can correct the matter or create problems in the supply and demand chain. The next analysis tool to be evaluated is termed Concurrent Engineering.

2.2.3. Concurrent engineering

Concurrent Engineering is a waste management design technique that is more closely associated with the objectives of this research as it concentrates on the economic factors to align the product or service with sustainable development. Spicer & Wang (1997) identify **Concurrent Engineering** as an engineering design philosophy in which all aspects of a product life cycle from production to product retirement are considered simultaneously during the design phase. They develop an Environmental Design Industrial Template (EDIT) which is a tool based on the principle that economics are often the driving force behind what may or may not happen in recycling. An increasingly important area of interest in Concurrent Engineering is design for the environment. Political, legislative, economic, and market forces are all pushing manufacturers and designers to produce products that are more 'environmentally friendly'. In other words, products must cause less harm to the environment than their predecessors. This design tool also confirms conscious design and manufacturing considerations to prevent environmental problems, rather than the traditional method of cleaning up after the damage has been done (end-of-pipe treatment). Spicer & Wang (1997) define **material recovery opportunities** as the re-use, remanufacturing and recycling of waste. Their major determinant is the role economics plays in the recycling process, and indicate that economics and product design are the determining factors for the end of life of a product. They indicate that economic factors determine the likely retirement stage and disassembly results, and thus the inventory assessment data. Product design again influences the economics of the product life system.

Realff, Ammons & Newton (2000) describe how the strategic design of reverse production systems utilise integer linear programming, to optimise the deviations of performance found from recycling under different scenarios. They indicate that increasing world population and improvement in standard of living leads to increased resource use and disposal. Their study of the recycling of carpets indicates the flexibility of the process technology to recycle, and create a strong driver towards overall economic effectiveness of the reverse production system.

Concurrent Engineering, as an assessment tool seems to contain more of a holistic approach than Life Cycle Assessments, as it includes the 'soft issues' that determine direction in strategic planning. Factors such as the ever-increasing world population or in some instances increase in standards of living do have a profound influence on integrated waste management.

2.2.4. Environmental management systems

Of note is the fact that in recent years (Bansal & Bogner, 2002) an increase in international trade, economic pressure and concern for the environment, led to the creation of some international **environmental standards**. Many customers importing commodities insist on their suppliers complying with some international standard. This in a way has been forcing exporting companies to review their environmental management systems. According to Bansal & Bogner (2002: 269) "ISO 14001 is an international standard for Environmental Management Systems introduced during September 1996. It has gained wide recognition among businesses, much like its sister standard on quality management systems, ISO 9000". ISO 14001 sets the criteria for an Environmental Management System (EMS).

The ISO 14000 series of voluntary standards is forcing corporations to assess their contributions to producing environmentally friendly products or services and take up their **producer responsibility**. Again economics create the driving force as the factories will only consider these added costs if they gain financially by exporting more. The socially acceptable and environmentally friendly facets should then automatically fall in place.

Zairi (2000) argues the fact that recently many business communities are paying more attention to environmental and societal concerns, and that companies and their stakeholders have no option but to address the "Triple Bottom Line" performance measurements concept. The Triple Bottom Line requires, that apart from the economic and social imperatives, companies need to address the environmental issues. Therefore, waste management is becoming part of the daily routine of management.

2.2.5. Summary of waste management analysis systems

Successful solid waste management depends on operating and managing businesses according to the Triple Bottom Line. This requires an analysis of the relationships between the imperatives relating to the economic, social and environmental issues. Various waste management analysis systems used, include **industrial ecology** which according to Ehrenfeld (1997) defines a new system for describing and designing sustainable economies. For some this proves to be a powerful analytic framework analysing the characteristics of social economic systems. The objective of industrial ecology is to define a sustainable paradigm which is the balance between man and the rest of nature. The life cycle of products and its influence on waste management is studied to determine impacts on the ecosystems. The theory that this research is developing, is that the correct economics applied to a project will lead to sustainability and that the social and environmental factors should then fall in place. Failure of waste reduction projects are proscribed by the incorrect application of economics.

Chertow (1998) indicates that waste can often be used as a feedstock for another enterprise. This provides all the more reason for considering the economics involved in the process to set this flow of material in motion. The experience gained by many researchers signifies their belief that **legislation** forms the only means by which to improve integrated waste management within industrial ecology.

Life cycle assessments seem to play an important part in analysing the environmental effects a product has throughout its life cycle on the ecology. It is often possible according to Nielsen & Wentzel (2001) to design products in such a way that it reduces the manufacturing cost and influence on the environment.

Warnings are raised by van Beukering & Janssen (2001) that some reuse of waste material such as waste tyres could lead to other social problems as for example accidents on roads. Indications are (Yap, 1999) that cleaner production methods, which form part of life cycle assessments, are driven by economic incentives and makes production facilities more cost effective. It also reduces the burden on the environment.

The Triple Bottom Line is becoming the benchmark against which responsible companies are measured. Management therefore needs to utilize waste analysis systems to measure and control there operations in terms of waste management to prove compliance.

Concurrent Engineering is a design tool that is utilised to evaluate all the aspects of a product from manufacturing through to retirement phase. The emphasis is placed on the economic principles as the driving force behind recycling and it also includes the environmental factors influencing the product design and manufacturing. Concurrent Engineering seems to be more of a holistic approach than life cycle assessments. In this regard the influence of economic parameters appears as the most fundamental aspect in the Triple Bottom Line approach.

Environmental management systems call for the introduction of international environmental standards such as the ISO 14000 series. International trade more often than not, specifies conformance to these standards to safeguard the exporting and importing companies against environmental prejudice. These standards, offered as voluntary systems only survive due to economics being the driving force. Companies would otherwise not consider adding these costs without any financial gain.

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3. CHAPTER 3: SOCIAL CAPITAL AND SOLID WASTE MANAGEMENT

After the assessment of environmental waste management principles and analyses systems versus sustainability in Chapter 2, the focus in this chapter is on the social human encounter influencing solid waste project outcomes. The role and contributions of belief systems, businesses and leadership to successful SWRM is investigated and evaluated.

3.1. Social capital

Analysing the *Values of Younger Workers* Cherrington (1977) describes how the work values of early American settlers were labeled the **protestant work ethic**. Over time this has changed to **puritan ethic** and more recently to **character ethic**. Character ethic teaches the way to success and wealth through hard work and that one should cultivate the virtues of frugality, industry, diligence, prudence, and honesty. Character ethics can also be traced back to England during the reign of Elizabeth I, around 1558, when it was philosophized that success only came from hard work, frugality and perseverance. Reference is made to Cotton Mather who, during the 17th century, indicated that a person had to be a good Christian and serve God in order to succeed, and furthermore, that in his personal calling he should have a job in which he spent most of his time productively doing good for others, thereby acquiring goodness for himself. Furthermore Cherrington (1977: 19) writes "Since financial success was the result of diligence and perseverance a pertinent issue became the **morality of accumulating wealth** …. Although the clergy did warn against the desire for wealth and riches, they did not condemn wealth". There was thus, indirectly, a link formed between the accumulation of wealth, hard work and perseverance. The deduction is a possibility that this link could have lead to a belief that the desire for wealth indicated a character ethic of high standard.

How can social behaviour be predicted or changed to create better cooperation towards environmentally sustainable development? In general terms, social capital (socio-cultural capital, cultural capital) according to Hediger (2000) refers to a society's capability to deal with social, economic and environmental problems and be active in shaping the development of the overall system. It consists of socio-cultural values and norms, learned preferences, human capital and labour force, local knowledge of the environment, social competence and institutions,

human health and life expectancy, as well as cultural and social integrity, and social cohesion. Hediger (2000) also signify that population growth is generally seen as a major threat to sustainable development. Therefore, economic development, which is growth of the per capita income, requires the growth rate of the aggregate income to exceed the population growth rate. **Population growth** is a major threat to sustainable development as it puts pressure on the overall ecosystem and reverts to survival economics.

Personal values or **value systems** form the building blocks of social capital. This in a way predicts the actions of people. Barnard (1968), in analysing functions of the executive, explains that persons choose whether they will enter into a specific co-operative system according to a choice, which will be made on the basis of:

- purposes, desires, impulses of the moment, and
- the alternatives externality to the individual recognized by him as being available.

Organisations result from the modification of the action of the individual through control of or influence upon one of these categories. Barnard (1968) defines **motives** as desires, impulses and wants. They are chiefly resultants of forces in the physical, biological, and social environments, present and past. Guth & Tagiuri (1965: 123) pronounce "unfortunately, our values are so much an intrinsic part of our lives and behaviour that we are often unaware of them or, at least, we are unable to think about them clearly and articulately. Yet our values, along with other factors, clearly determine our choices, as can be proved by presenting men with equally reasonable alternative possibilities and comparing the choices they make. Some will choose one course, others another, and each will feel that his election is the rational one". These personal values also influence corporate strategy through the strategic plans that managers initiate that determine environmental sustainability.

There are reported success stories in developing countries where communities have improved waste collection systems. Anand (2000) studies the **co-operation of households** towards solving environmental problems such as littering of streets. The issue is co-operation within an urban environment. They used committees formed in Madras, India to test various hypotheses on the conditions affecting co-operation of these street committees. This is a typical example of developing countries where there seems to be a large mismatch between the taxing powers of municipal corporations and their expenditure responsibilities for the provision of services to the community. The reported study is an attempt to examine factors affecting the co-operation of the street committees and how households being served by these committees complied with the rules

without the existence of sanctions. Of the various hypotheses examined the following results were obtained:

- co-operation of the households seems to be significantly determined by the management style and size of the committee,
- the number of committee members improve participation of households,
- co-operation seems to be unrelated to the fees paid by each household (within a limited range),
- co-operation seem to be unrelated to the age of the collection action institution,
- co-operation is positively associated with the number of services offered by the committee.

The social behaviour of people within the working environment of ecosystems needs to be analysed. Individuals continue to contribute to a group only as long as their own needs are fulfilled. Cherrington (1977: 56) says "the effectiveness of co-operative effort relating to accomplishment of an objective of the system is determined with a view to the systems requirements, and efficiency relating to the satisfaction of individual motives. The efficiency of a co-operative system is the resultant of the efficiencies of the individuals furnishing the constituent's efforts. If the **individual finds his motives being satisfied**, he continues his co-operative effort, otherwise he does not. If one person in a co-operating system finds no satisfaction to co-operating, his contribution would be inefficient. He would withhold or withdraw his services, so that the co-operation would be destroyed … Efficiency or equilibrium can be secured either by changing motives in individuals or securing substitute individuals of appropriate motives" Informal groups within society are what matters most as they form the basis from which individuals might form their own opinions, as seen above, or from which, formal organisations or governments might formulate policy in the long run. Barnard (1968) refers to informal organisations comprising the process of society which are unconscious, as contrasted with those of formal organisations, which are conscious, and has two important classes of effects:

- it establishes certain attitudes, understandings, customs, habits, institutions and,
- it creates the conditions under which formal organisation may arise.

The question arises as to what can be done to positively influence the individual and formal or informal groups to change their mindset and improve the ecosystem. Checkland (1981) indicates how soft systems based methodology is used for tackling real world problems where the problem situation is ill defined. It lends support to the view that the latter is not a given but is a process in

which an ever changing social world is continuously re-created by its members. This soft system methodology is a never-ending learning process. Apart then from **learning processes**, **incentives** are always required to induce the individual to higher aspirations. Barnard (1968: 139) already recognises that "an essential element of organisations is the willingness of persons to contribute their individual efforts to the co-operative system. The contributions of personal efforts, which constitute the energies of organisations, are yielded by individuals because of incentives. The egotistical motives of self-preservation and of self-satisfaction are dominating forces. The individual is always the basic strategic factor in an organisation. He must be induced to co-operate, or there can be no co-operation. **Hence, in all sorts of organisations, the affording of adequate incentives becomes the most definitely emphasized task in their existence**". This incentive within social capital forms the basis of the economic instrument that would motivate a society towards sustainable development.

Apart from the attitudes of individuals and groups, the objectives of companies follow their own path in creating wealth and do influence social capital. This is with or without regard to the ecosystem.

The question also arises as to where government fits into this social capital shaping process. The social and religious history of a region (Barnard, 1968) seems to strongly influence the behaviour of individuals and groups. This is the one aspect that would extend the time required to change the mindset of people and to improve the environmental management situation through a process of **training, teaching** and organisation. Barnard (1968) also makes the point that responsibility is the property of an individual, by which whatever morality exists in him becomes effective in conduct. It is this conduct that determines the outcome of ecosystem management.

Many non-governmental organisations (NGOs) formed by organized communities (Yap, 1999: 169) taking action "on local environmental issues, prove indispensable for creating pressure on companies and governments to improve waste management and reduce environmental pollution". Examples of these quoted by Yap (1999) refer to countries in North America, Europe, Asia and Africa. The same is also documented referring to workers of companies who endeavour to find solutions to pollution and health related problems.

Social capital is defined by Pargal, Huq & Gilligan (2000: 3) as "the social relationships, which come into existence when individuals attempt to make the best use of their individual resources. ...

Social capital refers to features of social organisation, such as trust, norms, and networks that can improve the efficiency of society by facilitating co-ordinate actions". Pargal et al (2000) also propose that the term **social capital** be applied to a variety of ideas that generally concern economic returns including networks of social relationships. This is an important observation, which indicates the fundamental aspect of economic return forming the network of social relationships, and underscores social capital. This social capital is the result of communities forming alliances to address the public good. In this case Pargal et al (2000) describe the public good for example being the collection of house-hold waste in Dhaka.

Social capital is often **damaged by free riders** within communities who prevent the forming of strong horizontal networks to address a public good such as, for instance, the collection of waste. It is also often the case that vertical networks are strengthened by means of members of the public offering their voting rights to neighbours or governments for introducing and enabling the provision of public goods. The formation of organisations within regions depends on individuals within the organisations able to form **horizontal networks**. Pargal et al (2000: 3-5) indicate that "aspects such as norms of reciprocity, sharing, trust, homogeneity of interest, education levels are important to form these networks".

Huhtala (1994) points out that environmental concern or guilt definitely plays a role with consumers. Commodity users for instance would rather see the recycling of material instead of incineration. Most people believe that burning product pollutes more than recycling. This author also proposes that with the use of **economic modelling**, it is possible for an economy to achieve a steady state where both resource and waste stock are kept constant. An optimal production policy however necessitates a pricing principle that accounts for environmental friendliness of recycled products and the environmental harmfulness of goods produced by conventional technology. For example biodegradable goods are typically seen as a positive idea. It would be far more beneficial to have a recyclable product instead of rejecting this resource, e.g. disposable containers, after the first consumption cycle. There are always trade offs between various types of pollution, which include air pollution and solid waste accumulation that once again can pollute soil and water.

The social capital of a society is often neglected. Scott (1998) quote from Grey (1985) *Ecological beliefs and behaviours: assessment and change.* Westport, Greenwood, "It is widely assumed that solutions to environmental problems are both technical and social, but that the social has been more neglected and is probably a stronger determinant of the outcome than the technological". The

deduction is that in general it is more problematic dealing with the social commitments of the community and their hidden agendas than the technical issues, when planning a SWRM project. Therefore this research aims to discover the motivational factors that would augment solid waste projects in the light of social hindrances in the process. The meaning of social hindrances is seen in the light of the self-centred approach of people in advancing their own situation instead of accepting the broader picture of sustainability.

3.2. Belief systems: beliefs, attitudes and values

It is **belief systems** that underpin the subject matter of this research in an attempt to discover the motivational factors that would lead to the propensity for people to work towards environmental sustainable development within their prospective ecosystems. The approach is to investigate the belief systems of individuals and managers and then develop the result of this into corporate belief systems. Managers have an influence on corporate activities whilst firms have their own culture that influences the course of events. In this instance governmental management is assumed to react similar to corporate management. It is imperative to start with personal belief systems.

3.2.1. Personal belief systems

The question arises as to why individuals react the way they do when confronted with the management of solid waste. Some react positively (Holmes, 1984) and endeavour to deal with the waste in an environmentally friendly manner whilst others simply discard it into rivers or onto soil. Is it possible to influence individuals to react in an environmentally sustainable way? Individual belief systems have been the subject of conjecture over the recent past. A belief system may be defined (Rokeach, 1968: 2) as “having represented within it, in some organised psychological but not necessarily logical form, each and every one of a person's countless beliefs about physical and social reality”. It is this **not necessarily logical form** that creates the problem in forecasting behaviour. Rokeach (1968: 11) continues that “a person's total belief system includes inconsequential beliefs, derived beliefs, pre-ideological beliefs about specific authority, and pre-ideological primitive beliefs, socially shared or unshared, about the nature of the physical world, society, and the self. All such beliefs are assumed to be formed and developed very early in the life of a child”. Beliefs are therefore formed by an individual as he or she obtains various signals

throughout life. Education early in people's lives is then a requirement. How do belief systems form attitudes, values and value systems?

Rokeach (1968) provide the following definitions for 'attitudes', 'values' and 'value systems':
"An **attitude** (Rokeach, 1968: 159) is **an organisation of several beliefs** focused on a specific object (physical or social, concrete or abstract) or situation, predisposing one to respond in some preferential manner. An attitude is thus a package of beliefs consisting of interconnected assertions to the effect that certain things about a specific object or situation are true or false, and other things about it are desirable or undesirable". **The reaction** of an individual towards SWRM is therefore greatly influenced by his or her attitude towards the situation and includes the action being desirable or undesirable. The question is whether this attitude can be changed. How does personal value apply?

Values, on the other hand (Rokeach, 1968: 159-160) "have to do with **modes of conduct and end-states of existence**. To say a person **has a value** is to say he has enduring belief that a specific mode of conduct or end-state of existence is personally and socially preferable to alternative modes of conduct or end-states of existence. **Once a value has internalized** it becomes, consciously or unconsciously, **a standard or criterion for guiding action**, for developing and maintaining attitudes toward relevant objects and situations, for justifying one's own and others' actions and attitudes, for morally judging self and others, and for comparing self with others. Finally, a value is a standard employed to influence the values, attitudes, and actions of at least some others, our children's for example". Schwartz & Sagiv (1995) define human values as desirable goals, varying in importance that serves as guiding principles in people's lives. The crucial aspect that distinguishes between values is the type of motivational goal they express. Guth & Tagiuri (1965: 125) defines a personal value as it "can be viewed as a conception, explicit or implicit, of what an individual or a group regards as desirable, and in terms of which he or they select, from among alternative available modes, the means and ends of action … The forming of personal values develops early during a person's life and most people have difficulty in identifying values until they come face to face with situations that force them to recognize the presence of values in their make-up. Parents do not often articulate their own value systems but transmit them and teach them to their children more by means of examples, rewards, and punishments other than by use of words and labels that would make the children explicit about alternative value systems … It sometimes makes it difficult for people to understand the values of other cultures where the language system is quite different. Values are closely related to personality and are indeed a part

thereof ... Values can be thought of as the guidance system a personality uses when faced with choices or alternatives ... Values may be identified by noting differences between individuals or groups in dealing with similar problems. Naturally, not all differences can be accounted for by variations in values. For instance, some variations are produced by differences in accumulated knowledge and intellectual skills. Yet there appears to be inter-dependence among knowledge, skills, and values. Sometimes a change in the first two will lead to a change in the third". This is an indication that education and training would be instrumental in reformatting the values of a person. This might of course be for the better or for the worse. These aspects are valuable in terms of approaches to environmental conservation. It also seems important to start the training and education early in a person's life. This would also apply to ecosystem values. Values also seem to be different between nations adding to the complexity of dealing with environmental issues.

Rokeach (1968) also notes that major sociable variables such as culture, social systems, caste and class, sex, occupation, education, religious up-bringing and political orientation are likely to shape, in more or less similar ways, the **value systems** of large numbers of people. From this it is understood that to change the attitude of people will first require an **upgrade** of the values of, or the standards employed by the individual towards issues such as sustainable development. The complication lies in all the inherited values (culture) an individual has and which are probably very difficult to influence.

Evaluating the trends in value systems the following theories on personal belief systems appear. Anshoff (1982) describes the social responsibility of managers, as enlightened self-interest. This is a sense of personal obligation by a manager or owner to serve a larger purpose of society. It relates to the siphoning effect they have on the retained earnings of the firm. Again indications are made that the basic economic objectives of a business and the morale or social responsibilities of the managers often seem to be divorced. The time horizon in the life of the firm also plays an important part on the value system underwritten or supported by its managers. Other authors such as Barnard (1968: 308) refer to "the mental processes of individuals and managers within organizations". Barnard finds it convenient and significant, for practical purposes, to consider the mental processes consisting of two groups that he calls the **non-logical** and **logical groups**. He signifies the logical processes - the conscious thinking which could be expressed in words, or other symbols, that is reasoning. The non-logical processes are indicated as those not capable of being expressed in words or reasoning and are only made known by a judgment, decision or action. These may be because the processes are unconscious, or because they are so complex and so rapid,

often approaching the instantaneous, that they can not be analyzed by the person within whose brain they take place. **Barnard also indicates that the conditions under which managers make decisions depend on their responsibility. He says that is probably why it is difficult to make correct decisions without responsibility. The right frame of mind is not easily possible when a question is treated as merely an intellectual problem.** The correct decisions can only be made under situations of responsibility, and by implication to the firm (co-operation) or the public at large. Some of the quality of reasoning expressed is frequently poor (though it may be perfectly adapted for the purpose), or because its object may not appeal to us, this business of persuasion is often erroneously considered one of low-grade intellect. From an environmental point of view, the above indicates the problems being experienced by managers or individuals applying sound reasoning when deciding on the management of waste material within their operations. The responsibility carried by the manager has a definite influence on his course of action.

Barnard (1968) also ascribed the failure of individuals to conform within a business, being erroneously ascribed as deliberate opposition. The **narrow limitations**, within which choice is a possibility, are those that are imposed jointly by physical, biological and social factors. Therefore, managers are pressurised by the business' requirements to make certain decisions. This would also apply to SWRM.

Previously, belief systems were termed morals. Barnard (1968) defines moral sectors as that of attitudes, values, ideals, and hopes, impressed upon the emotions of people through countless channels of physical, biological, and social experiences, and distilled into new specific purposes of co-operation. He also defines morals as personal forces or propensities of a general and stable character in individuals, which tend to inhibit, control, or modify inconsistent immediate specific desires, impulses, or interests, and to intensify those which are consistent with such propensities. This tendency to inhibit, control, or modify inconsistency and to reinforce consistent immediate desires, impulses or interests is a matter of sentiment, feeling, emotion, internal compulsion, rather than one of rational processes or deliberation, although in many instances such tendencies are subject to rationalization or occasionally to logical processes. When the tendency is strong and stable, there exists a condition of responsibility. **Morals arise from forces external** to the individual as a person. Some of them are believed by many to be directly of supernatural origin, some of them derived from their social environment, including general, political, religious, and economic environments. Many moral forces are inculcated in the individual by education and training and many of them accrue through absorption, as it were, from the environment - by

imitation or emulation, and perhaps also in a negative form of absence from concrete experience. It can be deduced that a lot of education and training will be required to change a person's morals and will be required early in a person's life.

There are **different cultures** around the world, each **with their own values** creating their own milieu. Many types of values can be subscribed by a person within his or her value system. Some important ones that apply to all cultures are identified by the Schwartz & Sagiv theory (Schwartz & Sagiv, 1995) and relate to the universals in the content of individuals' values, and derive ten motivational distinct types of values, postulated to be recognised in all cultures. The Schwartz & Sagiv study indicates the ten **value types** as follows:

- Achievement: Personal success through demonstrating competence according to social standards. (Successful, capable, ambitious and influential),
- Benevolence: Preservation and enhancement of the welfare of people with whom one is in frequent contact. (Helpful, honest, forgiving, loyal and responsible),
- Conformity: Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms. (Politeness, obedient, self-discipline, honouring parents and elders),
- Hedonism: Pleasure and sensuous gratification for oneself. (Pleasure and enjoying life),
- Power: Social status and prestige, control or dominance over people and resources. (Social power, authority and wealth),
- Security: Safety, harmony and stability of society, of relationships and one self. (Family security, national security, social order, clean and reciprocation of favours),
- Self-Direction: Independent thought and action, choosing, creating, exploring. (Creativity, freedom, independent, curious and choosing own goals),
- Stimulation: Excitement, novelty, and challenge of life. (Daring, a varied life, and exciting life),
- Tradition: Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion impose of the self. (Humble, accepting my part in life, devout, respect for tradition and moderate),
- Universalism: Understanding, appreciation, tolerance and protection for the welfare of all people and for nature. (Broadminded, wisdom, social justice, equality, a world at peace, a world of beauty, unity with nature and protecting the environment).

Therefore every nation throughout the world will tend to follow some of the identified values more strongly than others. This might account for the fact that some nations progress faster in life along sustainable development than others. To influence the values of people one would have to identify the stronger and weaker values of a nation and use the result in determining future education and training.

Schwartz & Sagiv (1995) prove that the values, **tradition**, **power** and **achievement** feature the most in the cross-cultural values. This is the second most important issue being identified after the findings by Rokeach (1968) that values become ingrained very early in a person's life. Of interest is that according to Schwartz & Sagiv (1995) achievement is personal success through demonstrating competence according to social standards. Is there something within these parameters that could be applied to developing countries? Are the references here to tradition, power, social standards and young people the crucial aspects to be addressed when applying sustainable waste development projects? The last mentioned refers directly to the social issues of communities which are part of environmental sustainability.

In contrast to the Schwartz & Sagiv (1995) theory for all cultures, Guth & Tagiuri (1965) relate to a classification of values and indicate that major value differences exist among people, cultures, professions and generations. Six kinds of value orientations of man are identified:

- The theoretical man, who is primarily interested in the discovery of truth in the systematic ordering of his knowledge,
- The economic man, primarily orientated toward what is useful, and interested in the practical affairs of the business world, production, marketing, consumption of goods and in the use of economic resources and accumulation of tangible wealth. He is thoroughly practical,
- The aesthetic man, finding his chief interests in artistic aspects of life, although he need not be a creative artist. He values form, harmony, grace and symmetry,
- The essential value for the social man is love of people, the altruistic or philanthropic aspect of love. The social man values people as ends and tends to be kind, sympathetic and unselfish. He finds those who have strong theoretical, economic and aesthetic orientations rather cold,
- The political man who is characteristically orientated towards power, not necessarily in politics, but in whatever area he functions. This relates to most leaders,

- The religious man is one whose mental structure is permanently directed to the creation of the highest and absolutely satisfying value experience. The dominant value for him is unity.

The above six classifications of value orientations within a community play a major role in the action displayed during waste management decisions. The political man will have a different approach to the theoretical man on environmental affairs. The personal values of man juxtapose with the traditional values of his professional career and they might be at odds with each other. With the above diverse interests in mind, the next aspect to evaluate is the social and economic pressures borne on man from a business point of view.

How do personal values and business norms and decisions match? This is important as ultimately it reflects the way businesses deal with waste material or participate in SWRM projects. Learned, Dooley & Katz (1959: 113) recount to the mission of man versus material progress and indicate the need to place stronger emphasis on spiritual goals. “It has been indicated that all through history, **material progress as a national** goal, led to stagnation, boredom and moral decay. No society ever flourished without a spiritual mission, and a quest for material progress alone seems to be insufficient to spur men on to achievements, which are required to create an enduring, dynamic and progressive nation”. These authors indicate a variety of ways of thinking about the relationships between spiritual and business considerations. There are people who contend that spiritual considerations simply cannot be given a position of major importance in business decisions. Some of the typical attitudes described are:

- “I believe in behaving responsibly; but when the chips are really down, then business profits and hence long term business survival are often incompatible with spiritual considerations”.
- “Business requires competition. That is what private enterprise is all about. If you're really worried about spiritual values, you couldn't bring yourself to be truly competitive”.
- “Look, I wouldn't last six months in this business if I really asked myself whether everything I do really meet acceptable spiritual standards”.
- “A businessman is supposed to run his business profitably. A successful business in itself can be a tremendous contributor toward 'good'. But if the businessman spends his time worrying about doing good, he will divert his attention from his real purpose - he'll lose his effectiveness as a businessman”.
- “Spiritual questions involve value judgments, they hinge on questions of what is right and what is wrong - what's good and what's bad. Business has no right to exercise its power to try to further its own particular answers to such considerations”.

- "Only a handful of companies are big enough to exert any real influence in so far as spiritual values are concerned. Even in those companies, there are only a handful of men at the very top who can make any difference. The average fellow would just be committing business suicide if he were to try".
- "Do you know what it is to meet a payroll? It's damn tough, and there are plenty of times when you can't take time to worry about whether a saint would approve of everything you've done".

These authors also point towards another familiar framework or rationale, which is, **good ethics is good business**. It does however seem that only larger and more successful businesses can afford these luxuries. It is true that men who attempt to integrate their spiritual values within their business life create personal tensions and often need to compromise. They do, however find consolation in the knowledge that although their efforts have been imperfect, they have nevertheless tried within the limits of their human capabilities. It is a play-off between **value systems** and **survival economics**.

Cherrington (1977) shows that **job related attitudes** are indeed determined by the kind of job a person has. Rotten jobs are expected to create negative attitudes and good jobs to create positive attitudes. Age plays a role in the attitude of workers. Older workers have a more favourable attitude towards their work than younger workers. He also determines that the younger workers in the USA have attitudes that are significantly different from older workers, especially relating to the role of businesses in society. Younger workers are more likely to question the usefulness of their own company and challenge its contribution to the community. Cherrington also signify, from results of surveys obtained in the USA, that several background characteristics are quite different for older and younger workers. One of the greater differences is related to **attitudes** towards the community and community involvement. Older workers had lived in the community longer and felt as though they belonged to it and were more willing to donate to community charities and participate in local elections than younger workers. The survey also suggests that money is more important to younger workers than older workers, but also subscribes to the fact that young workers earn less money. Cherrington (1977) suggests three hypotheses, of which the first proposes that the differences in work values (of workers) result from the process of growing older. As people mature, they probably realize more clearly that ethically they cannot shift the responsibility of providing for themselves onto society, and that a society cannot survive when it is forced to support an ever increasing percentage of the population. The second hypothesis suggests that the differences between older and younger workers' work values are caused by the historical

events they had lived through. Periods such as the Great Depression and the World Wars undoubtedly carved a deep impression on the attitudes and values of older workers. The third hypothesis suggests that the differences between the work values of older and younger workers result from their specific training and learning experiences. Older workers (in the USA) were taught the values of the character ethic in their homes and schools, whereas the younger workers are taught the personality ethic. The author is concerned with the survival of the character ethic that depends on value training, and the need to decide how to perpetuate the character ethic. If it is to be rejected, what should replace it? It is therefore important to attend to the so-called age gap that is often referred to when analysing the value systems and attitudes of younger versus older people.

The International Encyclopedia of Business and Management (Warner, 2002: 1284-1288) provides the following on **belief systems**: "The national culture of a nation emanates from societal variables, which include language, religion, history, etc, and its national variables such as laws and regulations, government, geography, economic conditions, etc. Specific cultures also include values, needs, attitudes and norms.

Values are described as enduring beliefs and that specific mode of conduct or end states of existence that are socially preferable to their opposites.

Needs are described as forces motivating an individual to act in a certain way and, once satisfied, these needs no longer have an impact on the individual.

Attitudes are described as a tendency to respond favourably or unfavourably to objects or situations based on beliefs about them.

Societal values influence what we respond favourably to and what we view with disfavour.

Norms prescribe or proscribe specific behaviour in specific situations and result in standardized, distinctive ways of behaving. They are seen as normal (thus the word norms) and appropriate behaviour". Based on the above it can be concluded that belief systems therefore encompass a range of behavioural factors and will be different for various nations. Values and needs seem to be the factors that form attitudes and societal values creating norms. The values (belief systems) of developing countries are different from first world countries, because their needs are still at a level of subsistence economics, and would therefore deal with waste in a different manner.

Would education assist in modifying belief systems? Rokeach (1968) presents data that suggest enduring changes in important values and attitudes are possible as a result of establishing certain education- rather than persuasion- orientated experimental procedures. This is an important finding

which means that anti-social or unsustainable environmental practices resulting from personal values and attitudes could be improved through educational procedures.

There are however, some beliefs that are more difficult to influence. Some beliefs, according to Rokeach (1968: 23) are more important to individuals than others, depending on their variation along a central-peripheral dimension. "It is, moreover, expected that more central beliefs would be more resistant to change than less central beliefs because the more central beliefs have more connections and therefore more consequences for other beliefs within the total belief system". From the literature quoted, it seems that personal beliefs are ingrained in people through their own values and tend more towards being society orientated, the older people become. Education and training might assist in improving values. But then Wright (1991) demonstrates that attitude and resultant behaviour is unpredictable in most cases, especially in negative attitude atmospheres. **Attitudes and behaviour are generally not linked** and **situational factors** influence behavioural intention despite certain attitudes.

The conclusion is that augmenting (motivating) factors, other than belief systems, need to be established before improved action towards sustainable solid waste management could be obtained. It will however be difficult to achieve results in a short period of time. It would also take years to change the value systems of especially the younger generations through education and training.

Individuals work in companies. And the question arises as to their influence on the decisions taken by businesses especially towards the dealings with waste. Therefore, the belief systems of individuals might have an influence on the outcome of waste management. In dealing with corporate social responsibility (CSR), leadership and by implication, waste management, Boehm relates that "Corporate leaders are the key to the motivation and success of the organization and they play a key role in their communities" (Boehm, 2002: 172). The next paragraph deals with this aspect.

3.2.2. Corporate and belief systems

The outcome of corporate belief systems on sustainable waste management is an important matter as personal values are not automatically reflected in corporate affairs. Warner (2002) defines

business ethics as the application of ordinary human ethical values or principles in the conduct of business. In this respect business ethics is no different from other branches of applied ethics such as medical ethics or social ethics. For most practical purposes (Warner, 2002) the terms ethical and moral have exactly the same meaning and only differ in their origin, as ethics was derived from ancient Greek and morals from classical Latin. It is however considered that ethics is the more scientific and systematic term. It is also indicated by Warner (2002) that modern business ethics constitute the dominant features of corporate accountability, social responsibility and stakeholder theory. This might reflect an idealistic view and a goal that many businesses aspire to achieve but in reality many operations fall short on taking up their accountability.

In earlier publications Guth & Tagiuri (1965) state that the personal values businessmen and others have could be usefully classified as theoretical, economic, aesthetic, social, political, and religious. Managers and employees are often unaware of the values they possess, and also tend to misjudge the values of others.

Turning to ethics Cherrington (1977: 20) relates how personality ethic began to blossom during the 1920's and 1930's especially with the publication of Dale Carnegie's book *How to Win Friends and Influence People*. "The personality ethic teaches that the way to success is through other people, and success comes from a pleasing personality. The basic principle of personality ethic is to provide logical ways to improve social interaction. The goal of personality ethic is to accumulate wealth for its own sake. This goal lacks the nobility of benefiting society, worshipping God, or helping others through charitable contributions or personal service. By avoiding arguments, speaking the other fellow's name, and emphatically admitting one's mistake, the individual increases his chances of making a sale, impressing the boss, or making friends. The ultimate goal is a self-seeking accumulation of status, wealth, or power". The above indicates a major shift during the early 1920s from a character ethic that regarded hard work and serving your community as the most important, to a self-enrichment through personality ethics. This self-enrichment will be regardless of resultant actions on the environment.

From ethics the focus is placed on the meaning of personal values. McCuen (1998) points out that value is a principle, character trait, standard or quality considered worthwhile or desirable. Values would include pleasure, knowledge, freedom, equality, and love, just to list a few. In some situations, freedom can also be a value. McCuen (1998) in studying *Balancing Corporate and Personal Values* in the context of career development of a professional indicates that it should not

be viewed solely in terms of technical and managerial skill. Advancing one's ability to make value decisions is a critical component of professional development. Importantly, McCuen (1998) finds that often professionals will need to apply a self-study approach to learn the balancing of corporate values and ethical issues with their own personal value systems. The values that are of primary importance in one's personal life may be quite different from the values that are important in one's professional life. A professional, who has a value of responsibility towards society, and values public health and safety, respect, and honesty, takes on a primary role with respect to society. Despite this the inference is that often professional value falters when economics dictate otherwise.

Loyalty is also considered (McCuen, 1998) an important value to be practiced by a professional. If the corporation (which could also be any association) operates at a level higher than the individual in terms of the value systems, there is conflict, which can be easily resolved. The corporation must either convince the individual to operate at the same higher level, or be dismissed. If the individual operates at a higher level than the corporation, two options unfold which are either compromising his/her principles to operate at the same lower level as the corporation, or resign. Often individuals do not choose these extremes but operate somewhere in between. In these cases the ethical conflict persists. McCuen (1998) also indicates a framework for value decision-making when presented with a value criteria problem, and this framework is to identify the conflict, then to plan alternative courses, and finally practice the best alternative. This, according to Rokeach (1968), is a person's **value system**. He also indicates that value decisions can be just as important to professional success as technical decisions, and entry-level professionals often fail to appreciate the multi-faceted nature of their value responsibilities, and that lastly the professional has expectations, mostly unwritten for balancing corporate and personal values. Anshoff (1982: 40) reminds us of the economic issues. “Others argue that the conflict is more apparent than real and the professional interests and ethics of the manager are, in the last analysis, consonant with the maximum profitability concept”. The author also points out the decentralization of the decision process in a large corporation. In line with Cyert & March (1963), Anshoff argues that people rather than organisations have objectives. Therefore, the objectives of a firm are, in reality, a negotiated consensus of the objectives of the influential participants. From this reasoning it is apparent what influence managers can have over the decisions made within organisations for example on waste management. Managers with various value systems can influence the operational control of a business and either work towards sustainable waste management or short term financial gain. Other earlier research such as Williamson (1985), in his work on *The*

Economic Institutions of Capitalism, deals with the various forms of organisations. One is being a centralized operation which places major strain on the executives or the holding company as the main operating instruction or otherwise a multi-divisional operation creating profit centres. The latter seems to be the most successful, as regional managers are given incentives to create more profit. These forms of corporate operation all use the **team theory** with the assumption of bounded rationality and non-self interest seeking. In this instance regional managers therefore have little contribution to make, except for reducing the cost aspect of operating a business. This indicates the little influence managers have on injecting their own values into the business and that they have to accept the corporate culture. Economics again seem to be the main motivating factor in the business. Corporate values are the **standards** against which a business is driven.

Lencioni (2002) in his research on *Make Your Values Mean Something* defines four types of corporate values being:

- Core values, which are deeply ingrained principles that guide all of a company's actions; they serve as its cultural corner stones,
- Aspirational values being those that a company needs to succeed in the future but currently lacks,
- Permission-to-play values simply reflect the minimum behavioural and social standards required of any employee,
- Accidental values that arise spontaneously without being cultivated by leadership and take hold over time. They usually reflect the common interests of personalities of the organisation's employees.

Core values seem to be the driving force within the corporate environment and they are altered by individuals with difficulty. Some incentives need to be created that would alter the course of a corporate towards, for example, sustainable environmental management.

Management often creates value statements to indicate corporate direction. Leaders within organisations can create images that are false. Lencioni (2002) highlights the fact that many corporate value statements are bland, toothless or just plain dishonest. Empty value statements create cynical and dispirited employees, alienate customers and undermine managerial credibility. Lencioni (2002: 7) states that “If you are not willing to accept the pain real values incur, don't bother going to the trouble of formulating a value statement”. The author also continues to indicate that value systems should be authentic in their content and not of the motherhood-and-apple-pie

type that appear in so many companies. They also don't need to sound like they belong in a Hallmark card. It is not required to obtain consensus from all employees or to engage all employees. This is precisely the wrong approach, because value initiatives have nothing to do with building consensus. They are about imposing a set of fundamental, strategically sound beliefs on a broad group of people. The best value efforts are driven by small teams that include the CEO, any founders who are still with the company and a handful of key employees. This highlights the influence the core executives have on the future direction of a corporate. The ingrained corporate values still overrule.

Corporate values can only succeed if they are honest and match individuals' value systems. There comes a time that company values 'backfire'. Edmondson & Cha, (2002: 2-3) states that "A leader will be measured on the basis of his perceived values, so he should ensure that employees and management share an understanding of what those values are … allowing employees to interpret company values on their own can set leaders up to fail. It may be difficult for a leader to hear the truth from his employees, but seeking honest feedback may be the only way to prevent disaster … when employees sense that a leader's decisions are at odds with company values, they are quick to conclude that the leader is a hypocrite". This is an indication that employees could at times remind a manager of the corporate core values. In practical terms this usually does not happen as employees are concerned with their positions in a company or can only comment after the event.

Some CEOs of companies go to great lengths to match personal and corporate values in an effort to maximize the effectiveness of the operation. Because of this there have to be some of the personal values of the employees, including the managers, that filter through to the mission and vision of the company. These values could be positive or negative from an environmental point of view. As an example Howard (1990) demonstrates how Robert Haas, the CEO of Levi Strauss utilize **Aspirations Statements** as a major initiative to define the shared values to guide both management and the work force. These include value statements about new behaviour, diversity, recognition, ethical management practices, communication and empowerment. 'The Aspirations Statement' is used in shaping how the company defines occupational roles and responsibilities, conducting performance evaluations, and training of new employees, organizing work and making business decisions. Howard (1990) says that a company's values (what it stands for and what its people believe in) are crucial to its competitive success. It's the idea of a business that is controlling, not some manager with authority. Howard (1990) points out that because people value open and direct communication, they give other people permission to disagree. "Senior managers

try to be explicit about our vulnerability and failings. We talk to people about the bad decisions we have made" (Howard, 1990: 133-143). Competitive success is the topic here and not sustainable environmental waste management on its own. Only economic motivators will alter a company's course in most instances.

Handy (2002: 3-4) discusses truths and trust within the corporate environment in *What's a Business For*? "Markets rely on rules and laws, but those rules and laws in turn depend on truth and trust. Conceal truth or erode trust, and the game becomes so unreliable that no one will want to play … The suspicion, right or wrong, that a business takes care of itself before it cares for others only fuels the latent distrust … Personal greed, insufficient scrutiny of corporate affairs, and insensitivity or an indifference to public opinion: those charges could be levied against some business leaders, but few, thankfully, have been guilty of deliberate fraud or wickedness. All they've been doing is playing the game according to the new rules". Here Handy refers to the latest corporate market environment and particularly to the investment markets such as the stock exchanges. Many smaller operations with few investors for instance harming the environment would not be as vulnerable and exposed to public scrutiny. Some unique incentives would be required to move executives towards successful (sustainable) waste management.

The employer-employee relationship determines the success of above **co-habitation** and exchange of values. Recently, employees of companies (Handy, 2002) are treated as costs and not as assets. A community has members and those members have certain rights, including the right to vote or express their views on major issues. This is in line with relating a good business to a community with a purpose, and a community is not something to be owned. A major change in the paradigm of executives is taking place, as they need to heed the values of employees as well as the move towards a 'greener earth'. Handy (2002) says that a business needs to take the lead in areas such as environmental and social sustainability. Instead of being pushed into the defensive, because of today's anti-globalisation protestors claiming that global businesses not only do harm, but that the harm outweighs the good. Phillips *et al* in their report on *Ethics Education in Business Schools* (AACSB International, 2004: 10) be-labours the fact that "the actions of business leaders affect not only themselves, but customers, employees, investors, suppliers, governments, citizens and communities". They promote the teaching of responsibility of business in society, ethical leadership and decision-making and corporate governance in business schools to prepare students for the realities of life as a future manager and leader in business. The values and ethics found within a business are generally determined by the culture within which the business resides.

Global trade is leading businesses to start a process of cross-pollination in terms of belief systems and is creating its own problems. The effect of culture on a business in a different environment can be demonstrated with Walsh (1997) reporting that many Japanese companies based in the UK are still grappling with the conflict between corporate values and culture and there is a need to develop an employment model for the future. It is also reported (Walsh, 1997) that success does seem to be measurable by the extent to which local nationals are involved in management. To deal with this integration, the UK Council on Economic Priorities launched Social Accountability 8000, which is designed to piggyback on the ISO 9000 quality auditing system. The SA 8000 is a system that is benchmarked on health and safety, union rights, minimum wages and working conditions. This still does not take into consideration the differences between belief systems of various cultures where one could be operating at a higher level than the other and thus cause tension.

The change in corporate beliefs versus that of their managers over the decades warrants investigation. In analysing the *Organisational Goals and Expected Behaviour of American Managers* the researcher England (1967) ranks corporate goals for the senior managers according to importance and aligns them with their personal motives. These managers rank the **maximization criteria** (organisational efficiency, high productivity and profit maximization) as the highest. This is followed by **associative status goals** (organisational growth, industry leadership and organisational stability) as second, while giving **intended goals** (employee welfare) and **low relevance goals** (social welfare) the lowest ranking. These results indicate the low levels of importance attached by managers in the USA to social issues. By implication this relates to any ecosystem, as it forms part of the social welfare of any nation. England (1967) also tests the relationship between various organisational and personal variables in response to goals, and indicates a high degree of **correlation between managers' age** and importance of social welfare. **Level of education** also plays a role in organisational stability of companies. It seems that older managers would be more concerned with social issues that could include, by implication, environmental ecosystems. The corporate profit motive was the only major driving force during the 20th century and little consideration was given to environmental issues such as good and sustainable waste management. Getting closer to the present day scenario, relating to corporate beliefs, it is found that the method of introducing responsible corporate values requires skill in making it effective. A company introduces (Littlefield, 2001) new corporate values, which include integrity, responsibility, co-operation, achieving against the best and the value of people and dealing fairly. The tactic followed is termed '**No need to shout about it'**. The strategy they

follow is to introduce these new values into the company by launching them without any fanfare and pass the concepts down the line of management at three-monthly intervals, allowing the tiers of managers to get to grips with the values before passing them on. They indicate that installing corporate values, as a project, is a process of evolution and that the secret lies in the idea that **training** and **development** is as valuable as finance or information technology (IT).

The **values and ethics** of managers and executives, being employees, need to match or even surpass that of the company. The following (Lessons from ENRON …, 2002: 1-2) relates the problems experienced by high profile corporations; "As the ENRON debacle demonstrates, lofty corporate values are meaningless and add little value unless employees are willing to practice them ... employees often complained that without clear vision and values, they were rudderless and did not know how to behave. Somehow, it was believed, these words energized people to think and work ... unless people are prepared to practice their **corporate values**, they are not worth the paper on which they are printed ... worse yet, rather than re-enforcing desired values, Enron's corporate values provided a mask that belied how people really behaved ... what this illustrates is the paradox and limited **value** of **corporate value** statements in influencing behaviour. Perhaps what is really needed are better executive role models and clearer rules governing self serving interests." Part of the problem in large corporations is that managers are forced to achieve or prove results despite often losing control or being unable to influence the course of events, even though their beliefs direct otherwise.

The question arises whether lofty high **corporate values** provide a recipe to success in the long run and how are they achieved. According to Black (2002: 16) “Anyone who thinks that rolling out a corporate values programme is going to make a lot of difference to their business is living in cloud cuckoo land. Once upon a time the values circus had a novelty factor. Poorly pitched initiatives question the credibility of senior management and can appear ludicrous to employees who often find it a pointless and patronizing waste of time. More than 90% of organisations' values come from just 12 phrases, including ‘teamwork, results, innovation and customer focus’. Furthermore, if the company values are to create a corporate glue to bind together disparate cultures, and increase company loyalty, then look for another solution. However, if the organisation's objective is to encourage employees to behave in a way that makes them more effective, then you are in with a chance. First, don't mention the values. Instead, focus on helping employees flourish as individuals, by encouraging them to gain the skills they think they need to be more successful, not just at work but in their life as a whole. Make learning these capabilities

as easy as going to the gym. A 90-minute session once a fortnight in the office will, over the course of a year, take less time than a week's course, and be a lot less disruptive. Human Resource (HR) professionals need no convincing that work culture is critical to business success. The challenge is in choosing a solution that delivers results. The best chance of changing the way people behave at work is to swap a top-down approach for one that comes up from the grass roots - change corporate values for personal development and continuous improvement. This way you will get the kudos of providing a new benefit - the value of delivering sustained improvements to both culture and performance. And you may even discover that your company values are being lived without trying". Black (2002) postulates that only by upgrading the personal value systems of the employees will the corporate values of a business be transformed to higher levels. The change agent lies with the employees and not by a top down approach. This is an important finding however there are other problems such as working away from your own environment.

Working away from the home country, brings about its own problems (Donaldson, 1996) and tension in the value system. Some developing countries have different ethics, such as ingrained bribery and corruption, that makes it difficult for foreign businesses to survive unless they use-the-system. The ecosystem within which the business operates, above all suffers the worst in such an environment, as personal greed takes the upper hand. Donaldson (1996: 48-53) in researching *Values in Tension: Ethics Away From Home*, states that "when we leave home and cross our nation's boundaries, moral clarity often blurs. Without a backdrop of sharing attitudes, and without familiar laws and judicial procedures that define standards of ethical conduct, certainty is elusive. If companies in developed countries shift facilities to developing nations that lack strict environmental and health regulations, or if those companies choose to fill management and other top level positions in a host nation with people from the home country, whose standards should prevail? The cultural relativist's creed – 'When in Rome do as the Romans do', is tempting, especially when failing to do as the locals do, means forfeiting business opportunities. The Japanese, for example, define business ethics in terms of loyalty to their companies, their business networks, and their nation. Americans place a higher value on liberty than on loyalty. Although a country's level of economic development plays a large part, culture, including ethical attitudes may be a more crucial factor. Companies must help managers distinguish between practices that are merely different, and those that are wrong. Research shows that management ethics differ among cultures; respecting those differences means recognizing that some cultures have obvious weaknesses - as well as hidden strengths". Donaldson (1996) also identifies core human values that define minimum ethical standards for all companies**. The right to good health and the right**

to economic advancement and an improved standard of living are two core human values. The third value is to **maintain reciprocity**, which is not to do to others what they do not want done to themselves. The three, core human values across the world are defined therefore as respect for **human dignity, respect for basic rights, and good citizenship**. Donaldson (1996) also points out that bribery is widespread and insidious. He indicates that routine bribery is intolerable. It undermines market efficiency and predictability, thus ultimately denying people the right to a minimal standard of living. Some degree of ethical commitment and some sense that everyone will play by the rules, is necessary for a sound economy. Bribery does more than destroy predictability because it undermines essential, social and economic systems. He also provides guidelines for ethical leadership in the sense that creating a company culture that rewards ethical behaviour is essential, and that corporate values and formal standards of conduct are absolutes. He also advises that foreign business units should help to formulate ethical standards and interpret ethical issues. Efforts to support the decrease in institutional corruption should be promoted.

Making values and ethics work in a business seem to be more effective than a **command-and-control** approach. Corporate values should be articulated through HR Policies. According to Begley & Boyd (2000: 8-12) "When a value-based culture is blended into HR policies, the combination sets the stage for coherent vision, clear direction, and sound decision-making. The declining relevance of the command-and-control approach in business has extended into the roles played by some companies. Many companies regard their employees' talents as providing a significant competitive advantage. Employees seem averse to the mindset behind that style (command-and-control), and wish to be treated as adults capable of making their own decisions". This type of approach is in order for a corporate as long as the employee value-based culture aligns with the general strategic direction of the operation. Businesses select their people to fit in with their organisation culture which aligns employee thinking and reaction to operations strategy. Given this alignment of values still does not guarantee responsible waste management. The latter day movement of corporate employees, having more of an influence on business, is encouraging but requires people to be educated in sustainable development aspect of waste management to make it successful.

Apart from the latter day approach, as highlighted in the above paragraph, a 'forth wave', namely the **spiritually based firm**, also seems to be developing. Previously, a 'third wave' was described by Wagner-Marsh & Conley (1999) referring to Elvin Toffler (1980) *The Third Wave.* New York, Morrow, who foretold and described the technological 'third wave' back in 1980.

This dealt with technology developments. Wagner-Marsh & Conley (1999) suggest and explore certain basic attitudes and practices that appear to be essential for success in maintaining a spiritually based corporate culture. These are:

- honesty with self,
- articulation of the corporation's spiritually based philosophy,
- mutual trust and honesty with others,
- commitment to quality and service,
- commitment to employees and
- selection of personnel to match the corporation's spiritually based philosophy.

Top management that take over an organisation, or those who start their own businesses, make moves to try and remake or form the organisation after their own image. Many of the leaders of successful spiritually based firms' embrace Robert Greenleaf's servant-leadership philosophy.

The third basic attitude or practice that Wagner-Marsh & Conley (1999) observe about spiritually based firms is that they value mutual trust and honesty. These firms are extremely upfront with their employees, customers, and suppliers. The spiritually based firms (Wagner-Marsh & Conley, 1999: 296) also "put quality and service at the forefront, while still being profitable and highly competitive". Spiritually based firms also value their employees as individuals and are committed to development of their employees, far beyond their professional development. They look for sincerity and the right attitude. These types of operations would in general work for the good of mankind and consider environmental issues in a positive light.

The question arises as to what influences ethical conduct in a business. What reactions could be expected under the normal pressures of business? DiBattista (1988: 207) postulates "ethical conduct in business appears to be influenced by factors such as time constraints when making decisions, political pressures within the organisation, the moral and ethical constraints of current ethical standards, and decision maker's personal values". Business is becoming more competitive as international competition up the ante. This increases pressure on employees to deliver at all costs. Environmental aspects could be the cost. The ingrained values of an employee need to be known to the general management of a business. To this end Giacomino, Akers & Fujita (2001) uses the definition of a personal value as quoted by Rokeach (1968) in *Beliefs, Attitudes and Values.* Joscy-Bass, San Francisco, "A **value** has been described as an enduring belief that a specific mode of conduct or end state of existence is personally and socially preferable to alternative modes of conduct or end states of existence". Values are deeply engrained, stable in

nature, and a relatively permanent part of a person's inner self. Business managers, either individually or collectively, make decisions that are influenced by their values. Thus, identifying and measuring the values of individual business managers may be useful for understanding the basis for a manager's decisions.

It is important to find a match between corporate strategy and the values underwritten by the managers in a business. Guth & Tagiuri (1965: 123) write that "some managers may feel that their choices of corporate strategy are entirely objective. This may well be so if they include their personal values among the elements they take into account in their analyses and decisions. For it is quite clear, on the basis both of observation and systematic studies of top management in business organisations, that personal values are important determinants in the choice of corporate strategy". This also applies to corporate waste management. It often seems problematic for managers to match their personal values regarding the environment and the goals forced upon them by their businesses.

3.2.3. Education and waste management

Education applied over a considerable period of time seems to be one of the factors that changes the mindset of people to participate in waste management programmes. There are references dealing with belief systems that demonstrate that education is one of the few avenues available to change peoples' values. Read (1999) describes how a weekly 'doorstep recycling collection process' in the UK improved by using education to overcome the local barriers of participation. An effective promotion, through a door-to-door communication strategy, increased the recycling tonnage and public participation in the doorstep recycling service within the borough of Kensington and Chelsea, UK. The road show was launched to convey the message of reduce, reuse and recycle. They also indicate that certain boroughs, such as Dorset, proved the success of programmes in their reduction of waste through the use of a carrot-and-stick approach with waste disposal contractors. The contractors were fined for exceeding certain tonnages of waste brought to landfill and rewarded with a bonus if the levels dropped below a certain minimum value. The problems foreseen with this scheme are that it might lead to dumping of waste to keep the tonnages down, and the overall ecology not being sustained. The interactive approach decided upon was door-to-door surveys and education, presentations at schools, public meetings, radio

advertising and telephone hotlines. Ecosystem conservation should therefore be taught at junior school level to influence people towards sustainable development.

3.2.4. Belief systems summary

Rokeach (1968) includes **beliefs**, **attitudes, behaviour** and **values** of man within the term **belief system**. The author also indicates that behaviour cannot be determined by one attitude alone. **A minimum of two attitudes are necessary to activate behaviour**. Several considerations guide the author to place the **value concept in nomination ahead of the attitude concept**. Rokeach (1968: 157) postulates that "value is a more dynamic concept since it has a strong motivational component as well as cognitive, affective, and behavioural components. Second, while attitude and value are both widely assumed to be determinants of social behaviour, value is a determinant of attitude as well as of behaviour". This is an indication that education and training could be instrumental in reformatting or adjusting the values of a person. This change might, of course, be for the better or for the worse. These aspects are valuable in terms of environmental conservation approaches in changing the behaviour of people or companies when dealing with waste.

Spiritual aspects also form part of a person's belief system. According to Wagner-Marsh & Conley (1999) it is true that men who attempt to integrate their spiritual values into their business life do create personal tensions and often need to compromise in relation to unresolved problems. It is therefore possible that a business deals with its waste in an unsustainable manner in conflict to the personal values of its employees.

Rotten jobs are expected (Cherrington, 1977) to create negative attitudes and good jobs are expected to create positive attitudes. Rotten jobs could therefore lead to a don't-care attitude and environmental issues might suffer its consequences as a result. He also proposes that older workers have a more favourable attitude towards their work than younger workers. Older workers might have a more positive attitude and endeavour to deal with waste in a more responsible manner.

On the other hand younger workers are more likely (Cherrington, 1977) to question the usefulness of their own company and challenge its contribution to the community. Anti-social or unsustainable environmental practices resulting from personal values and attitudes can be improved (Read, 1999) through **education** procedures. This important finding directs attention to

younger workers as a group requiring education and **training** in efforts to improve ecosystem management. It is therefore important to attend to the so-called **age gap** that is often referred to when analysing the value systems and attitudes of younger versus older people. England (1967) suggests that installing corporate values, as a project, proves to be a process of evolution and that the secret lies in the idea that training and development, is as valuable as finance or information technology (IT).

Handy (2002) reports that a business needs to take the lead in areas such as environmental and social sustainability, instead of being pushed into the defensive. This is due to today's anti-globalisation protestors claiming that global businesses not only do harm, but that the harm outweighs the good. The question arises whether lofty high corporate values prove to be a recipe for success in the long run. "Perhaps what is really needed is better executive role models and clearer rules governing self-serving interests" (Lessons from ENRON ..., 2002: 2). In summary, it seems that attitude changes could be made by **educating and training the younger workers** and managers in a business who can then take the lead in environmental matters.

Some developing countries have different ethics (Donaldson, 1996) including bribery and corruption, that make it difficult for foreign businesses to survive unless they use-the-system. The ecosystem within which the business operates, generally suffers in such an environment as personal greed takes the upper hand.

Generally business brings about its own pressures. DiBattista (1988: 207) pronounces that "ethical conduct in business appears to be influenced by factors such as time constraints when making decisions, political pressures within the organisation, the moral and ethical constraints of current ethical standards, and decision maker's personal values".

Indications (Giacomino, Akers & Fujita, 2001) are that values are deeply engrained, stable in nature, and a relatively permanent part of a person's inner self. Business managers, either individually or collectively, make decisions that are influenced by their values. Thus, identifying and measuring the values of individual business managers may be useful for understanding the basis for a manager's decisions. Guth & Tagiuri (1965: 123) announces that "some managers may feel that their choices of corporate strategy are entirely objective. This may well be so if they include their personal values with the elements they take into account in their analyses and decisions. For it is quite clear, on the basis both of observation and systematic studies of top

management in business organisations, that personal values are important determinants in the choice of corporate strategy". It is also signifies that modern business ethics constitute the dominant features of corporate accountability, social responsibility and stakeholder theory. The Triple Bottom Line concept is a move in this direction. It forces corporations to audit their environmental practices and redirect efforts towards sustainable development.

Wright (1991) refers to the **not-for-profit-marketing** concept that started from 1969 onwards to address issues other than profit, such as to induce social change **to serve society as a whole**. This again opened the debate on the degree to which personal behaviour influences attitude. The consensus seems to be that positive, negative or neutral attitudes have varying degrees of influence on behaviour. It is quite difficult to change the attitudes of those people with negative attitudes. Marketing efforts spent on endeavouring to influence people with negative attitudes are 'a waste of money' and should only be done as a last resort. The promotion of behavioural change can be achieved by reverting to more cost efficient 'actionable' factors, such as economic or informational and convenience factors. Wright (1991) prescribes increasing collection points, economic incentives such as tax credits or tax on sales to provide for a collection fund, pre-separation of waste by consumers or banning sales of difficult-to-recycle products such as plastic bottles. It seems as though **economic incentives prove to be more powerful than trying to change people's attitudes**.

Wright (1991) also emphasises the results of studies done in the USA demonstrating the major difference between the opinion of people and their behaviour. The majorities agrees and have an environmentally aware attitude that recycling should be the responsibility of business or be done by individuals but seldom participate in any recycling themselves. **Therefore pro-recycling attitudes do not result in recycling behaviour**. The above is an important result signifying that economic factors promote SWRM in the face of attitudes and behaviour, which in itself is unpredictable. This includes the fruitless pursuance of people with negative attitudes and possible negative behaviour. Wright (1991) suggests that marketing strategies for recycling should emphasize other aspects of marketing mix, rather than attempting to change attitude, and by implication, behavioural change. The author refers to strategies for improving information and convenience or providing economic incentives. Wright (1991) proposes that **the most cost efficient recycling strategy would follow after determining the relationship of a particular incentive option to the consumer behaviour patterns**.

Economic incentives seem to be the major driving force to direct people towards sustainable waste management. The belief systems of inhabitants, which form their attitudes and behaviour, will only change over time using education and leadership examples to move people towards higher ethical standards and better ecology management.

3.3. Waste management and leadership

Societies, businesses, governments and associations require leaders to manage them and make them effective in attaining environmentally sustainable objectives. Most people are passive and go about their normal lives so long as their existence is not threatened. Leaders within corporations will generally promote the profitability of the business, often despite environmental impacts. Politicians promote their careers by trying to keep people happy. Leaders within communities seem to have difficulty changing the behaviour of people around them.

3.3.1. Historical Leadership

Barnard (1968: xx) states that leadership is not only a function of the individual but also plays a role in the shaping of decisions made within an organisation. He defines it as "leadership in organisations means taking the initiative in the adaptation of organisation resources and processes to clearly understood and attractive objectives, the formulation of which is not wholly an organisation rather than an individuals' process". Thus leadership should guide the organisation by using consciously created strategic plans or intuitive plans as time unfolds. The question to answer is whether the leader will endeavour, from an environmental point of view, to maximize profits whilst at the same time making the business operate at an environmentally friendly level. Societies, businesses and governments require leadership to manage them into specific strategic directions. Can we expect the leadership to follow environmental objectives at the cost of economies or business economics? The next few paragraphs deal with an analysis of leadership.

Indications are that businesses go through cycles of having environmentally conscience managers to purely profit seekers. Anshoff (1982) cites examples of various cycles a business endures from one generation of management being far-sighted, outward orientated entrepreneurs of the expansion era who then make way for methodical profit minded efficiency experts.

This can be interpreted as cycles of a business being managed by individuals who place more prominence on the profit motive of the business versus other far-sighted managers who consider environmental issues important and subscribe to ecosystem leadership.

Barnard (1968) indicates the essential functions of an executive being:

- To provide the system of communication,
- To promote the securing of essential efforts and,
- To formulate and define purpose (which in later years became known as strategic planning).

Defining **purpose** could be in terms of own enrichment or taking cognisance of ecosystem management. Has this shift in expectations taken place over the last couple of years? Drucker (1976: 453-454) in *The Practice of Management* dealing with the responsibilities of management proposes that private enterprises are **organs of society and serve a social function**. Managers "have power over people and their decisions have great impact upon society, and that they have to make decisions that shape the economy, the society and the lives of individuals within it for a long time to come". This is still true today and points to sustainable development in the environmental sense of the word. A leader with authority will make a society functional. Barnard (1968) points out that **authority** is another name for the willingness and capacity of individuals to submit to the necessities of co-operative systems. Authority arises from the technological and social limitations of co-operative systems on the one hand and of individuals on the other. Hence the status of authority in a society is the measure both of the development of individuals and of the technological and social conditions of the society. Barnard (1968) also says that we should not deceive ourselves by thinking that either a science of co-operation in an organisation, or the further development of the executive parts will alone promote a greater integration of social forces, or even maintain the present status. Inspiration is necessary to inculcate the sense of unity, and to create common ideals. Emotional rather that intellectual acceptance is required. This applies especially to environmental issues.

The psychoanalyst Maccoby (1976) analysing new corporate leaders in *The Gamesman,* identifies a new type of corporate manager that developed during the 1970s in the advanced-technology corporation of the United States of America (USA). They are labeled as 'deal cutters and gamblers'. Previously, during the 1800s and early 1900s there were entrepreneurs such as the 'jungle-fighter industrialists' and 'autocratic empire builders'. Thereafter, during the 1950s, the bureaucratic salaried 'corporate man', who is marketing and security seeking, followed.

Maccoby (1976) identifies four types of **corporate men** in advanced-technology corporations in the USA after the 1970s:

- The 'craftsman and scientists' holding productive-hoarding characteristics,
- The 'jungle fighter' with the goal of power,
- The 'company man' previously well known as the organisation man of and,
- The 'gamesman' who is identified as the new man with interests in challenges and competitive activity, where he can prove himself as a winner. He is impatient with others who are slower and more cautious, likes to take risks and to motivate others to push themselves beyond their normal pace. He responds to work and life as a game. Will this person really consider the well being of future generations? It is doubtful.

There are also people within businesses who relate to the soft issues of management, which includes **spirituality**. Delbecq (1999: 345) says that "examples of some executives are indicated whose personal spiritual tradition deeply informs and shapes their leadership. Themes include a sense of leadership as a calling, the desire to integrate deeply held personal values with a leadership role, and spirituality as a source of courage when facing daunting challenges". Delbecq (1999) also illustrates how some companies establish a culture of generous service to the customer, and a mature and respectful internal organisational ethos among a very diverse workforce. The vanity of executives points towards the bonfires of their pride, power and wealth. This being the case the question arises as to what percentage of leadership will resolve to make good waste management practices part of their calling. The executive of a business often has the ability to use the values he considers important to influence the business. This includes environmental issues. Guth & Tagiuri (1965) describe how a manager goes about making his personal values explicit to himself. A manager can examine his behaviour from time to time with the question in mind of what values he holds. What matters most, is the attitude or frame of mind with which the manager approaches the problem of identifying the part his values play in his work. Two requirements are important:

- There must be personal acceptance of the fact that his personal values are related to his implicit or explicit strategy choices,
- There must be a willingness to focus on personal values as a possible explanation of differences between the concepts of corporate strategy held by various executives.

It is often possible through identification of similarities and differences in personal values, to **design a new strategic alternative that will satisfy all concerned**. This could include dealing with solid waste reduction management (SWRM).

There are leaders who achieve results in a determined but unobtrusive manner. Badaracco & Joseph (2001) study the great leaders who achieve results. They signify that these males and females aren't high profile champions of right-over-wrong. They don't spearhead large-scale ethical crusades. **They move patiently, carefully, and incrementally**. They correct moral wrongs in the workplace inconspicuously and usually without casualties. They identify these people as quiet leaders because their modesty and restraint are, to a large measure, responsible for their extraordinary achievements. The approaches used by these quiet leaders are that they usually buy time to solve a problem, pick their battles carefully, do sometimes bend rules but not break them and finally solve problems by utilizing compromise. This applies to leaders within companies and communities.

Bass & Steidlmeier (1999: 181-182) deals with the morality of leaders saying "the morality of transformational leadership has been sharply questioned, particularly by libertarians, grass roots theorists, and organisational development consultants. They argue that to be truly transformational, leadership must be grounded in moral foundations. The **ethics of leadership** rest upon three pillars:

- The moral character of the leader,
- The ethical legitimacy of the values embedded in the leader's vision, articulation, and programme which followers either embrace or reject and,
- The morality of the processes of social ethical choice and action that leaders and followers engage in and collectively pursue".

Transformational leadership therefore requires specific moral foundations to lead a society into sustainable development. These include concern for the environment and society probably using economics as a vehicle to move development in a sustainable direction.

Pillai, Schriesheim & Williams (1999) analyse the differences between transformational and transactional leadership. **Transactional leaders** are those who clarify for their followers their responsibilities, the expectations they have, the tasks that must be accomplished and the benefits to the self-interests of the followers for compliance. Transactional leadership is thus based on an exchange process in which the leader provides rewards in return for the subordinate's effort and

performance. Transformational leaders are those who motivate their followers to perform beyond expectations by activating the follower's higher order needs, fostering a climate of trust and inducing followers to transcend self interest for the sake of the organisation. The primary factors of the transformational leadership model include charisma or idealised influence and inspirational motivation, as well as intellectual stimulation and individualised consideration. Successful waste management probably hinges on transactional leadership as everybody requires a return on efforts put into for example waste management.

In the paragraphs above various types of leadership styles have been identified such as:

- far sighted,
- outward orientated entrepreneurs,
- powerful,
- gamesman (winners),
- spiritual,
- differing personal values,
- unobtrusive and not 'shouting',
- transformational (informs people),
- transactional (create greater expectations, rewards, return).

The persons in charge with these leadership styles will have a variety of ecosystem management processes in mind during the execution of their management tasks. The question is how to motivate them all towards sustainable waste management. It is firstly important to evaluate contemporary leadership in terms of sustainable development before theories can be developed.

3.3.2. Contemporary leadership

Reading publications on contemporary leadership reveals that corporate management styles and techniques, developed many years ago, are once again becoming important. It is likened to neoclassical leadership. In terms of waste management it evolves around **corporate social responsibility** (CSR) the evolution of which dates back to the 1800s in Europe when industrialists provided employees accommodation, schooling, health care, etc with the aim of attracting and retaining workers. CSR (Juholin, 2004: 20) "is not based on religion or charity but on business ideology and entrepreneurship". CSR is a leadership style or imperative that is again becoming

important because "currently, (Juholin, 2004: 20) multinational companies are coming more and more under the scrutiny of different audiences, NGOs and the media". Leaders (Juholin, 2004) are now expected to take up values concerning the welfare of the environment and people and it is becoming a prerequisite for the success of the company as well as long term profitability. Some companies do however argue that they pay taxes and obey the regional regulations and laws and wonder how much more corporate philanthropy is required. Brown (2001) in assessing CSR identifies corporate responsibility as a company's relationship to its employees, to its particular industry and to society at large. The last issue includes aspects such as its contribution to the environment and constructive involvement in good government. The contemporary leader has therefore a lot more to be concerned with than simply financial performance and growth of a business.

Community leaders (Boehm, 2002) have key roles in policy making, direction, inspiration and initiatives in terms of social projects. Corporate leaders need to motivate and organize projects, therefore, their scope has widened to include the social aspects of communities. The collaboration between corporation and community leaders (Boehm, 2002) is now based more on reciprocity than philanthropy.

Hamann (2003) reflects the change in leadership styles in terms of CSR over the years. From a business perspective it has moved from considering NGOs as threatening, to involvement and now, entering into the partnership phase. Civil society, on the other hand, previously saw business as opposing social development; this was followed by it being a mistrusted source of funding, to the present partnership for social development. Hamann (2003: 251) concludes that "globally, business wants to be seen as taking on a more responsible and interactive role in social transformation and sustainable development". Hollender (2004) researches the true nature of business responsibility in the USA and finds changes occurring in America's corporate culture. The signs are there (Hollender, 2004: 113, 119) that a fundamental shift is occurring in society and business, "making responsible corporate behaviour an imperative … Business has the power to change the world and make it better for this generation and those to come".

Zadek (2004) in Harvard Business Review lists the five stages of organisational learning that a corporate progresses through during the development of corporate responsibility. These stages move from being defensive, to compliance, to managerial, to strategic and finally becoming civil

in nature. In the last mentioned civil stage of learning an organisation is promoting broad industry participation in corporate responsibility.

Assuming CSR as a given, it follows that corporate is being pressurised by NGOs and the community to do more than simply create wealth for the shareholders. There are now stakeholders to be considered, and not only shareholders. Management aspects such as corporate governance, which includes strategic planning and risk management, together with producer responsibility will be tagged onto CSR. Producer responsibility again requires corporate to attend to the waste generated from its products or services in the market place. The cradle to grave concept is therefore, now, becoming an imperative. It is consequently deduced that corporate and its leaders are now experiencing external pressures to take up their producer responsibility and deal with solid waste reduction management in terms of their in-factory and down stream waste generated. The search for augmenting factors toward SSWRM is now, more than ever, required to progress this waste management imperative.

3.3.3. Leadership versus state of the economy

Failures in solid waste reduction programmes in developing countries are mostly ascribed (Holmes, 1984; Yap 1999) to the lack of funds, technology, training and education. There are actually instances (Anand, 2000) where successes are achieved in the face of poverty. Leadership seems to be the factor that really makes the difference between success or failure as is demonstrated in the next example from India. Anand (2000) studies the co-operation of households towards solving environmental problems such as littering streets. The issue is co-operation within an urban environment. They use committees formed in Madras, India to test various hypotheses on the conditions affecting co-operation of these street committees. This is a typical example of developing countries where there seems to be a large mismatch between the financial taxing powers of municipal corporations and their expenditure responsibilities for the provision of services to the communities. The reported study is an attempt to examine factors affecting co-operation within the street committees. That is households served by these committees complying with the rules of the game plan without the existence of sanctions to punish them. Of the various hypotheses examined the following results are obtained:

- Co-operation of the households seems to be significantly determined by the management style, leadership and committee size,

- The increase in number of committee members improves participation of households,
- Co-operation seems to be unrelated to the quantum of fees paid by each household (within a limited range),
- Co-operation seems to be unrelated to the age of the collection action institution,
- Co-operation is positively associated with the number of services offered by the committee.

Leadership drives these projects and result in success when using incentives such as the number of services offered. There is a fine balance between effort afforded by the community and perceived return. The deduction made is that the underlying factor driving success is economics. It takes leadership to piece it all together.

Other examples of good leadership making a difference to SW reduction programmes, despite difficult economic conditions, within developed countries abound. For example according to Tilman & Sandhu (1998) the states of California, Florida and Wisconsin are among the leaders in recycling, each diverting almost 40% of their total waste stream away from disposal. The state of California has an extensive framework of solid waste legislation that began in 1986. They provide more than $20 million in funding of private recycling programmes and in the process save $54 million annually in avoiding disposal costs. This plan makes economic sense.

Leadership should actually understand their role within SW reduction programmes. The stumbling blocks in successful ecosystem management often arise from divergent goals set by business, its managers and the ultimate influence on the world's ecosystems. The problems lie within the value systems of people and their forced actions within an employment relationship.

Leadership and economics at the social level are related and demonstrated as follows. The concept of **ecosystem management** (EM) developed (Steel & Weber, 2001), which is the key that deciphers the relationships within nature, and between humans and nature. Central to these efforts are innovative, decentralized institutional arrangements which delegate or share significant authority with private citizens, programme managers within existing bureaucracy, or other agencies with similar jurisdictional and policy concerns. Therefore EM devolves and shares authority with local citizens and other stakeholders to reinvent the existing model for managing the environment. EM is a very powerful management tool in environmental and natural resources management that empowers government and private citizens to plan future environmental systems

maintaining a good balance between democracy and technocracy. EM will not work unless it creates some **economic return** for the communities involved.

Chertow (1998) reports a strong correlation between public response and **legislative action** involving many types of waste. The same relationship exists within industry. Only legislation changes the propensity of the public or industries to continue dumping waste instead of reducing or recycling it. This indicates that experience gained by many researchers predisposes legislation as the final means of obtaining successful industrial ecology and integrated waste management. Here leadership is required to create the legislation. Against this background legislation might not be required should sufficient economic incentives be installed to move the process in the right direction on its own. **Legislation is often required** to enable economic incentives to be instituted and administered.

Many developing countries (Holmes, 1984; Yap, 1999), facing large population growth, are dealing with survival economies. Sustainable environmental issues are not on the priority list. There is also a large trade in waste products for the wrong reasons. Economic pressures within developing countries force people to use waste products for their original intended purpose. For example a scrapped tyre put back on a vehicle and used as a normal tyre whilst it is in reality unsafe. Other practices create environmental side effects that are detrimental to the ecology such as waste tyres or paper being burnt for heat in winter or to recover the scrap steel from the tyres. Traders are quick to cash in on adversity and create a flow of waste products from first world countries to underdeveloped areas. Strong leadership is required to return practices back to sound ecological sustainability. How does the leadership of developed countries compare to that in less developed countries? Although a bit dated, the following reference still holds true today. Learned, Dooley & Katz (1959) compares the personal values and business decisions between business people in the USA and developing countries. They describe a growing concern with the spiritual implications of everyday activities, which have been highlighted during recent years. They propose that numerous articles appear dealing with ethical or moral problems. There has been an upsurge of businessmen's interest in questions of ultimate personal values. This mostly relates to businesses in the USA. Suggestions for these trends are:

- That some developments are rung from businessmen by the pressure of circumstances, such as organised labour, the fear of communism, and memories of recent political pressures, or

- A guilty conscience buying respectability to atone for the accumulation of great wealth and economic power through practices which cannot measure up to the highest ethical standards, or
- A public relations campaign, or
- Periods of uncertainty, or
- This is the most important, relating to a time that has lent itself to the luxuries of conscience. Saying that after satisfying the basic needs for food, shelter and so on it has been increasingly easy for a broad section of the population in the USA. For the men of genuine ability in business, the challenge has often been, not that of finding an adequate job but that of choosing among a variety of promising alternatives.

An increasing number of people are able to ask what they would like to do with their lives. This is in sharp contrast to the scenario that business people of developing countries are finding themselves in where the basics for food and shelter or employment are still very high on their list of sought-after values. They tend to resort to economic measures that advance their own financial positions but at a cost to society as a whole. Here leadership and **state of the economy** face each other in stark contrast. The economies of those undeveloped societies have to be rectified before the possibility of sustainable advancement can be achieved.

Tilman & Sandhu (1998) point out that new **integrated waste management programmes** require intelligent and **aggressive implementers (leaders)** who are persistent enough to develop new **standards and regulations**, and willing to enforce them in spite of resistance from both politicians and the public. The importance of project promotion and education seems to be the most difficult part of the foreseen programme, as the conventional attitudes and throwaway **behaviour** of consumers needs to be changed. Every effort should be made to curb costs and increase public participation. Surveys should be sent to participants to obtain feedback on how the programme is perceived by the public and to obtain ideas for improvement of the programme. Tilman & Sandhu (1998) summarize that there are changes that need to occur in the state government, education systems and the economy before a mandatory recycling programme could realistically be implemented. The theory is therefore that correct **leadership** in any less developed country is more important than the state-of-the-economy to instigate a sustainable SW reduction management programme. The India, Madras waste collection programmes proves this.

This research focuses on the importance of the correct economics in relation to social acceptance and the environmentally friendly fit of a solid waste project. Good leadership is required to install these parameters. For this to be achieved leadership should develop a suitable strategy.

3.3.4. Strategy

The question arises as to what values underlie the strategies formulated in businesses, governments and social units of association within the ecosystem that will lead to sustainable development. The dichotomy between the beliefs of the individuals versus what is practiced in firms and what would benefit the ecosystems requires analysis.

It is important for a business to have a strategic plan. Anshoff (1982: 18) says "the strategic problem is concerned with establishing an **impedance match** between the firm and its environment". Anshoff (1982) develop the use of strategy within the firm and divided firms into three categories:

1. **Reactors** that wait for problems to occur before attempting to solve them,
2. **Planners** who anticipate problems, and
3. **Entrepreneurs** who anticipate both problems and opportunities.

Anshoff (1982) points out that no general agreement on a proper philosophical basis for business objectives existed during the 1960's. Strategic development of business plans was based on the main objective of improving the return on investments, or profitability of the firm and the environmental impact was ignored.

Often a systems approach is required to compile responsible strategic plans that will include environmental management. Checkland (1981: xii) discusses **systems thinking** and defines a system as a central concept that embodies the ideas of a set of elements, connected together to form a whole, thus showing properties that are properties of the whole, rather than properties of its component parts. Checkland (1981) relates systems theory to systems practice. The systems approach is used to solve **real world problems**. By real world is meant "the interacting human activity, which makes up the business of living, as opposed to the artificial world of the laboratory experiment". Checkland (1981: 5) also defines a systems approach as "an approach to a problem which takes a broad view, which tries to take all aspects into account, which concentrates on

interactions between the different parts of the problem". Environmental sustainability has now entered the realm of 'real world problems' and needs to form part of the systems approach.

Cyert & March (1963), analysing the *Behavioural Theory of the Firm*, assert that the objective of the firm is to maximize net revenue in the face of given prices, and a technologically determined production function. The theory of the firm purports to explain the way resources are allocated by a pricing system. For monopolistic and oligopolistic firms, it is an issue of decisions on price, output and resource allocation. Added to this is the 'organisation theory' that maintains that a firm consists of bureaucracy, efficiency and administration. Shortcomings of the Cyert & March (1963) dissertation above are that very little of the external environment is mentioned or considered within the treatise on what is essentially a price elasticity model. Furthermore, 'net revenue' is not the ultimate goal of a firm. Financial goals such as 'net return on capital employed' or improvement of the net worth of a business are also important. Costing systems such as 'activity based costing' would provide the answers sought by Cyert & March (1963). The Boston Consulting Group (1968) in *Perspectives on Experience* expands on what Cyert & March researched, by developing the **learning curve** to explain price and competitive behaviour.

Anshoff (1982) indicates that the economic environment and the non-economic environment within the operation support the master list of objectives and constraints of the firm. These in turn are formatted by the economic objectives, the non-economic objectives of individuals, and the responsibilities and constraints within the institution. The non-economic objectives of individuals relate to philanthropy, personal ethics, social responsibility, and status and reputation of the individuals within the firm. Anshoff (1982) also narrates the setting of objectives for the firm as a complex result of practical limitations, evaluation of long-term profitability of the firm, in the presence of non-economic objectives.

In contrast to Cyert's *Behavioural Theory* (Cyert & March, 1963), strategic planning and management would provide the answers to the real issues to be considered in analysing the optimisation of a firm's financial aspects, and considering the decision making process within the human capital of the operation. Thompson & Strickland (1999) outline the processes required when developing the strategic management plan and a structure of a business, using what is basically a 'systems approach'. This is based on the framework of strategy (SWOT analysis; strength, weakness, opportunity and threat) as proposed by Andrews (1987) in his book "The Concept of Corporate Strategy". Thereafter, Collis & Montgomery (1995) developed the resource-

based approach, which places more emphasis on analysing the resources of the firm within its economic environment and to create strategic empowerment within the strategic planning process. Ghemawat (1999) provides a good guide for analysing the business within the internal and external environments, using various analytical tools, which assist the strategic planning process. The above provides the means of identifying the strategic issues within a business that require planning and execution, and to match the personal values of executives within the business to make the plans work. Creating strategic goals and matching values is an iterative process that leads to sustainable success. Herein lies the value of how far the non-economic objectives could be pushed to reduce the environmental impact the wastes a business generate, will have on the ecosystem.

There are good examples emerging of innovative methods used by business to create **green policies**. Rondinelli, Berry & Vastag (1997) describe how a private company revised their strategic planning for environmental management and gain market share through far-reaching environmental management. They point out that some management theorists, such as Henry Mintzburg, argue that strategic planning, as most corporations practice it, is really strategic programming. Companies that endeavour to translate broad corporate green policies into Environmental Management Systems are required to understand those forces, develop a vision of the future, and articulate operational strategies for achieving them. They also cite the event in New York City harbour during the spring of 1987 when a garbage barge left New York City harbour to dispose of its noxious cargo in a southern port and unexpectedly began a 6000 mile, 156 day voyage with its 3000 tons of baled garbage. What developed was the **not in my back yard** (NIMBY) syndrome, which symbolises the break down of the nation's municipal waste management system. They continue to describe the policy that this private company designed which was ‘we make it, we take it back’ philosophy. For certain of the packaging products used by the customers, it started to make sense to rather have the containers returned than to pay for the disposal thereof. The implementation of this private company's take-back policy allows them to retain or expand their markets for several products and develop new business opportunities. It buffers the company from potential threats, and bridges its business strategy and environmental concerns in ways that strengthens their market position. This is also a very good example of **Producer Responsibility** taking up the challenges of environmental management.

The executive in a business plays a key role in incorporating personal values into the strategic decisions of the firm. Guth & Tagiuri (1965) signify how the personal values, that are most

important to an executive, have a profound influence on his strategic decisions. It is also important for a manager to focus on the relationship of those reporting to him and to the nature of alternative strategies. Executives who take steps to better understand their own and other people's values can gain an important advantage in developing workable and well-supported policies and strategies. Guth & Tagiuri (1965: 127) says that "corporate strategy is an explicit and shared set of goals and policies defining what the company is to achieve and become in the future and how it must operate in order to reach its goals". They also point out that executives, in the absence of strategy, tend to behave in accordance with their own concepts and in turn, their own values. Until a clear strategy has been set and agreed upon amongst all the managers of the business, it might lead to conflict and disorganisation in the company. Incorporating sustainable waste management programmes in corporate strategic plans is required to make it effective.

3.3.5. Summary of management and leadership

The **soft systems methodology** (Checkland, 1981) starts off with an urge to bring about improvement to a social system in which there is felt to be an ill-defined problem situation. Then express it by examining elements of structure and process, and their mutual relationship. The root definitions of relative systems must then be formulated and conceptual models of those systems be built. The conceptual models will be improved by using the formal systems model. The conceptual models must be compared with **the real situation** and the comparisons used to define desirable, feasible changes in the real world, and finally implementing the agreed changes.

Integrated waste management in developing countries (Yap, 1999) seems to be given the least attention by its leaders as long as they remain in survival economic mode. This fact distinguishes first world and developing countries from each other in achieving sustainable development. Momentum is only achieved where societies and government participate and leadership develops. Managers according to Drucker (1976: 453-454) "have power over people and their decisions have great impact upon society, and that they have to make decisions that shape the economy, the society and the lives of individuals within it for a long time to come". This power of managers or leaders also relates to sustainable development in the environmental sense of the word. Leaders and managers therefore need to be educated and trained to update their value systems to understand the requirements of sustainable waste management. The best personal value adjustment efforts are driven by small teams that include the CEO or any founders, who are still with the

company, and a handful of key employees. It is established that apart from education some incentives need to be added to move the business or society into ecosystem management. However it is often possible through identification of similarities and differences in personal values, to design a new, alternative, **strategy** that will satisfy all concerned.

The types of managers required are **transformational leaders** who motivate their followers to perform beyond expectations by activating the follower's higher order needs, fostering a climate of trust and inducing followers to transcend self interest for the sake of the organisation. The primary factors of the transformational leadership model include charisma or idealized influence and inspirational motivation as well as intellectual stimulation and individualised consideration.

There are operations, however, that give no heed to environmental management. How should this problem be dealt with? Non-economic objectives need to be developed to reduce the environmental impact a business will have on the ecosystem. There are good examples (Wilson, 1996) emerging of innovative methods used by business to create **green policies**. Companies that endeavour to translate broad corporate green policies into Environmental Management Systems are required to understand these forces and develop a vision of the future, and articulate operational strategies for achieving them. Wilson (1996) in researching the use of policy measures **to move waste management up the hierarchy came to the conclusion that a balanced strategy needs to combine information dissemination mechanisms, legislative sticks, producer responsibility, other economic sticks and economic carrots**.

The prime motivator making leaders, especially in developing countries, aware that a problem exists in terms of sustainable solid waste management, is the issue. This awareness is often brought about by pressures from other more developed countries and lobby groups. This pressure is (Minkes, Small & Chatterjee, 1999; Juholin, 2004) leading to corporate social responsibility (CSR) becoming topical in contemporary leadership styles and making financial gain not the only business objective.

Leadership within companies is well aware that financial growth determines their success rate. This is creating wealth for the stakeholders of the firm. The belief systems of leadership within companies, government and other NGOs will only create strategies for sustainable solid waste management once they realise and apply the total concept of integrated waste management through **economics**. The aspects of the interaction between integrated waste management and economics

can form part of the application of Game Theory (Harvard, 2004) that seeks to explore how people make decisions if the actions and fates depend on the actions of others. Applying the correct economic measures having an influence on the total life cycle of a product or service leads to sustainable development. The Triple Bottom Line concept is an effort to move leadership of businesses in the correct direction through the use of economic factors.

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4. CHAPTER 4: ECONOMICS AND SOLID WASTE MANAGEMENT

Sustainable waste management is the result (McDougal, 2001a) of projects that comply with the three parts of the triangle being: socially acceptable, environmentally friendly and economically viable. As far as business performance is concerned it is also known as the Triple Bottom Line. The introduction to this research is contained within chapter 1 whilst chapter 2 deals with solid waste management perspectives and analysis systems which aspire to the **environmentally friendly** part of the sustainable triangle. Chapter 3 explores the soft issues surrounding the corporate governance of waste management from personal belief systems through to corporate leadership and strategies and builds on the managerial aspects and by implication the **social parameters**. This chapter 4 is an investigation into producer responsibility and the **economics** leg of the triangle but cannot be divorced from the socio-economical aspects of solid waste reduction management. Despite the various aspects of waste management, legislation always seems to form the linkage that regulates societies. Environmental resource economics lies at the heart of this chapter and becomes part of the fundamentals of the theories being developed.

4.1. Fundamental environmental economic processes

The Palmer Development Group (1996: 3) report "although there are standard activities within the waste management process, solid waste management systems cannot be planned according to universal principles but need to be adapted to prevailing physical, cultural and economic circumstances of the communities which they serve. Clarifying a conceptual framework thus provides a point of reference against which circumstantial factors can be measured". Here the authors create a philosophical framework within which the aspects of physical, cultural and economical circumstances of the community are mentioned as being important. It argues furthermore that the plans have to be adapted to the specific milieu of the community. This report does not include the forces international waste economics have on local plans. Examples are developed countries using poorer countries as the dumping ground for their waste together with payment of some sorts to governments or individuals.

A rating of the waste management aspects or factors that would lead to or augment success is being searched. Trends observed throughout the world indicate that less developed countries are

unable to affect solid waste reduction programmes on a sustainable basis. For example Sangodoyin & Ipadeola (2000) studying hazardous waste management in Nigeria find that many respondents of commercial operations are ignorant of the waste from their processes and factories. The respondents did however also attest to the fact that some chemicals used are corrosive. It was also a problem conducting the research as the return rate for questionnaires was very low, but informal interviews reveal that wastes are rarely reused and often disposed of indiscriminately. Wastewater is thrown onto open spaces in front of shops or salons. At best, such systems are linked with the open rain system, polluting water systems. This highlights the major problems experienced with the lack of environmental concern in the developing countries. People do not seem to be concerned and at best the lack of education contributes to this situation. Research done in Zimbabwe reports similar problems noted with the lack of waste reduction management. Johnson & Wilson (2000) account for the institutional sustainability, community and waste management in Zimbabwe through their endeavours to instil sustainable development within this third world country. They spent a month in Bindura, which is about 80km from Harare testing a hypothesis that a learning orientated framework could be used to investigate social dynamics of development interventions and enable participants to begin a process of building institutional sustainability. The solid waste management (SWM) problems being experienced in Zimbabwe are ascribed to the rapidly increasing quantity of waste generated per capita and is fuelled by population growth, urbanisation and lifestyle changes. Ways of disposing or dealing with waste are inadequate. Landfill is a problem because of the difficulty of finding suitable sites, and the lack of resources within the public sector as the sole provider of services. Other problems experienced are inefficient waste collection due to the use of obsolete equipment, which frequently broke down. Access to urban areas proved difficult, as owners seldom bring out the waste in time to be collected, in addition to the inaccessibility of certain areas. Therefore very little recycling is being done in the country. Many workshops held with a large number of stakeholders such as regional government, non-governmental organisations and other social institutions turned out to be fruitless. The major problems identified are the lack of funds, households not separating their waste, no recycling taking place, and owners of waste expecting to be paid for their contributions to recycling. The hypothesis was therefore not supported, as neither local government nor society had the means to progress the project and generate sustainable development. Here we observe that state of the economics and lack of education seems to play the most important role in the failure of the waste collection processes in the face of organisational and governmental attempts.

There are many contributing factors that increase the solid waste in developing countries. Examples are the notion of international practices where developing countries are used as dumping grounds. Duraiappah, Xin, & van Beukering (2002) uses an optimal life cycle (OLC) model to research the Chinese plastic sector production, recycling and international trade. They highlight the existence of increasing pressures by governments and NGOs to restrict international trade in secondary material waste, because in reality, this might be a disguise for waste dumping by the exporting country. It is reasoned that some of the secondary waste could be utilised by the developing country to support economic development, and that such trade might be useful, but under a number of stringent conditions. It is a matter of control, leadership and good management.

Many examples in the literature (Holmes, 1984) quote recycling or waste disposal plants that are donated to developing countries and never start operating, or if they do, discontinue operation and become white elephants. The question is **why these projects failed**. Researchers are still endeavouring to discover interventions that would augment sustainable solid waste management in developing countries. This research explores the fundamental requirement for effective solid waste reduction management in developing countries as being for its leaders to understand that economic processes form the cardinal base of success. In other words, that economics underpin all activities as it seems to be the only motivating factor that would create sustainable development.

The above examples of solid waste reduction failure do not really address the economic issues involved. Some indicators, such as owners of waste expecting to be paid to separate waste and obsolete equipment being used, refer to some of the economic issues involved. Leadership, recognising economic factors such as collection costs and recycling opportunities, would bring waste reduction closer to reality. The above examples indicate the lack of leadership from government, communities or private businesses. Momentum is only achieved where society and government participate and ecosystem leadership develops. Integrated waste management in developing countries seems to remain at the bottom of the population's priority list as long as they remain in economic survival mode.

From all the literature studied few references could be found that point towards economics forming the basis of success. Many articles, such as the following, list other factors together with economics. McDougal (2001a) indicate that (environmental) sustainability could be thought of as a triangle with the three elements, being environmental effectiveness, economic affordability, and social acceptability. Sustainability is about balancing these three elements, and a stable balance

requires all three of these elements to be considered equally. The problem lies in finding this balance. Social acceptability often underscores environmental effectiveness and economic affordability. Communities frequently simply accept non-performance in terms of SWM in stead of addressing the economic factors and making the project sustainable. Many participants are less inclined to assist the programmes to its logical conclusion, for selfish or economic reasons.

Many definitions of waste management contain the same message and are **idealistic**. Such as (McDougal, 2001a: 143) **integrated waste management** is defined as "an overall approach to waste management; it combines a range of collection and treatment methods to handle all materials in the waste stream in an environmentally effective, economically affordable and socially acceptable way". This is the idealistic outcome. This balance is not easily achieved in the real world. Another such definition is Hediger (2000) describing the general definition for sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This author also provides a more precise definition as developed by the World Commission on Environment and Development (WCED) as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations". There are some fundamental principles of sustainable development that require review from an ecological and economic perspective. Hediger (2000) also shows that there are different paradigms for sustainability that are referred to as **weak and strong sustainability principles**. Weak sustainability requires that the welfare potential of the overall capital base remains intact. Strong sustainable development requires that the adverse impact on the quality of air, water, and other natural elements be minimized so as to sustain the ecosystem's overall integrity. One possibility is that the correct application of economical factors would draw the other environmental aspects in line.

There are some examples of economic processes that are used in solid waste management. Often, a **carrot-and-stick** approach is required to encourage sustainable economic processes. Kulshreshtha & Sarangi (2001) state that market generated deposit-refund systems are almost absent in developed worlds whilst still being quite popular in developing countries. The reasoning is that in developed countries cheaper technology and the convenience of disposable (single use) containers make it possible for firms to move away from the voluntary deposit-refunds of the 1960s. Increased environmental concerns however, is leading to the subsequent introduction of mandatory deposits in many parts of the world. These authors suggest that the product side of the market,

especially issues relating to the market structure, require further study, and that it would be noteworthy to study the different aspects of oligopolistic markets (large and few producers) and their welfare implications. This refers to **hustlers** (hoarders) who collect waste and return it to recover the deposits as a way of earning an income. Results of price and quantity competition in the product and recycling market, or a perfectly competitive recycling market within an oligopolistic product market are possible extensions to further studies. They do show that often firms brand their own packaging, thereby exercising monopsony (several waste sellers but single buyer) power over buying back their own packaging. The various economic factors that need to be considered are issues such as the size of **deposit-refund schemes**, monopolistic or oligopolistic markets, marketing of packaging and other applications for waste products other than recycling e.g. re-use of the waste for other applications. The role of hustling in the recycling of waste definitely plays a major role and works only if the financial gain outweighs the collection effort.

Another example of economics at work is described by Barde (2000) in *Environmental policy and policy instruments* relating how many countries apply green tax reforms and move towards **eco-taxes**. This is a powerful economic instrument to encourage compliance to environmental principles as well as creating a source of income to government. Some problems arise when governments use it more as a source of income than for solving the actual commodity waste problem.

Some research and systems do address sustainable economics as an important aspect. Industrial ecology, as an emerging concept (Ehrenfeld, 1997) plays several roles in shaping technological change as manifested in products. In its present state of evolution, industrial ecology takes many forms. For some, it is a new powerful analytic framework, capable of capturing the systematic and dynamic characteristics of social economic systems.

Various aspects of environmental resource economics are being researched. Ehrenfeld (1997) focuses on environmental concerns indicating that a number of alternative systems of thought have emerged in recent years. They represent a succession of worldviews, each moving closer to a unity of man and nature. The author defines the **economic-environmental paradigms** over three parts:

- Frontier economics which contends that earth is limitless and environmental problems, as we know them are absent. Sustainability is not a concern,

- Externality Control (environmental protection) in which earth is an open system and environmental problems are **failures in the economic system**, yet sustainability is not a concern and the future can be protected by interventions in the market through policy strategy,
- Resource management whereby earth is seen as a closed economic system and the mismanagement of resources is an externality to be internalised and a policy strategy is required through economizing ecology or getting the price right with technological optimism and clean technology.

This is further illustrated by Chertow (1998), who defines **industrial ecology** as being based on the principle that environmental protection and economic prosperity are both desirable ends. Chertow refers to the definition used by Graedel & Allanby (1995) "Industrial ecology is a systems view of industrial operations in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product, and to ultimate disposal. Industrial ecology focuses on all human activity and how it connects to the bio-physical environment from which we obtain resources and into which we place our waste". The problem with the above-defined industrial ecology in achieving success is that it generally operates well within developed countries. The less developed countries are unaware of this approach.

There is also the role that people play in sustainable development. Kulshreshtha & Sarangi (2001) point towards two kinds of individuals in the population, being consumers, of which one type has a lower marginal disutility (or cost) from recycling than the other. This is the case where only some consumers return products for which a deposit was payable. These consumers also reduce the cost of recycling by assisting with the return of packaging, resulting in reduced street litter.

The role of international economics in sustainable development is also illustrated by O'Neill (2001) who relates to the *Changing Nature of Global Waste Management for the 21st Century* and questions it as a blessing. He reasons that the development of **regulatory problems** and increasing development of required reliable storage, transport and disposal practices, including encouragement of waste minimization, are costly for industries. It is also difficult and costly for governments to enforce. Wastes are likely to be exported from rich countries to poor countries with weaker environmental policies and it is less likely for environmental regulations to be altered due to powerful constituencies in all countries who oppose such moves. This creates pollution havens, which act as receivers for excess waste generated in rich and developed countries. There is also a problem with developing countries improving environmental regulations due to long

delays in implementation, **weak enforcement capacities** of the governments and international agencies influencing the process. Fortunately, the author also highlights a growing influence of non-governmental organisations (NGOs) and environmental groups that are becoming more active and influential in international environmental issues. The point remains that the initiatives are not brought forth by the developing countries themselves, as these international bad practices of shipping waste to less regulated countries is benefiting somebody who prefers the status quo to remain.

From the above it seems as though all sustainable environmental issues revolve around economics and not so much personal value systems or internal environmental pressures, especially in developing countries. It is up to **leaders** to recognise this aspect before attempting any environmental programme. Getting the economics right will change matters for the better. The other two aspects of sustainable development such as a project being socially acceptable and environmentally friendly are probably dependent on the success of economic affordability from an operational point of view.

Stedge (1996) develops a costing model measuring the cost of solid waste disposal versus the options of criminal enforcement. This research refers to **regulatory enforcement versus subsidies**. The results prove that if policy makers are concerned with the total costs and there are no public budget constraints, then subsidies are found to dominate. If however, official concerns are the gross or net public cost due to budget constraints, then enforcement dominates. In most cases of waste management policies, the subsidies obtained from taxes or levies on the sale of product are being paid to waste handlers (collectors and processors) and not to waste generators. Importantly, it is also demonstrated that the demand for goods would remain price inelastic as long as the **environmental levy** remains small in relation to the purchase price. Recovering therefore the **full life cycle cost** of a commodity that includes the disposal and recycling cost are less difficult than producers believe. Consumers will accept a small disposal fee. This is always the fear of manufacturers when taking up their producer responsibility and needing to recover the additional cost from the only source of funds, which is the consumer. Stedge (1996) utilizes the waste tyre disposal policy options as applied in Virginia State USA to demonstrate the critical balance between taxes raised on tyres sold, transport fees, tipping fees and charges made at landfills for dumping of waste and scrap tyres. Included in this reference is the legal cost of enforcement that is on the whole a hidden cost to the state.

In a publication by the South African Department of Environmental Affairs and Tourism (1993) Claassen (1996) report that environmental waste management needs to compile alternate strategies including the use of market base instruments (MBI). MBIs are economic instruments that are developed in literature on environmental resource economics. Claassen (1996) also recommend the use of cost benefit analysis (CBA) for setting environmental standards. Under MBI a number of policies are identified and include the following:

- Resource charges that are applied to the use of non-renewable resources,
- Product charges, such as taxes on leaded petrol,
- Deposit refund systems, encouraging the return of containers and bottles,
- Process charges, permitting certain operations and manufacturing,
- Emission taxes to control lower levels of pollution such as sulphur dioxide,
- Security deposits on hazardous substances,
- Fees on final waste disposal to the environment to fund collection and recycling cost,
- Product subsidies, for example production of wind energy,
- Investment subsidies to encourage cleaner technologies,
- Activities subsidies, to promote establishment of nature conservation,
- Research and development subsidies,
- Marketable permits, relating to environmental quotas, allowances and ceilings of emissions, including fishing quotas,
- Resource charges to facilitate the effective use of natural resources such as water and forests.

Claassen (1996) also signify that an economic instrument (MBI) can only be effective if:

- It leads to a change in behaviour,
- Prevents negative effects at source,
- Takes the full life cycle of a resource or product into account,
- Does not transfer negative effects from one environmental medium such as air and water to the next,
- Optimizes the use of non renewable resources by encouraging the introduction of more efficient technologies,
- Promote re-use and recycling,
- Encourage sustainable levels of renewable resources to be employed more efficiently.
- Protect future resource potential including changing life styles of people,
- Whenever possible, focus on causes and not symptoms.

Economic efficiencies concern the degree to which environmental objectives can be achieved and these MBIs need to:

- Minimize the cost to authorities to ensure standards are enforced,
- Do not place excessive cost burdens on private enterprises.

MBIs will be unacceptable if they have a significant impact on the poor or private enterprises.

Market base instruments are important and powerful tools to create sustainable solid waste management because these are economic motivators moving individuals, corporate and governments to follow best practices. The underlying contention is economics.

4.2. Business and the waste management environment

An example of businesses using sustainable development to their economic advantage is quoted from Lovins, Lovins & Hawken (1999: 145) "in recent years farsighted companies are finding powerful business opportunities in conserving resources to reduce manufacturing cost. They are embarking on a journey towards natural capitalism that comprises four major shifts: The first stage involves increases in productivity of natural resources. The second stage relates to adapting closed-loop production systems that yield no waste or toxicity. The third stage requiring fundamental changes to the business model from selling products to one of delivering services and as a last stage involving re-investing in natural capital to restore, sustain, and expand the planet's ecosystem". The above revolves ultimately around economics which in the competitive world is forcing businesses to evaluate their operating costs and at the same time become eco-friendly.

4.2.1. Producer responsibility

Many countries are experiencing a major growth in solid waste. It is complicated by history and various views on who should actually be taking care of waste abatement. Wilson (1996) in researching the use of policy measures to move waste management up the hierarchy comes to the conclusion that a balanced strategy needs to combine information dissemination mechanisms, legislative sticks, producer responsibility, other economic sticks, and economic carrots. The omission here is emphasising the importance of producer responsibility being the route.

Private enterprise is always more effective in launching projects than governments and the same applies to the producer responsibility. This is especially true in less developed countries, where subsistence economies are still the order of the day. To be effective **producer responsibility** has to be mandated by law to ensure all within that product group comply with the agreed environmental processes. Producer responsibility is the single most important factor or tool moving solid waste reduction up the hierarchy ladder. Coggins (2001) summarises the issue of shared responsibility of waste prevention amongst UK producers and consumers. The emphasis on waste management to date has been on end-of-pipe options, such as recycling, and end-of-pipe measures, such as recycling rates. The shared responsibility for waste reduction needs to become one of **resource management** rather than waste management. The 1994 EU packaging directive places obligations on various parties in the packaging chain and is the first example in Europe of producer responsibility. This responsibility ceases at the point of selling the (packaged) product. A second responsibility involves consumers through education, and publicity for more take-back schemes, and proposals to encourage households to reduce and recycle their waste. A third aspect of responsibility is referred to as **extended producer responsibility**. This includes over and above waste management the choice of resources and the design of products. The ultimate aim is to promote integrated product policies where all products are designed in the context of cradle to grave evaluation. This includes economic and environmental costs and benefits, using such tools as Life Cycle Analysis and Value Chain Analysis. It is noteworthy that qualitative waste prevention can be introduced in parallel with waste reduction through consumer behaviour. This is for example using products containing less hazardous material, products containing recycled materials, longer life products, and repairable products, leasing or hiring the products, as well as buying refill packs, buying less packaging, avoidance of disposable packaging or items, using electronic information instead of printed paper and opting out of receiving junk mail. Economics will drive this process.

Mayers & France (1999) summarise the latest trends in integrated waste management since the 1980s, being various governments moving towards a new market-based approach to waste management known as **Producer Responsibility**. This is a direct application of the **polluter pays principle**. The aim of producer responsibility is to encourage more sustainable patterns of production and consumption by **internalising the external costs of environmental degradation**, including costs of waste management, to the cost of products and services. The sales price of a commodity often doesn't contain the cost of waste collection and recycling once the product becomes waste or not fit for original intended use. The producer responsibility approach is

developing along with the support for the polluter pays principle, and recognition of the need to improve the management and recycling of waste as agreed at the Rio Earth summit in 1992. Mayers & France (1999) also propose **that producer responsibility will only be effective under legislation**. The fact is that producers do not willingly take up their producer responsibility. Under legislation there are well-defined price mechanisms and that makes everyone within the industry participate, resulting in the appropriate level of environmental improvement. Examples are green fees raised on every sale in the form of a separate line item, similar to sales tax procedures. This prohibits unfair competition between manufacturers and suppliers who comply and raise fees or levies to cover the cost of integrated waste management versus others who do not raise fees. Producer responsibility itself does not intend to address the full life cycle of a product. It merely reinforces the orthodox view of the hierarchy of waste management which is in descending order of re-use, recycling, and incineration with energy recovery being preferable to disposal in landfill sites. As an example, Mayers & France (1999) signify three main approaches for the collection of electronic products, being:

- Municipal authorities establishing collection systems,
- Retailers taking back old products from customers on the sale on new products, or
- Industries establish collection systems and take back products directly as part of commercial agreements.

The producer responsibility aspect generates (Mayers & France, 1999) three issues that require planning:

- Financial responsibility for the collection cost,
- Responsibility for the managing part of the recycling train and,
- The operational responsibility to contract recyclers and the collection process.

Aspects to be considered are also the responsibility for segregating the waste and delivery to collection systems, retailers collecting old products, and producers redesigning products and services and establishing collection and recycling schemes. The aspects of funding mechanisms could be a fee administered to end users for the disposal process or local taxes charged to the general public or costs included in the price of the product. Various countries such as Italy do enforce legislation requiring industries to set up collection systems free of charge to the end user.

Germany proposes a combined approach with a fee to the end user to fund the municipal collections and increased product prices to fund industry recovery schemes. Denmark proposes a similar arrangement except that the collection funds are obtained through local taxes. Sweden, with their eco-cycle proposal, has local authorities recovering their collection cost through charges

to the industry. Mayers & France (1999) offer a proviso that the price increases required to fund the collection process, need to be realistic and only cover the actual disposal costs to fit in with the ethos of the producer responsibility. The inclusion of costs for the recovery of previous products sold (including old waste stockpiles) before the implementation of the directive, could distort the price signals. This is often required by legislation in dealing with the problem of waste already in landfill sites or discarded throughout the countryside.

Taking up the producer responsibility by an industry always results in an increase of the commodity price to the consumer. Within the economics of production and selling, there is no other source of funds to pay for the collection and recycling responsibilities placed upon the producer by producer responsibility. Governments in general are not willing to bear the cost. What the Italian regulations do, as indicated above, only results in the inevitable inclusion of the cost in the price of the commodity, even if recovered by the producers at a later date. One of the major problems in this regard is funding the legacy-of-the-past in cleaning up existing discarded product waste. The question always arises, **who pays for cleaning up present waste stockpiles**. Various methods of funding are applied and usually end up as a combination of sources, such as from consumers via producers, governments or donors. In the end it all relies on economic incentives to make it work.

The problems associated with cost, effectiveness and finding an environmentally friendly solution arise as soon as producer responsibility is discussed. This also forms part of certain regulations that impose problems on industries. There seems to be a fine balance between social responsibility, economic incentives and legislation.

4.2.2. Extended producer responsibility

Extended producer responsibility includes over and above waste management the choice of resources and the design of products and is not something that businesses would willingly embrace. Handy (2002) narrate how some American and European companies act responsibly in serving the community, but that these remain in the minority. Capitalism continues to be seen as the rich man's game, serving mainly itself and its agents. Additionally democratic pressure may force governments to shackle corporations, limiting their independence and regulating the smallest detail of the operations. Handy concludes that we shall all be the losers. Producer responsibility

brings about its impact on belief systems. Corporate core values should, according to Lencioni (2002) be integrated into every employee related process. Employees should be constantly reminded that core values form the basis for every decision the company makes. After a company has embedded its values into systems, it should promote those values at every turn. **Incentives** are required to move companies and industries into extended producer responsibility.

Complying with extended producer responsibility creates its own challenges especially in commodity sectors containing additional phyto sanitary requirements or severe competition. Paul & Strout (1997) report that on average, most healthcare facilities are doing less than they should in the area of source reduction and recycling, and will likely do so until mandated by law. The main reasons for this are ever-tightening health care budgets, limited staffing and the high cost of operating health care producer recycling programmes compared to the cost of general solid waste disposal. This denotes the economic balance between the cost of waste reduction and the disposal thereof. Often government intervention is required to seed the integrated waste management process. Vigneswaran, Jegatheesan & Visvanathan (1999) describe the problems experienced in Thailand with manufacturers endeavouring to comply with specific effluent standards and are forced to treat their waste before disposal. Nonita Yap (1999) refers to **cleaner production** as a route of sustainable economic development. Many African governments see industrialization as indispensable to their ability to achieve national development goals. Cleaner Production (CP) is defined by the United Nations (Yap, 1999: 166) as "the conceptional and procedural approach to production that demands that all phases of the life cycle of a product or of a process be addressed with the objective of prevention or minimization of short- and long-term risks to human and to the environment". This provides a win-win solution as cleaner production approaches by industry creates opportunities for reducing the cost of production and therefore improving industry's competitiveness. It also reduces the cost to governments of enforcing policies and improves environmental quality within and beyond the work place. Cleaner production strategies enable firms to reduce its waste. More raw materials are converted into product and waste and other by-products become raw materials for other producers.

According to Holmes (1984) and Yap (1999) developing countries generally fail to initiate sustainable solid waste reduction programmes. Therefore the question that arises is: what would seed the process to start such programmes? To this end developing any process **requires leadership** as we are dealing with people. Finding environmental orientated leaders should be the focus of governments, which are normally politically orientated, or of societies or businesses.

Again as indicted by Yap (1999) politicians in less developed countries tend to fail in strong leadership, as they are normally too busy (The Economist, 2004) furthering their own careers and wealth without much care for the general environment. Political views often cloud government officials' environmental leadership skills, as they tend to take the easy or popular political route. Generally leaders within society have little influence over the starting of large environmental projects especially in poorer communities. It is often the case that the government of the day ignores the plight of the general public. The only other leadership groups available are the leaders within businesses. They could use their influence and marketing skills to engage in projects using their goods or services to promote environmental programmes. There is thus a combination of incentives required to move business leaders towards extended producer responsibility and utilise the entire life cycle of their products to achieve sustainability.

4.2.3. Risk management within ecosystems

Risk assessments are now frequently used (Morris, 2002) to evaluate environmental related proposals before implementing any plans. The general goal of risk management within strategic planning is to assess, plan, motivate and control either financial or business risks within any given business. The plans and actions decided upon in terms of integrated waste management or ecosystem management programmes create their own financial or business risks. The **Systems approach** described by Checkland (1981) indicates how **hard systems** such as engineering can be dealt with by means of systems engineering or systems analysis. Analysis of many different cases shows they all assume that problems can be solved by the making a choice between alternative means of achieving a known end. The (previous) success of systems engineering then led to many attempts to use the same concept to solve problems of social systems, including those formulating public policy. These failed in many instances. The concept of human activity system is relevant to tackling **the soft ill-structured problems of the real world**. In soft type problems the designation of objectives is in itself a problem. Not surprisingly, hard systems thinking were not usable with these problems, which were always those of a kind to which the concept of human activity is related. Some analysis tools used to improve the design efficiencies of systems, such as **systems engineering**, create a risk in itself, if extended, and used to improve environmental problems in which human activity is involved. Shrader-Frechette (1998) in the discussion of what risk management teaches us about ecosystem management, signify a contemporary risk management community, which is witnessing a dramatic battle between environmental

hypochondriacs and industrial cannibals. The environmental hypochondriacs often argue that only zero risk is ethically and environmentally acceptable. They forget that virtually nothing has zero risk. On the other hand, industrial cannibals frequently maintain that almost any level of risk is justifiable, provided that the economic benefits are substantial enough. There are two main approaches to eco-system management. The first is based on ethics and the traditional **eco-system management** paradigm and the second an approach based on **ecological risk assessment and eco-system management**, which is more comprehensive. General strategy management has moved from expert determination to stakeholder participation. Eco-system management needs to make the same transition. The holists' believe that we manage health and environmental risks by reducing them and by enlisting the active participation of stakeholders in risk management. It is of importance that management of businesses has therefore over the past century moved from purely profit driven operations to strategic management within eco-system management. The process of managing the ecosystem moves away from individuals reaping all the benefits towards locals sharing in the economic activities created. This is a fundamental shift of the paradigm.

Problems are encountered (Morris, 2002) with environmental scanning during the process of gathering information as it could lead to incorrect conclusions. Morris (2002) in analysing the relationship between risk analysis and the precautionary principle role in the environmental conservation decision-making process quotes the risk as ubiquitous and unavoidable. Two approaches are followed utilizing the precautionary principle (PP), which is directly observing risks or assessing them together with management through heuristic processes. Direct observation is often insufficient to establish the nature and extent of risk. In such cases reliance is placed on institutions, especially reputations and the rule of law. Indications of the four different sectors dealing with environmental risks are:

- The public which is by nature informal and heuristic (trial and error) or,
- With the private sector and corporations that balance costs and benefits to avoid risks,
- Manufacturers and retailers who avoid legal action to protect their reputations and,
- The forth and last, public sector relating to politicians who seek to maximize re-election and claim credit for good outcome.

Morris (2002) point out that applying the PP might have devastating consequences such as retarding technological development, undermining trade, slowing economic growth, and ultimately exposing people to higher levels of risk. The PP would also force decision makers to give more weight to the misanthropic views of environmentalists and other undemocratic pressure groups

who claim to speak for the public. It does seem that common sense often has difficulty in prevailing as a result of the above pressure groups that play a role in the environmental conservation decision-making process. Risk assessment with ecological programmes has a role to play during the evaluation steps of a waste management project but has to be used with caution. Environmental groups often have their own agendas based on the idealistic situation and refuse to accept sound reasoning. This makes following purely democratic approaches to waste projects difficult during the design phase adding to the risks in getting the project off the ground.

Garrick (2002) reports on the use of risk assessment to evaluate waste disposal facilities in the United States of America (USA). It follows that contemporary risk assessment methods are starting to be used, especially by regulatory agencies. The primary purpose of the risk assessment of solid waste is to provide a technical base for setting standards. These assessments are sometimes used to evaluate specific design features of solid waste disposal facilities, such as liners for a disposal site. These practices are really just the beginning of the assessment tools being used in solid waste management. Risk assessment leads to reducing the risks and ultimately, the future financial costs. It points to the practicing of good economics and preventing future social problems as well.

4.2.4. Conclusion of business and waste management

Risk management should be included within all integrated waste management programmes to avoid unacceptable outcomes. The use of risk assessment to evaluate the outcome of waste reduction projects in terms of environmental friendliness, social acceptability and economic acceptability, can be valuable. It should be a measure of the sustainability of the project.

Producer and extended producer responsibility has its advantages as a basis of solving solid waste problems. Much can be done to reduce the impact of product manufacturing and use on the environment. Nielson & Wenzel (2002: 247) says that "significant environmental improvements can often be achieved by integrating environmental properties as an optimization parameter in product development, together with more traditional values such as production cost, functionality, aesthetics etc". Nielsen & Wentzel (2001) also indicate that quantitative **Life Cycle Assessment** (LCA) methods are used to identify environmental hotspots in a reference product's life cycle and are used to select new environmentally optimized solutions for a new product. The environmental

performance of a product or a service is determined as a sum of all impacts throughout the product's life cycle.

From the above it seems that extended producer responsibility might be the only method to move solid waste reduction programmes up the hierarchy ladder in less developed countries and make the process sustainable. The reason for this is that the private sector seems much more enterprising in getting things done than governments. The means to this end may be legislation forcing producers to take up their producer responsibilities.

4.3. Environmental resource economics

Environmental resource economics (ERE) as a science forms part of environmental resource management. Claassen (1993) summarise environmental resource economics to include firstly a natural component and secondly a human component. The natural resource component contains geological resources with economic value (minerals), productive value (soils), aesthetic value (landfill) and assimilative value (waste absorption). It also contains flow resources with life support value (water, air), aesthetic value (clean air, water features), and again assimilative value (waste absorption). Finally, it contains biological resources with nutritious value (plants, animals), production value (ecosystems), conservation value (biodiversity) and aesthetic value (specimens and ecosystems). These resources can be classified as either renewable or exhaustible resources. Claassen (1993) also signify the second component of environmental resources to include the human component with skills containing production value, processes with efficiency value, technologies with creative value, economic with monitory value and ethics with normative value. Human resources are a vital component adding value to natural resources through the application of skills, processes and technologies. **Economic and ethical norms** are the determinants of resource values. Environmental resource economics treat natural and human resources as capital with the income being the added value arising from the utilization of those resources. Economics seem to be the common factor or thread sustainable development depends on for ERE to be correctly applied.

Publications indicate (Claassen, 1993) that one of the main reasons for the gradual decline in a country's environmental quality can be attributed to the fact that the values of its environmental resources are not always fully reflected or internalised in the transactions that are made. This is an

important aspect. Consumers do not always pay for the full life cycle cost of products or services used by them and this shortfall is therefore subsidised by the environment in one way or another. This results in environmental cost such as pollution, derelict land and general deterioration of natural resources. It is also shown that **economic techniques** can often be used with the implementation of future policy and formulation of alternative strategies to deal with environmental resource management.

Communities do not always appreciate the value and associated cost attached to resources. McDorman (1999: 48-49) points out that "there are signs however, supportive of the **cornucopian theory**, that people may be changing their position. American businessmen said in 1965 the thing that bothers them is people regard air and water as something that is free. When you pay your rent and your taxes, you find out how 'free' they are. Water is probably one of the most expensive commodities we have .... When public monies invested in reforestation, restocking of fish and game, rebuilding of soils, preventing erosion, purifying streams, and controlling air pollution are combined with private investments made to purify water and air or maintain soils of forests, only one conclusion is possible: there is nothing free about any of these goods. The businessman who calls them: 'expensive commodities' is absolutely correct. The free goods have moved into the cash economy". Any economic calculation made should therefore include the real cost of all the resources.

The success of any sustainable environmental plan is determined by the measure of sound economics within the business and its relations to the social structures within which it survives. Some background to business is formulated by looking at the profit motives of firms over the past years. The main purpose of a business is to generate money. Anshoff (1982: 17) defines a business as "the adjective business has traditionally meant that the firm is an economically or money motivated social organisation. This implies that a set of objectives or purposes can be identified in most firms". Williamson (1985) in *The Economic Institutions of Capitalism* indicates that complex organisations commonly serve a variety of economic and non-economic purposes. Companies during the early 20th century were mainly concerned with the law, economics and study of organisations. Williamson promotes the transaction cost approach for institutions, which mainly has the purpose and effect of economizing on transaction costs. The thoughts of operating a business during the early 20th century were mainly reserved by technology and monopoly power issues. Little thought was given to conserving the environment as the industrialization of

production was still in the process of development. Williamson (1985) identifies the m-form of decentralised office operations during the early 1930s as follows:

- Identifying the separable economic activities within the firm,
- Accord profit centres,
- Monitor the efficiency,
- Award incentives and,
- Allocate cash flows to high yielding users.

All of these were performing business planning according to the profit centre concept.

Williamson (1985: 7) also says "during the period 1940 to 1970 the economic activity between firms and markets were characterised as production functions, whilst the markets served as signaling devices, with contracting accomplished through auctioneers. Disputes were also disregarded because of the efficacy of court adjudications". Production drove the markets, not the other way round. Williamson (1985) ascribes the failure of markets and companies during the 1960s to transaction costs not being attained, and problems experienced with information failure. Again the indications are that during the 1960s and onwards, companies were concentrating on transaction costs and endeavouring to produce as cheaply as possible with existing knowledge and technology. Little attention was given to the environment and the huge expansion of pollution that resulted from industrialization during the 20th century. These trends of unabated pollution require intervention. The question is how.

Industrial ecology also forms part of environmental resource economics. Azapagic, Mellor, Wright, Clift & Stevens (2002) deal with industrial ecology, defining it as the development of new approaches to the systematic use and re-use of materials to achieve incremental reductions in resource consumption and waste. Consumers now have greater influence on the way companies react to reducing costs of manufacturing or trading through recycling practices. Kulshreshtha & Sarangi (2001) describe consumers returning products for which a deposit was payable. These consumers also reduce the cost of recycling by assisting with the return of packaging, resulting in reduced street litter. These items provide external benefits to the consumer, who participates in returning schemes. Hustlers (informal collectors) also assist in this regard. They would continue should the refund be of an economical quantity for them to collect waste and return it to **take-back-centres**. Other types of items with external benefits, but not assisting recycling include coupons, food stamps or mail-in rebates. In the presence of an external benefit the amount of recycling induced by a firm can be socially sub-optimal, simply because the private and social

incentives to recycle differ. They also point out that under-recycling could arise due to reasons such as the net cost of recycling being too high for the consumer or hustler failing to return the deposit bearing items. Government intervention is often required to alleviate the under-recycling problem through a subsidy or an additional deposit-refund offer. In this case hustling eliminates under-recycling. These authors Kulshreshtha & Sarangi (2001) create a mathematical model that derives market demands from the consumers' utility maximization problem and are able to relate market outcomes to underlying economic fundamentals. This is an important contribution to environmental resource management as it assesses inter alia the crucial aspects of any solid waste reduction project. Getting the economics right is a major step in sustainability. The authors also establish the link between optimal recycling and price discrimination. The presence of external benefits allows them to go beyond discount coupons and examine socially optimal recycling. Their formulations enable the identification of over-recycling, government intervention and the consequences of hustling in a precise manner. Problems exist with deposit-refund schemes whereby certain containers could be returned to other manufacturers, or even countries, if the refund of the other party is of a considerably higher economic value to the consumer or hustler. These authors specifically analyse the consequences of monopsony power in markets where firms use deposit-refund schemes to promote return and re-use of their own product packages. It is of significance that a consumer's disposal decision requires investigation, due to their options of disposal, of which recycling is one of several. It might be possible to utilise the waste for some other application other than recycling such as soft drink cans used in wall construction or wooden pallets as fire wood.

Competition amongst industries is related to innovation and environmental issues. Carree & Thurik (2000) summaries the industry evolutions and the sudden disappearance of large numbers of firms across a broad spectrum of industries, such as steel, airline carriers, financial intermediaries, automobiles and tyres. An important strand throughout the literature argues that the catalyst for these shakeouts is the introduction of a new dominant product innovation. It is indicated that oligopolistic industries are specifically prone to these trends. These are industries where the capital investment is important, production capacity is relatively fixed and a largely homogeneous good is produced. They also refer to Porter (1980), who discern four stages in the industry life cycle and provide some characteristics of these stages. In the introductory stage, there are few competitors and prices and margins are high. In the growth stage, there are many competitors and prices decrease. In the maturity stage, there is severe price competition, a shake out of producers, and the lowest prices and margins throughout the life cycle. In the decline stage,

there are few competitors and price and margins are low. They also point out that the prices of commodities e.g. tyres are influenced not only by the cost of tyres but also by the degree of competition. In times of severe competition, the prices of the commodities are closer to the cost of the commodities than in times when there is some degree of collusion in the industry. This motivates governments to legislate against collusion and thereby keep prices as low as possible. The above is also an indication that those industries resorting to environmental management issues are often better positioned to reduce costs thereby creating a better image with consumers and the public at large and improving their profit margins. Anshoff (1982: 17) writes that "from a decision view point, the overall problem of the business of the firm is to configure and direct the resource-conversion process in such way as to optimize the attainment of the objectives". He also points out that a firm would eventually run down unless it generates profits. The resource-conversion is changing because firms are taking environmental issues into account these days. This includes greener products and use of recycled materials and renewable energy.

Economics in third world countries operate in a very different manner and often with disastrous effects to the environment. Johnson & Wilson (2000) endeavour to find solutions to creating sustainable development of waste disposal within marginal groups such as found within Zimbabwe. Dealings with civil society, social learning and the transformation of local governance through NGOs proved futile in starting environmental programmes. The total lack of funds and interest by government, as well as the fight for survival within which civil society finds itself, proved to be the causes of failure. Comparing waste management programmes operating in developed countries with the problems of waste management in marginal groups indicates that environmental issues are very low on the priorities of marginal groups in developing countries. Education is lacking and the ERE is simply not functioning.

Wright (1991) demonstrates the importance of the scrap value of waste to the success of recycling. **High value** items such as aluminium, copper, glass and paper create their own financial incentives for hoarders to collect and submit to recycling plants. **Low value waste** requires other incentives such as **convenience and information or economic factors**. Yap (1999) relate how Bata shoes in Malawi through amazing creative and technical simple in-house initiatives within their production facility undertook various recycling, reduction and re-using practices which saved scarce resources. It also established a very good corporate profile and benefited the environment as well. What is particularly remarkable about the Bata shoe factory in Malawi are the initiatives taken in pursuit of public interest in the absence of pressure groups which is a behaviour not normally

associated with multi-national corporations.

Curlee, Schexnayder, Vogt, Wolfe, Kelsay & Feldman (1994) reveal that the number of waste to energy projects in the USA and Europe increased dramatically from the 1980s onwards due to the major cost of land-filling and associated environmental problems. Thereafter, near the end of the year 2000, the waste-to-energy projects then ceased to expand due to the high costs of these facilities and governments restriction of tax exemptions and other financial aid. There are also uncertainties about the potential environmental and health risks involved with waste to energy programmes. It is noteworthy to note that the major reason for this sudden decline of these processes can generally be ascribed to economical problems. A decline in the available waste to be converted to energy can also become a reason for limiting expansion of these fuel derived projects.

Environmental waste management predominantly contains two elements (Claassen, 1993), which are direct control, often termed **command-and-control** or other incentives used such as economic measures to force consumers and polluter to move in a sustainable direction. A combination of command-and-control, economic measures and other issues such as provision of information and training are required to solve environmental management problems. Various extreme views between environmentalists developed during the 1960s. One view, termed eco-centrists, was that economic growth was incompatible with environmental protection and that the only solution lay in zero economic growth using minimum resources leading communities to reliance on organic agriculture. The opposing view was held by cornucopian techno-centrists who argued that freely operating market forces would permit economic development processes to continue. It is also recognised that the debate has now moved away from these extreme positions and that market forces are accepted as playing a key role in the generation of economic development. Poverty is also recognised as an important cause of environmental degradation. Therefore, **economic development needs to be seen as part of the solution rather than the root of the problem**. The management of resources is therefore of critical importance and requires a strategy to deal with sustainable development. The high level of living standards in developed countries is the result of the evolution of economic systems within those countries. The acceptance of a market based approach to environmental resource management favouring economic instruments rather than command-and-control mechanisms is an important step in the process of reconciling economic and environmental goals. **Economic instruments** are listed by Claassen (1993) as charges or taxes, marketable permits, (such as quotas, allowances), deposit refund systems and subsidies. It is noteworthy that subsidies are often required to catch up on environmental debt for insufficient

payments made in the past for services or products utilized. The use of environmental taxes often has a double dividend feature by means of improving the tax collection base as well as forcing polluters to reduce their activities and thereby creating sustainable development. Environmental resource economics view environmentally damaging activities as a normal consequence of economic activity, rather than the result of illegal acts. It is the incorrect application of economics.

Claassen (1993) specify that different approaches are often required within environmental resource management depending on the specific situation. It may sometimes only be necessary to provide information or the use of market related mechanisms whilst other cases require command-and-control measures. A combination of theses various measures might also in some cases be appropriate depending on the specific situation and success depends on getting the right mix to develop sustainable waste management programmes.

Environmental resource economics (ERE) is a subject that is attracting a lot of discussion lately and environmentalists (Blignaut & de Wit, 2004) are realising the cardinal importance it has in understanding sustainable development. Following the above reading, it is the contention of this research that economic development by means of ERE might prove to be the solution to sustainable development. The social and environmental parameters of the sustainable development triangle will then by implication fall in line.

4.4. Consumer buying behaviour

The consumer, being part of the life cycle of goods is placed near the end of the value chain. These days many commodities manufactured and sold are designed to have minimum negative affect on the environment. Their specific recycling capabilities at the end of life cycle play an important part. Bhate & Lawler (1997) research and report on factors that influence the adoption of environmentally friendly products. They concentrate on consumer buying behaviour of **adaptors** and **innovators**. Businesses are eager to satisfy market requirements by utilising environmental awareness as a niche market. Some enter this market to match their own perception of the world, and therefore consider it as their social responsibility. Other businesses utilise environmental awareness as a means to increase profits. They also quote the Economist (1990) saying “the market is flooded with so-called green products, which create suspicion with some consumers regarding the claims of these products. It might be possible to mislead the ignorant consumer, but

it does turn off the knowledgeable". The reason for their research is to analyse consumer behaviour and obtain a clear profile of the **green consumer**. Consumers being researched are **adaptors**, who are passive in their problem recognition, do research and are meticulous in their evaluation with conservative decision-making and post-purchase analyses. On the other hand, **innovators** are pro-active, do superficial research, and are quick and impulsive on evaluation and radical in their decisions, continuously seeking novel experiences. The marketing of green products as a marketing lure seems to be only effective as long as convenience of the buying experience is not jeopardised. The research findings of Bhate & Lawler (1997) confirm that although some consumers might be sensitive to greener products they wouldn't go out of their way to obtain them. There is a limit on the perceived effort and return expectation of the consumer. The social commitments of consumers are limited. Economic matters and other incentives will be required to move them up the hierarchy ladder of environmental sustainable development.

4.5. Social concern and business economics

Is social concern for the environment only now filtering through into boardrooms of businesses and households? Analysing the trend of social concern over the past years provides the following. According to Anshoff (1982) the business firm has basic economic objectives, which are different and distinct from individual objectives of the participants, the managers. It is noted that the economic objectives of the business become more important than the individual objectives of the participants. This creates a problem for those managers who endeavour to promote their social responsibilities through the business. Anshoff (1982) on analysing corporate strategy develops a system of objectives, which he bases on economic objectives, and aimed at optimizing the efficiency of the firm's resource conversion process, and the social or non-economic objectives, which result in the interaction amongst individual objectives of the firm's participants. Anshoff (1982) proposes that the social objectives exert a secondary modifying and constraining influence on the behaviour of management. He also realises that, apart from the economic and social objectives of a firm, two types of influences are exerted on management behaviour. These are responsibilities and constraints. Indications are that objectives relate to decision rules that enable management to guide and measure performance of the firm towards its purpose. Responsibilities are obligations, which the firm undertakes to augment. These could be any social responsibility undertaken by management, which has little to do with the objectives of a business. Constraints are decision rules, which limit the options of the firm. These constraints are often legal obligations

that management needs to abide by. In the distant past few **environmental constraints** were applied to businesses.

Anshoff (1982: 39) also points out that "in reaction to the public outrages at the smash-n-grab imperialism of the nineteenth century, business has acquired a sense of social responsibility to society in general, and participants in the firm in particular …. The objectives of the firm should be derived by balancing the conflicting claims of the various stakeholders in the firm which are managers, workers, stockholders, suppliers, and vendors. The firm has a responsibility to all of these and must configure its objectives so as to give each a measure of satisfaction". It is noteworthy to note that throughout the Anshoff (1982) book, environmental issues, apart from strategic management, are not mentioned. The general public's health at large is also not mentioned. This era of business ethics as described by Anshoff, is generally concerned with profits and less with the environmental pollution that takes place as result of the firm's selfish pursuance of the profit motive, regardless of environmental damage done in the process.

Looking at later years' practices around communities and individuals, Yap (1999) reports the making of compost by households and the major benefits to be derived by household gardens, parks and urban farms. This practice is not applied in Africa and is not making the impact it has in Canada. Similar backyard composting programmes also failed in the USA and Europe. It is possible that although this composting could lead to savings in terms of purchasing composting materials for agricultural uses the advantages could outweighed by the health problems of having composting systems in every backyard. Good modern techniques should be used in reverting to household composting. This would assist in reducing the high content of wet organic material added to landfills causing problems with gas and leacheate.

Beede (1996) indicates three important ERE issues that relate to municipal solid waste especially with regard to developing countries. Firstly, improvements in handling of municipal solid waste at an early stage would be far less costly than undoing the predictable damage to the environment and to human health caused by current handling practices. Secondly, that MSW, which represents undesirable by-products, certainly has positive economic value in terms of creating jobs both in the informal sector such as scavenging and in the formal sector with recycling. Thirdly, Beede indicates that MSW disposal extends beyond households and firms and promotes the social good. It leads to intervention in the form of collection, transport, disposal services, management

activities, establishment of various taxes and subsidies, research and development. There is evidence that private participation in MSW management is evolving in developing countries.

Scott (1998) studies the different groups of households motivated by environmental concern. He divides his research sample in Canada into four groups, being economic incentive, socially concerned, altruistic environmental concern and finally a group termed NIMBY (not in my back yard). He concludes that both the environmental and the NIMBY groups agree more stringently than the economically motivated group that garbage is a serious environmental problem. The economic group is significantly less supportive than the environment group of either set of initiatives (those who would have a direct or indirect cost to consumers). The token recycling of newspapers or beverage containers will continue, so long as the blue box is visible. Of all the motivational groups, the environment group practice the widest range of waste diversion actions. These include composting, considering packaging when making a purchase or avoidance of purchasing disposable products to reduce municipal waste. Scott also proposes that the use of economic instruments (e.g. quantity base garbage collection costing) would improve the level of recycling and prove to be a prudent approach. Scott (1998) in the survey done on Canadian households indicates that 54% of the active groups are motivated by general and environmental concerns, whereas the largest proportion (45%) of the other so-called sporadic groups are motivated by community specific environmental concerns which include social pressure or economics.

There are however also indications that over the past 70 odd years the matter of social concern with, inter alia, the environment, has been filtering through into corporate board rooms in the form of **corporate governance**. The development of corporate governance by Williamson (1985), in his book *Economic Institutions of Capitalism* deals with the relationship between the firm and each of its constituencies, being labour, capital, suppliers, customers, the community and management in contractual terms. The board of directors is regarded primarily as a governance structure to safeguard the firm and owners of equity capital, and secondly as a way to safeguard the contractual relation between the firm and its management. This development opens the way by which the board of directors views their overall responsibility, which not only refers to returns on investment or capital employed, but also the responsibility towards investors, employees and society. Corporate social responsibility (CSR) is lately being forced onto leaders in businesses by NGOs, unions and community leaders. Recently, a number scandals surfaced as the financial status and management of some well-known companies turned out to be different from what the general

public thought. "There is a crisis (Harvard, 2004: 1957) in corporate social responsibility. … The ensuing public outrage has created a demand for increased attention to corporate accountability and integrity". Although community leaders are more supportive of CSR (Boehm, 2002: 188-189) than corporate leaders, "they do maintain favorable attitudes towards CSR. … The collaboration between corporation and community should be based on reciprocity more than philanthropy". Hamann (2003) introduces partnerships between companies, governments and civil society as an effective and efficient strategy for corporate social responsibility (CSR). Karp (2003: 15) relate "Socially responsible leadership in the coming decade will not only be about doing business, but also about questioning how this business is done and how value is created". This contemporary leadership style is required to make waste reduction projects sustainable. Businesses are reforming their often harmful objectives following societal pressure on the manner they conduct business. From the above paragraphs it is deduced that economic incentives seem to be the major environmental motivational factor for societies. Social concern does filter through into governments and boardrooms albeit at a slow pace. International governance is creating support with programmes such as **the Triple Bottom Line** leading corporations into environmental sustainable development. Business direction is changing. The Triple Bottom Line requirements for business (Klee, 2002) and producer responsibility (Mayers & France, 1999) are now social contracts for sustainable environmental businesses. The problem is that this above all applies to big companies and is generally not supported by small businesses. The trend is however moving towards environmental sustainable development.

4.6. Legislation, standards and waste economics

Williamson (1985) studying The Economic Institutions of Capitalism refers to market failures during the 1960s. Sufficient negative market conditions that arose created opportunities for government intervention. Simultaneously, it created a growing awareness that regulation was beset with problems of its own. The realisation is that complex contracting between various economic parties serves a better purpose than the interventionist era of the 1960s, when governments interfered with economic operations through streams of legislation.

A strategic balance exists between legislation and the free market system in creating a sustainable equilibrium for capitalism to grow and the general ecosystem to survive for future generations. References (Claassen, 1993) indicate that some form of government interference is often required.

That is to enforce sustainable development whereas the main objective of businesses and most individuals is the creation of wealth, regardless of the damage being done to the ecosystem in the process. Little thought was given to the environment (ecosystem) by governments, firms or most individuals during the massive industrialisation that occurred over the past 500 years. Greater sensitivity over the past 20 to 30 years towards ecosystems is being driven home with the realisation that the ozone layer is reducing and governments are assuming a broader social responsibility. A major shift is being noticed (Mayers & France, 1999) where governments are now resorting to legislation to encourage **producer responsibility** and thereby shifting the onus of ecosystem management onto business.

A milieu is developing (Klee, 2002; Morris, 1997) whereby the value systems of individuals are filtering through and are being incorporated into business strategic plans and product development. Large corporations buying on the international markets are forcing their suppliers to comply with environmental standards. Standards such as the European Union ISO 14000 producer responsibility series are non-compulsory but are becoming a requirement for international trade and investor ethics. This doesn't require government intervention. A large range of specifications, created by international standards organisations for the prevention of pollution and environmental hazards, are available. The present-day ease of international trade and relaxation of trade barriers is encouraging a demand for such standards, which in turn promotes ecosystems.

All is not well with developing countries (Yap 1999) as they are still in economic survival mode coupled with large population growth figures. Environmental issues are not high on the agenda. Some developed countries are also contributing to the growing mass of waste being generated through ever increasing consumer spending and growing demand for disposable containers and commodities. Morris (1997) deals with the concern that national environmental labelling (of packaging) and management schemes might become technical barriers to trade. The International Organisation for Standardization (ISO) develops international consensus standards in the field of environmental management tools and systems. The environmental standards are referred to as the ISO 14000 series. This style of standard is also known as **command-and-control**. As the high cost of command-and-control type regulations became apparent, other alternative mechanisms for achieving environmental objectives are being devised. These are the so-called market based mechanisms, which are intended to have a similar or same affect as traditional regulations but at a much lower cost. The best known of these are pollution or green taxes and tradable emission permits. Apart from the economic instruments mentioned, a number of other mechanisms are

being proposed as a means of protecting the environment. Examples of these are labeling of products indicating environmentally friendly aspects. One of the ISO 14000 standards, ISO 14001, requires firms to employ management procedures for each plant that are consistent with existing law and legislation of the particular country in which they operate. The problem with this is the question of whether the legislation is fit for the task of protecting the environment in that specific country. Morris (1997) also states that if ISO 14000 and 14001 remain purely voluntary systems, firms would weigh up the cost of registering against the alternatives, and choose the cheapest option. It is desirable for firms that wish to trade in the international market to improve their environmental performance and they would therefore aim to comply with the primary objective of ISO 14000. The practical aspect is that, where particular countries have inadequate environmental regulations and a company uses ISO 14000, it would not actually bring about an improvement in a firm's environmental performance. It is more often becoming an alternative option for firms to use an internal life cycle analysis (LCA) that identifies key areas of wastage. An advantage of complying with ISO 14000 is that it is likely to reduce the credit and insurance risk of a business by providing a signal of regulatory compliance to the state in a specific country. Other ISO 14000 standards such as ISO 14015 deal with environmental site assessments, which are useful during the transfer of real estate and is often preceded by an assessment of the environmental condition of the property. This puts perspective buyers on notice to avoid future surprises and liabilities. ISO 14020 deals with environmental labelling programmes and this has a perceived added value to the product.

Many examples of legislation exist. One from South Africa has been specifically chosen as it represents the middle road between a highly developed nation and a developing country. The *White paper on Integrated Pollution Control and Waste Management for South Africa* (2000) refers to section 24 of the Bill of Rights in the Constitution of the Republic of South Africa that guarantees environmental rights to its citizens. Section 24 states that everyone has the right to an environment that is not harmful to their health or well-being and have the environment protected for the benefit of present and future generations through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation,
- Promote conservation and,
- Secure ecologically sustainable development and the use of natural resources whilst promoting justifiable economic and social development.

This integrated waste management plan of the South African government also allows for the general functions of an integrated pollution control and waste management coordinating mechanism. This allows for permits and/or authorisation to indicate a set of conditions which result from negotiations between the authority and any relevant specialist participating in the plan. The suggested policy also provides for the **polluter-pays principle** indicating that those responsible for environmental damage need to pay the repair costs both for the environment and human health, as well as the cost of preventative measures to reduce or prevent future pollution and environmental damage.

Mrozek (1996) in his studies of deposit and refund systems for recyclable materials indicates that earlier adoption (by industry initiative) of recycling, which is taking up producer responsibility, depends on the size of the group desiring an additional waste disposal option, and not on a consideration of disposal cost savings. Later adoption proves to be poorly explained and suggests that if a government or state mandates collection and recycling, it overrides the interest groups' considerations. This then leads to inefficient implementations of recycling schemes. Lately industries have considered taking up their producer responsibilities but are hampered by various laws such as anti-competition acts.

Command-and-control measures and standards are therefore often required to empower any waste minimisation programme. The more efficient systems however follow from producer responsibility and economic incentives that reduce the cost of ensuring compliance.

4.7. Environmental levies and taxes

There is always a cost associated with the execution of any environmental waste improvement plan, regardless of it being pro-active or re-active. It is also true that some well-constructed strategic plans benefiting the environment could actually result in savings to the producer. Examples of such cases are quoted below. The fundamental economic issue in this regard is that the consumer remains the only source of funds in the chain of production and selling events. This is even true if governmental funds are used to clean up the environment, as the consumers and companies pay taxes that fund the state. The taxes paid by companies are also sourced from the consumer. These days, environmental levies are becoming popular as a source of funds and are frequently being raised by governments and companies to pay for environmental programmes.

There are two fundamental types of environmental taxes. The first type is usually installed by producers in the form of deposit schemes or **environmental levies or fees** to provide for the full recovery of product cost which includes waste collection and recycling. The second option is **environmental taxes** instituted by government as means of widening the tax base and at the same time discouraging harmful environmental practices. The problem with the latter is it opens an avenue for abuse by the government of the day. Both types of fees are known as **green fees**.

Repetto, Dower et al (1992) argue that a shift in taxes from normal taxes to green fees could improve the tax base as well as serving the environment. Taxes are inevitable and government relies largely on personal and corporate taxes to generate revenue. It is recommended that the use of green fees such as charges on pollution, waste and congestion would also solve many environmental problems in the process. Green fees provide citizens and corporations with an incentive to curb environmentally destructive behaviour. Environmental taxes and fees are not theoretical inventions as they already exist in various forms in many countries. The present normal taxes on personal income and corporate income is a disincentive for production because the more money people or companies earn, the more taxes they pay. Environmental charges are one of several incentive based instruments of environmental policy. Unlike **command-and-control regulations**, they provide market signals that allow firms and households to respond in innovative and efficient ways. Taxes and charges, like other environmental policy instruments, are mechanisms for dealing with the systematic failures in market incentives that arise when individual actors are not confronted with the full cost of their activities. For example where waste collection in communities is taxed through local property taxes, individual households pay the same annual amount irrespective of the amount of trash they generate. Raising environmental taxes on waste generated per bag would immediately reduce the cost of collection as history proves the immediate reduction in waste generated per household or industry. Environmental taxes can also be raised on carbon dioxide emitted for the fuel burnt by industries or households. These carbon taxes would immediately reduce the amount of carbon dioxide, which creates the greenhouse effect whereby the earth warms up. The gains from environmental taxes would come in the form of improved environmental quality, reduction in the needs for infrastructure, increased employment and faster productivity growth. There would also be less pressure on the environmental quality and job creation would be improved. Other measures to reduce the burden on the environment are:

- Effluent or emission charges,

- Charges on environmentally damaging activities, such as highway congestion, noise pollution, and use of public land,
- Product charges, such as taxes based on content of fossil fuels, gasoline charges, etc,
- Deposit return charges on high value items such as vehicles, batteries, and containers,
- Reduction of tax benefits and subsidies on items such a ground water extraction, timber sales and grazing of public lands.

Barde (2000) in *Environmental policy and policy instruments* describe how many countries start applying **green tax** reforms and are therefore moving towards eco-tax systems. They show the importance of these eco-taxes replacing other normal taxes as the norm for acceptance by the general public, and to change the attitudes and habits of production and marketing. For example Sweden based their 1991 tax reforms on significant reduction in income tax, which is offset by new eco-taxes especially on carbon, sulphur and nitrogen oxides production and energy consumption. In contrast to only being a fiscal tax, the green tax serves as a financial motivator towards pollution reduction and environmental sustainability. This seems to be a holistic approach to general taxing in a country.

The principal of the **producer pays** is also becoming commonplace in the world as governments are placing the onus on firms to organise and administrate waste reduction programmes throughout the product life cycle using levies obtained from consumers. Various methods are used by companies to extract levies from consumers and to compel consumers to return waste to collection stations: Kulshreshtha & Sarangi (2001) in their treatise on *No return, no refund* defines a deposit-refund system which requires consumers to pay a deposit, which is subsequently refunded when consumers return the reusable part of the commodity. They also describe **hustling**, meaning some consumers or collectors returning recyclable packages discarded by other consumers. These researchers also refer to Chaplin (1992), providing empirical evidence in favour of deposit-refund systems as a policy tool. It discusses the effect of government initiated and market generated deposit-refund schemes in some product markets such as alcohol, milk, toiletries, shampoos, laundry soaps, film cartridges, motor oil, and medicines. It also applies to lead battery recycling. These authors also refer to the findings of Palmer et al (1997) in that deposit-refund systems are the least costly of all pricing policies. They also signify that voluntary or market generated deposit-refund schemes often arise from considerations other than social efficiency, such as price discrimination, and may not lead to socially optimal outcomes. The main issue here is the ratio of

deposit fee versus total price of the commodity. If the fee is small in ratio the effect would lead to a lot less price discrimination.

Environmental fees should be correctly designed to prevent discrimination against some parts of the social fabric. Wiebelt (2001) investigates the short-term and long-term economic sectorial impact of an environmental tax on hazardous waste in South African mining, proving that the brunt of the resultant adjustment will have to be borne by the black mine workers. This is a perception formed about improving waste management within a developing country which does not always provide the complete picture.

Claassen (1993) attributes market pricing failure in an environmental sense, as a market that fails to fully reflect the real value of an environmental resource. This is attributed to the following.

- The existence of public goods. This refers to natural resources such as air, sea, roads, forests etc. The problem lies in the use of these natural resources without provision made for considering future environmental problems,
- Imperfect information. Planning based on imperfect information leading to clearing prices being charged which are insufficient to deal with future environmental damages.
- Externalities. These are benefits and costs that arise through the production or consumption of goods and services but not reflected in the market price. Meaning the present pricing doesn't cater for future environmental corrections in waiting,
- Imperfect competitions. When markets are dominated by one or two competitors that include special arrangements to limit competition and the general principles of market efficiencies are violated which has a detrimental effect on environmental resources.

Within an economic sense, situations might arise that newly planned market based measures would only function properly through the use of new control measures. This is to re-direct the commodity suppliers towards environmental planning and force them in the direction of sustainable waste development through the use of environmental taxes. It is often found that overzealous sin taxing on certain products such as alcohol and tobacco leads to other problems. Higher taxes create incentives for crime syndicates to start the smuggling of goods in order to avoid these higher taxes. These syndicates usually operate within many product groups and usually end up with money laundering and drug trafficking. The result is that the initial emphasis on increasing the tax base creates excessive criminality in a country.

There are two basic approaches (Claassen, 1993) that could be pursued by economic measures to guide development onto a sustainable path. These are policy developments to alleviate specific environmental problems, and to identify problem products and develop policies that will reduce their impact on the environment. This proposes that numerous economic tax measures exist to assist in changing the environmental habits of companies and households and at the same time reducing the burden on the environment through a resultant reduction in pollution. This provides for sustainable development as well as reducing the tax burden which in general has a negative effect on the economy including prohibiting additional employment and overtime work. All this requires is a shift from command-and-control legislation to tax legislation.

4.8. Developing countries and the economics surrounding waste

The trade in waste products often creates problems especially when sold for their originally intended use. Invariably economic pressures within developing countries force people to sell and use waste products to generate income. An example of this is a scrapped tyre sold as a part worn tyre and put back on a vehicle. One of the side effects of this trade is the high rate of horrific accidents due to tyre failure. Traders are quick to cash in on adversity and create a flow of waste products from first world to developing countries. Van Beukering & Janssen (2001) study the trade and recycling of used tyres in Western and Eastern Europe including the movement and legislation issues surrounding truck tyres. Results indicate that amongst other things, the greater part of the overall environmental impact occurs during the life of a tyre before disposal. The fuel used to overcome the rolling resistance of a car tyre accounts for 15% of the total fuel consumed during the life cycle. A growing problem during the waste management stage is the increasing incidence of illegal dumping of old tyres. The introduction of landfill taxes and collection fees are closely linked to this phenomenon. Collectors accumulate used tyres from car repair shops, receive the collection fee, sort out the useful tyres and dump the remainder. The illegal dumping of waste tyres by dealers in the country-side causes major pollution. Frequent reporting in the media (van Beukering & Janssen, 2001) about incidents of illegal dumping by western countries into low income countries implies a large north-south and east-west trade in used tyres and tyre related rubber waste. There are specific differences between countries that may have an impact on their environmental performances. These differences can be economic (labour cost, technological

efficiency), institutional (disposal fees, safety regulations), and social (environmental preferences and safety awareness).

The management of waste in developing countries is a major problem and examples abound. Sangodoyin & Ipadeola (2000) study hazardous waste management in Nigeria and found that many respondents of commercial operations were ignorant of the waste generated by their processes. Awareness of environmental concern needs to be created in the developing worlds. Researchers are still endeavouring to discover interventions that will augment waste management in developing countries. Johnson & Wilson (2000) report on the institutional sustainability of waste management in Zimbabwe through their endeavours to instil sustainable development within this third world country. Very little recycling is being done in the country. Many workshops held with a large number of stakeholders including regional government, non-governmental organisations and other social institutions turned out to be fruitless. The major problems identified are the lack of funds, households not separating their waste, no recycling taking place, and owners of waste expected to be paid for contributions made to recycling. Integrated waste management in developing countries seems to remain at the bottom of their priority list as long as they remain in economic survival mode. Basic economic measures need to be developed to address SWM.

O'Neill (2001) reasons that the development of regulatory problems requiring improved reliable storage, transport and disposal practices, as well as encouragement of waste minimization is costly for industries. It is also difficult and costly for governments to enforce. It is also argued that wastes are likely to be exported from rich countries to poor countries with weaker environmental policies. In many of these countries it is unlikely that environmental regulations will be improved due to powerful constituencies opposing such moves. This trade in waste creates pollution havens. Similar problems also exist in the eastern countries. Duraiappah, Xin, & van Beukering (2002) report on the Chinese plastic sector production, recycling and international trade. They point out the existence of increasing pressures by government and NGOs to restrict international trade in secondary material waste because, in reality, this might be a disguise for waste dumping by the exporting country. The value systems of the population and governments in developing countries need to be changed if any success in sustainable development is to be achieved. The lack of funding will remain and less costly solutions need development. Fraud and corruption are rife in developing countries. Lencioni (2002: 9) articulates that “given all the hard work that goes into developing and implementing a solid values system, most companies would probably prefer not to bother. And indeed they shouldn't, because poorly implemented values can poison a company's

culture". Yap (1999) proposes that those who work on waste issues, either as academics or professionals, know how scanty the literature is on waste management in African countries with exception of South Africa. Yap (1999: xii) makes a summary of studies done within Africa and the various problems encountered within developing countries. Building construction accounts for the use of 25% of forest wood and 40% of raw stone, gravel and sand traded worldwide. Tremendous amounts of wastes, some hazardous can arise from the production of construction materials, building design, construction, maintenance or demolition. Biogas technology is used in Kenya as an alternative energy source but the farmers have problems making this a sustainable technology. Experiments where waste water is re-used in agriculture for applications such as hydroponics yielding high value crops are done. Reference (Yap, 1999) is also made to animal production practices and its influence on the environment. Pollutants emitted by animals from eating fodder are nitrates, phosphates, methane, ammonia, hydrogen sulphide and sulphur dioxide. The lack of adequate and affordable fodder, places a major constraint on the advancement of animal production in Africa. Further examples quoted are wet brewery by-products that can be incorporated in animal diets to improve feed efficiencies. There is a need to replace donor assistance and international commercial loans with direct foreign investment and liberation of national economies. This will increase the dominance of the private sector in national economies. It is important to ensure the private sector complies with the environmental protection policies and have an understanding of reducing the administrative burden to ensure compliance. Onibokun (1999) in dealing with governance and waste management in Africa describes the urbanization process in Africa and the negative effects it has on waste collection. Africa and Asia record urban growth of 4,9% and 4,2% respectively between 1990 and 1992, whilst urban growth rates in Europe and North America in this period registered only 0,7% and 0,1% respectively. Various African cities represented urban populations of around 1% to 3% during the 1950s and have since grown to represent close to 60% or 70% of the total population. Onibokun (1999: 1-2) adds that "however, when the rate of urbanization gets out of control, it poses a big challenge to governance as optimizing forces become weakened, institutional capabilities become inadequate and in-effective, and, with these, the problems of urbanization are compounded". The same author refers to recent events in African urban centres where waste management has become a monster and efforts made by city authorities, state and federal governments and professionals alike have been aborted. Many African cities reveal waste management problems such as heaps of uncontrolled garbage, roadside littered with refuse, and streams blocked with junk. Disposal sites constitute a health hazard with inappropriate disposal of toxic waste. There are clear indications of a need for adequate management services that are typically not found in African cities. Most municipalities

or city councils only collect a part of the refuse generated. The problems are generated by rapid urbanization in Africa which threatens the governance of these centres. The World Bank (1992) perceives governance as "the manner in which power is exercised in the management of countries' economic and social resources for development". Waste management in Africa (developing countries) can only improve when accompanied by new forms of governance that will increase efficiency and effectiveness and maximize popular participation in services provisions. An increasing interest in public-, private-, and community partnerships is evident (Onibokun, 1999) but is often related to a concern with technical or financial issues, rather that the political, sociological and environmental relationships involved. Technical-financial approaches have failed to develop the kinds of organizational and institutional approaches needed to empower citizens to comprehend this service and participate effectively, as they have no clear conceptual and strategic framework of understanding. This author proposes that efficient and effective waste management service delivery depends on key elements such as managerial and organisational efficiency, accountability, legitimacy, responsiveness to the public, transparency in decision-making, and pluralism of policy options and choices.

Nothing above refers to the basic economics required in these countries to make the waste management systems operational. Many only deal with the soft issues and ignore driving forces such as money. Studies are done (Onibokun, 1999: 241) on waste management within cities such as Ibadan in Nigeria, Dar es Salaam in Tanzania, and Johannesburg in South Africa and Abidjan in Côte d'Ivoire. The results show that good governance and citizen participation are identified as the major reasons for success or failure. The experience gained from the four cities reveals that no system of waste management can be effective without an effective revenue base. The revenue bases of most municipal governments in Africa are poor and the cities need to enhance their collection of local revenue, and manage available finances better. It has no sense assigning responsibilities to local governments without corresponding sources of revenue. The private sector should be involved in a reciprocal stakeholder-participatory approach. This is in view of the financial constraints and limited infrastructure relative to the needs of the public sector. Onibokun (1999) notes that, the management style of governments in African countries tend to be **long on policy and short on implementation**. Success can only be achieved if policies are trimmed and strictly enforced. Another reason given for the unsustainable waste management systems in the cities studied is the limited capacities of the responsible public agencies and institutions to recover their operating costs. Studies did reveal that people in general are prepared to pay for waste services that are efficient and have a good mechanism installed for revenue collection, along with

penalties for defaulting. A very important fact discovered by means of the study of the four cities reveals that a major part of the waste management problem is that waste is regarded as waste and not as an asset. Therefore recycling is very low key and only some private sector businesses start recycling. A major contributor to some of the recycling efforts is ascribed to individual scavengers who move from one refuse site to the other, collecting saleable refuse for recycling. Recent studies (Onibokun, 1999) conducted in Nigeria reveal that the volume of waste generated could support 5000 waste recycling businesses. All that is required to make this possible are **incentives**, micro credit for seed money, a policy to facilitate the process, and the goodwill of both the public sector and the civil society organisations.

Extensive contributions are made by scavengers in African cities endeavouring to make a living. This is impeded by the **lack of organisation from governmental bodies** and societies. Indications point to, the exploitation of the hoarders by dealers who purchase the waste from them at low prices, and the major opportunity for job creation that exists in this regard. The scavengers are exposed to major health risks.

Flintoff (1984) defines the differences between developed and industrialised countries as a developing country producing mainly primary products (raw materials) and industrialised or developed country creating manufactured goods. There is no universal solution to solve the waste management problems, as each city requires a system that is tailor made for its own physical and economic environment. Holmes (1984) in his dated, but still valid reference to solid waste management in developing countries advises that the wholesale imposition of western technology will not necessarily solve the solid waste management problems in developing countries. Examples are quoted of failed projects such as incineration plants that were built in developing countries and never started operating. The ground rules accepted as the four main pillars of solid waste management are described as follows:

- Storage at or near point of generation,
- Collection of waste,
- Street cleansing,
- Disposal of waste.

Holmes (1984) also indicates that quantities of waste are invariable lower in developing countries because of the lower prosperity and consumption as well as extensive scavenging and salvaging by beggars and the very poor. The density of waste in developing countries is much higher due to

absence of paper, plastics, glass and other packing material. Waste collection projects in developing countries play a major role in providing jobs to people who sweep the street and collect waste using small carts to transport the waste. Many of the developing countries that successfully start waste collection projects still make use of large numbers of people to collect waste using basic equipment. It is often not possible to get into or move between the shantytowns with larger trucks and containers. Mechanical street sweeping equipment can only be used in avenues that are properly surfaced with curbs and without impediments such as hawkers and parked vehicles. The most successful systems in developing countries still, therefore, require manual labour to sweep the streets and collect refuse. The waste collected in developing countries is ideal for conversion into organic fertilizer and compost due to its high organic material content. Holmes (1984) reports that a large percentage of waste collection taking place in developing countries is due to the desperate need of beggars and scavengers for an income. It can therefore be proved that in many instances developing countries do more recycling of certain commodities of value, than in more affluent parts of the world. It is therefore important to have a full regard for economic circumstances of developing countries and the very different solutions that they require for waste abatement schemes.

Pickford (1984) report that developing countries are generally synonymous with poor countries and that most of the people are underprivileged. More than half of the world's population are living in developing countries and are in fact very poor. Municipalities in developing countries use large numbers of unskilled labourers to collect waste. Although this labour seems to be cheap in terms of rate per man-day it still remains very labour intensive and inefficient in terms of the rates per ton of waste collected. Street sweepers can be very inefficient without good management and supervision. India spends four times as much on street sweeping as on refuse collection. The same results apply to Jakarta. Manila employs good management, provides the personnel with attractive uniforms and insurance as well as incentive schemes, and is experiencing tremendous improvement in their solid waste management and collection projects. It is economics that drives the process.

4.9. Summary of socio-economics within waste management

Ehrenfeld's (1997) definition of **frontier economics** says that the earth is limitless and environmental problems, as we know them are absent. Sustainability is not a concern. Frontier

economics can explain the environmental neglect that is most often encountered in developing countries. The neglect found in this regard might be ascribed to failure on the economic, political leadership and value systems fronts within the population. Comparing successful solid waste management programmes operating in developed countries with the problems of waste management within marginal groups of developing countries indicates that environmental issues appear to be very low on the priority list of those marginal groups. The social capital of developing countries has not yet been developed to such an extent that they can deal with the frequent failure of democracy and political leadership. The socio-economic fabric within these countries has not yet reached the point where social capital supports the economics required for good waste management. Implementation of basic economics for sustainable development in some of the developing countries will require more time. Nevertheless the process can be speeded up if more attention is given to fundamental economic processes instead of concerns applied to combating political turmoil. The problem is that disenfranchised groups within societies, whilst not contributing to the social capital and economics of the country, always revolt feeling they are being mistreated.

During the early twentieth century it was customary for management to only consider the generation of profits as an objective with virtually no concern for the environment. The concept of a time horizon for a firm (Anshoff 1982) plays a major role in its strategic direction. Large operations seem to adopt an infinite time horizon whilst smaller operations seek to have a short-term horizon aiming, for example, to sell the business and maximize profits regardless of environmental regard. It is therefore up to large corporations to lead the way to sustainable waste management utilising the Triple Bottom Line concept as a guide line.

Economically affordable waste collection systems require funds to manage and operate them. A fine balance exists in deciding what system of funding to utilise and the resultant success of the programme. Kulshreshtha & Sarangi (2001) point out that market generated deposit-refund systems are almost absent in developed worlds, whilst still being quite popular in developing countries. Salvia et al (2002) demonstrate how a sensitivity analysis could be performed to evaluate the influence of land filling fees on the choice of waste processing technologies, in order to foster waste management strategies that are environmentally sustainable, economically affordable and highly effective. The results signify the key role separate collection processes and mechanical pre-treatments play in the achievement of legislative targets. Waste owners often dump waste, or use other illegal means to get rid of it when faced with high transport and dumping fees.

The cost of transport plays a fundamental role in this socio-economic balance. Powell et al (1996: 97) report that "the financial cost of recycling schemes **failed to account for external costs** and benefits such as environmental pollution, road congestion and accidents. Results of studies in the UK show that the curb-side collection scheme has a lower external cost than the bring scheme, but this is of less importance than the benefits to be gained within the manufacturing system by using secondary materials". Aspects also to be considered are the responsibility for segregating the waste and delivery to collection systems, retailers collecting old products and producers redesigning products and services and establishing collection and recycling schemes. The collection and recycling of waste in developing countries tend to conform to the basic needs of the population. Vogler (1984) reviews the social, technological and market forces behind the principle opportunities within solid waste recycling in these countries. The waste being referred to by Vogler is paper, steel, non-ferrous metals, glass, tyres, plastics, textiles and agricultural products. Far less wastepaper is generated and found on dumps in developing countries than in Europe or the United States. Large numbers of scavengers collect waste paper and sell it to agents. Equipment used to collect and recycle the paper is often very old, without any electronic frills and operated by cheap labour. Steel scrap collected is reformed into other objects, and utilized by households for items such as containers storing liquids or solids. Vehicles are repaired or if un-repairable, dismantled and sold as spares for other old vehicles. Non-ferrous scrap is sorted from the other waste materials using cheap labour. This is sold to merchants who make vast amounts of money collecting these materials for use as raw material in other metal plants. Useful containers, often containing 100% recycled material, are manufactured from glass collected. Scrap tyres collected are cut and used for making sandals or ground into rubber crumb which is a much cheaper raw material than virgin rubber for manufacturers of some low specification rubber products. India, as a case in point has a major shortage of rubber casings due to the extensive rework of waste tyres. Plastic waste material collected is used for regrinding and moulding into products not requiring high performance specifications such as containers and irrigation pipes. The recycling of textiles has proved to be difficult as the users in developing countries wear the clothes until the fibres are so thin and worn out that they become useless for recycling purposes. Old clothing and material is frequently used to produce rags whilst many countries such as India where vast production facilities for fabric manufacturing exist oppose competition from recycled textiles. Agricultural waste proves difficult to recycle although applications such as biogas have been investigated without much success. The cost of transporting agricultural waste also prohibits large-scale re-use. Some rice and sunflower seed husks are mixed and used in old steam boilers for producing energy. The reclamation industry in the developing world depends on a huge network of extremely poor

scavengers who barely subsist and are grossly exploited by merchants and industries. The desperate need for work, forces people in developing countries to become scavengers. There appears to be a major lack of interest by their governments and organized businesses to improve the lives of these people. The scavengers should be assisted to become organised to prevent their abuse by merchants who buy the collected waste materials.

Barde (2000) in the book on *Environmental policy and policy instruments* point out that a number of countries are applying **green tax** reforms and moving towards eco-taxes. It is important for the general public to accept these eco-taxes as the norm and to change the attitudes and habits of wasteful production and marketing. This is a move from production and consumption taxes towards environmental taxes. The application of the correct financial incentive is crucial.

A strategic balance exists between legislation and the free market system in creating a sustainable equilibrium between growing capitalism and ensuring the survival of the general ecosystem for future generations. Claassen (1993) point out that government interference is required to achieve managed ecosystems. This is used to enforce sustainable development whereas the main objective of businesses, and most individuals, is the creation of wealth regardless of the damage done to the ecosystem in the process. A major shift is taking place with governments resorting to legislation such as **producer responsibility** and thereby shifting the onus of ecosystem management onto businesses. The milieu is being created whereby the value systems of individuals are being engaged and incorporated into business' strategic plans and product development. Large corporations, buying internationally, are enforcing compliance (Bansal & Bogner, 2002; Morris, 1997) by their suppliers to some environmental standards. Standards such as the European Union ISO 14000 series are non-compulsory but are becoming a requirement for international trade and investor ethics. International environmental standards are being adapted to include the economics of the manufacturing and marketing processes. International companies are moving towards compliance with these standards because economics now form the base of acceptance. Studies indicate that some developing countries in Eastern Europe are experiencing problems in creating successful integrated waste management programmes. Thomas (1999) studying waste management and recycling in Romania, conclude that despite considerable enthusiasm from NGOs and other participants, **lack of interest from the public, lack of funds, and education create a major barrier in recycling efforts**. Many obstacles can be overcome with sufficient capital and programmes made available for widespread public education. It is noteworthy that in many situations like these, the public expects to be paid for recyclable material. Coupled with attitudes

formed during the communist era a situation has been created in which it is difficult to encourage voluntary public participation. An indication of a tendency for central and eastern European countries to adopt **laws and standards**, resulting from an unquestioning adoption of high-income country standards that may not be sustainable in themselves, exists.

The economics of imports and exports need to be balanced. Eco-dumping, which is an eco-countervailing duty that could be raised against imports from countries with lower manufacturing costs due to less strict environmental laws, is a noteworthy concept. Booysen (1999) points out that production capacity might have a tendency to move to lower manufacturing cost countries due to their less strict environmental laws. Empirical evidence does not support the argument that marginal environmental standards create international trade problems. It is probably an issue of causality. It is also argued (O'Neill, 2001) that solid wastes are likely to be exported from rich countries to poor countries, with weaker environmental policies. It is unlikely that environmental regulations will altered due to powerful constituencies in countries that oppose such moves. This creates pollution havens. The issue of waste dumping (Yap, 1999) in developing countries is extensively documented. The **value systems** of populations and governments in developing countries need to be changed if any success in sustainable development is to be achieved. The lack of funding will remain and less costly methods are required. The question arises as to what could be done to positively influence the individual and formal or informal groups to change their mindset and improve the ecosystem. Checkland (1981) indicate how soft systems-based methodology is used for tackling **real world problems** where the problem situation is ill defined. This soft system methodology is a never-ending learning process. Today, this is termed a philosophical approach. Fraud and corruption are rife in developing countries. Education over a considerable period of time proves one of the factors required to change the mindset of people and to encourage participation in waste management programmes. **Education** is one of the few change agent avenues available to alter people's values.

Bhate & Lawler (1997) research the factors that influence the adoption of environmentally friendly products. They conclude that consumers would not go out of their way to find environmentally friendly products. These results indicate that innovators are more inclined to buy environmentally friendly products than adaptors. Involvement in green issues does not appear to be a significant variable in explaining buyer behaviour. The incentive for consumers to travel distances to buy environmental friendly products is related to the financial gains to be obtained. Some innovators would travel a little longer distance but not much. There is a small marketing advantage for

greener products, next to others on the shelf, with greenies as shoppers. At the end of the day economics remain the dominant factor moving consumers towards sustainable development.

A World Bank report (Bernstein, 1993) portrays the alternative approaches to waste management through the use of **regulatory and economic instruments**. **Regulatory instruments are standards, permits and licenses** together with land and water use control. It also refers to **economic instruments available, such as pollution charges, market creation, subsidies, deposit-refund systems** and **enforcement incentives**. The use of command-and-control systems (direct regulation along with monitoring and enforcement) offers the regulator maximum authority over resources controlling spending to achieve environmental objectives. Economic instruments provide the regulator with a reasonable degree of predictability on pollution level production. It also regulates competition amongst waste facilities making them un-economical. **The negatives of command-and-control strategies** are lack of achieving legislative mandates and deadlines, being economically inefficient and difficult to enforce. It often also provides little incentive for innovation in terms of reducing pollution. Despite this, many countries have recently adopted various economic instruments to reduce pollution using pollution charges, marketable permits, subsidies, deposits and return systems and enforcement incentives. Most of these instruments operate as incentive for polluters to determine the most efficient and cost effective ways of achieving environmental targets. The principles of **polluter-pays** and **user-pays** are incorporated in these economic instrument systems. The polluter-pays principle is a financial penalty paid by the polluter for higher levels of pollution or a financial reward for lower levels of pollution. The user-pays principle is based on the user of a resource paying for the full social cost of supplying the resource including waste treatment. Other economic instruments involve pollution taxes on input such as for example fuel taxes. The benefits of economic approaches are that they promote the following:

- a cost effective means for achieving acceptable levels of pollution,
- stimulate development of pollution control technology and expertise in the private sector,
- provide government with sources of revenue to support pollution control programs,
- provide flexibility in pollution control technologies,
- eliminates a government's requirement for large amounts of detailed information required to determine the feasibility and appropriate levels of control for each plant or product.

Bernstein (1993) also reports that a product environmental levy, as an economic instrument does

produce results. If the charge (green fee) is small in relation to the total cost, it will have little influence on the usage of this product. If it is used to improve collection for recycling purposes, it will succeed. A high percentage of charge versus cost of the product results in reducing its use with consumers finding alternatives. Pollution charges are classified into the following

- effluent and emission charges (fees levied on quantity or quality of pollutants),
- user charges (direct payment for cost of collective or public treatment of pollution),
- product charges (fees added to price of products that cause pollution during either manufacturing or the consumption phase),
- administrative charges (fees paid to authorities for registration and implementation of environmental regulations) and,
- tax differentiation (tax used to promote consumption of products that are environmentally save).

The biggest problem to be considered currently is that most prices for commodities do not include the waste collection and recycling part of its life cycle. The aspect of extended producer responsibility has not yet been taken up by most producers and therefore prices for products exclude fees for waste management of the final product waste. This is especially true in developing countries which at most, only concentrate on items that are highly successful at collecting and recycling such as metals, glass and paper.

Bernstein (1993) lists market-creating incentives which include marketable permits that are tradable, subsidies which include grants, low interest loans and tax incentives, deposit refund systems and enforcement incentives. Mixed systems are often used because in practice economic instruments are rarely used without regulations to achieve environmental protection objectives. They generally supplement direct environmental regulations to raise revenues for financial pollution control and other measures to stimulate pollution reduction and recycling. Effective enforcement mechanisms and institutions are crucial to the success of any command- and -control and economic strategy improving environmental quality and waste management. It is therefore important that the selection and implementation of regulatory and economic instruments or a mix of instruments incorporate a strategy for enforcement. These can include fines, warning letters, administrative audits, permit suspension or revocation, permit modification, adverse publicity, black listing, civil injunction and penalties, criminal penalties, and incarceration.

Bernstein (1993) also point out that successful environmental strategies for developing countries

require economic instruments with appropriate standards and effective monitoring and enforcement capacities. Economic incentives on their own, as viewed by some as an alternative to the traditional command-and-control approach is not viable in developing countries, unless it is supported by law enforcement. Economic instruments alone cannot replace traditional regulatory instruments. Charges for effluent emissions and product charges seem to be the most effective for reducing pollution and waste in developing countries. **Bernstein proposes more research to identify means of building appropriate enforcement capabilities in developing countries**. Bernstein (1993) believes that economic incentives could not assist in successful solid waste management without legislative enforcement. The theory that needs to be researched is whether the correct economic incentives, without legislative enforcement, taking the entire ecosystem into account, would in fact have all the sustainable waste management pieces fall in place. A waste management programme based entirely on economic incentives will only fail as a result of some issue within the system becoming skewed. An example of this is Holmes (1984) indicating that the cleanliness of Singapore city is attributable to low crime and freedom of corruption. It is common knowledge that its people are industrious and diligent, and that the government is organised and free of corruption. Crime rates are low and public places are well maintained being a shining example to other developing countries in terms of order and stability. The entire population needs to gain one way or the other for any project to succeed. These successes should be measured according to all the various types of economic incentives offered. These are direct and indirect gains by any stakeholder within the framework.

Scott (1998) refers to a quotation from a report by Brown, Flavin, & Postel (1991) in a report *State of the World 1990. A World Watch Institute report on progress toward a sustainable society*. Norton, New York. "In the sustainable, efficient economy of 2030, waste reduction and recycling industries will have largely replaced the garbage collection and disposal companies of today … and the principle resource of materials for industry will be recycled goods". Producer responsibility and economic incentives will move the equilibrium in this direction.

Bernstein (1993) suggests that more than just command-and-control regulations which form part of legislation and policing will realistically be required to achieve proper solid waste management. **Excessive legislation in many countries is less frequently supported with effective policing**. Other incentives are required to motivate all the stakeholders towards controlling solid waste and to create sustainable management systems. In this regard, environmental resource economics have become important.

Environmental management could require (Blignaut & de Wit, 2004) various policy instruments to create sustainable development. These policy instruments are comprehensively listed as command-and-control, self-regulation, voluntarism, education and information instruments, economic instruments and free market environmentalism.

Natural resources accounts (NRA) is a procedure according to Blignaut & de Wit (2004) that adds missing environmental values to conventional economic activity creating a unified framework for macroeconomic and environmental management. This forms the basis for the wider assessment of projects especially during the scoping phase, which is the ex-ante of projects. These days the World Bank and UNCED of the United Nations are placing more demands on ex-ante and ex-post economic appraisals of environmental projects in promoting sustainability. Blignaut & de Wit (2004) also list the six development phases that environmental impact assessments (EIAs) have undergone over the past 35 years. Prior to the 1970's, the pre EIA period, projects were reviewed using engineering and economic studies e.g. cost benefit analyses with limited consideration for the environmental consequences. Thereafter, during 1970 to 1975 EIAs were developed with methodological procedures. This was extended by adding social dimensions from 1975 to 1980 and then a redirection of the process followed the next five years. Sustainable paradigms (ideas and imperatives) were added between 1985 and 1990. Following this, some developed countries introduced strategic environmental assessments to promote sustainability. Integrated environmental management (IEM) has started replacing EIAs as they are less restricted in scope. All the major institutions throughout the developed world are hard at work to discover the ideal tool to predict successful outcomes for future environmental projects including solid waste management. Success is also a relative term because some projects, whilst being financially progressive could fail environmental targets or the social costs could outweigh the social benefits. It depends what is meant by being financially progressive. There should be success if all the economic aspects of a project are taken into consideration and the ecology is balanced. Environmental target and social cost failures are in theory only due to certain economics within the system not being taken care of. Projects are often forced into the right direction without the creation of excessive financial incentives one way or the other. These financial incentives should be designed in such a way that they produce positive environmental and social outcomes and dynamics within the system making it sustainable without requiring other command enforcement.

According to Blignaut & de Wit (2004) EIAs should only include details having the potential to derail the project or indicating financial and economic viability. The dilemma with most of the discussions about environmental projects including waste reduction projects is that they weigh up all the risks associated. A single denominator measuring present or future success is not highlighted.

To end off the literature research it is important to restate the objectives of this research. It is therefore the **objective of this research** to identify the motivational factors of social capital including management processes, leadership and people management that would augment solid waste reduction management (SWRM) projects that are lethargic at starting or deteriorating, to achieve sustainability, with special reference to developing countries.

A further theoretical extension of this research is the matter of **idealism, realism** and **failure** of sustainability. Realism and idealism refers to the following:

Realism contains and is:

- Good SWM and is not simply end-of-line treatment,
- Not command-and-control only. (legislation and policing),
- Environmental resource economics being important
- The 4R principals are now required. (reduce, re-use, recover and recycle).

Idealism contains and is:

- Environmental Sustainable Development and which is based on projects that are environmentally friendly, socially acceptable and economically viable,
- Or in business terms, The Triple Bottom Line (integrated sustainability) which is founded on projects that have the imperatives of social equity, environmental quality and economic prosperity.

The literature survey as noted in chapters 2, 3 and 4 is done in an effort to identify the motivational factors that would augment the SWRM processes that are lethargic at starting or deteriorating, with special reference to developing countries. In table 1 a list is presented of the main management motivational factors identified throughout the mentioned three chapters having an effect on solid waste reduction management (SWRM). Each factor listed contains a brief description of reference.

Table 1: Management motivational factors augmenting SSWRM

Management factor	Description
Corporate governance	Business acting responsibly in terms of environmental matters
Corporate leadership	Private sector leadership taking lead with SWRM
Economic incentives	Economic incentives to promote solid waste reduction programmes
Education	Educating and training public or employees in SWRM
Environmental taxes	Taxes raised by government to reduce impact on environment and increase tax base
Governmental leadership	Government leadership taking lead with SWRM
Legislation	Environmental legislation to empower and enforce SWRM programmes including, process standards, permits and licenses
Life cycle assessment	Assessments by private sector to determine and direct product design and manufacture for least impact on environment
Personal values and belief systems	Belief systems in respect of SWRM
Producer responsibility	Business taking up cradle-to-grave responsibility for their product or service
Risk management	Assessment by government or corporate of risks posed by environmental issues
Social pressure	Social pressure on government and corporate to act environmentally responsibly
Standards, local and international	Environmental related standards to establish producer responsibility
Value of waste material as raw material	Value of a waste material by becoming the raw material for a new product or process

From table 1 the 14 motivational factors, together with the components of sustainable solid waste management and the Triple Bottom Line form the subject of research as expanded in chapters 5, 6 and 7.

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5. CHAPTER 5: RESEARCH DESIGN AND METHODOLOGY

The problem identified requiring research is that many solid waste reduction projects fail (Holmes, 1984; Yap, 1999) or do not progress beyond the planning boards of governments, businesses or non-governmental organisations. This is prevalent in developing countries and the question that arises is; **what is the single most important factor that will augment (initiate) these projects and at the same time guarantee success**. In other words, this research endeavours to find a solution to the incapacity of countries, including developing countries, of being able to solve their mounting solid waste problems and move towards sustainable development.

It is the objective of this research to identify the motivational factors of social capital including management processes, leadership and people management that would augment solid waste reduction management (SWRM) projects that are deteriorating or lethargic at starting, to achieve sustainability, with special reference to developing countries.

The goal of this work is to apply the results of the **research objective** in the creation of a **model** or road map that can be used by managers and leaders, especially in developing countries, to augment sustainable development of solid waste reduction projects. Models are developed in chapter 7 to create the road map.

5.1. Hypotheses, conceptualisation, definitions and key variables

The methodology adopted for this research is illustrated by figure 3 which is a diagrammatical presentation of the research process being followed. This will be used to finally arrive at the model or road map that could be used by management to implement successful solid waste reduction management projects. The aim of the research is contained in the top part of figure 3. The lower sections of the same diagram identify the research routes required to attain the goal. The research is guided by defining specific research problems, raising questions and then formulating and testing hypotheses.

The method of approach is very similar to Checkland (1981: 163) which outlines a proposed model for dealing with **real world** problems utilising a seven-stage process. These stages are as follows:

Stage 1: Defining the problem situation,

Stage 2: Expressing the problem situation,

Stage 3: Root definitions of the relevant systems,

Stage 4: Creating conceptual models which consist of formal systems concepts and other systems thinking,

Stage 5: Comparison of stages 4 with 2 (conceptual models with the expressed problem),

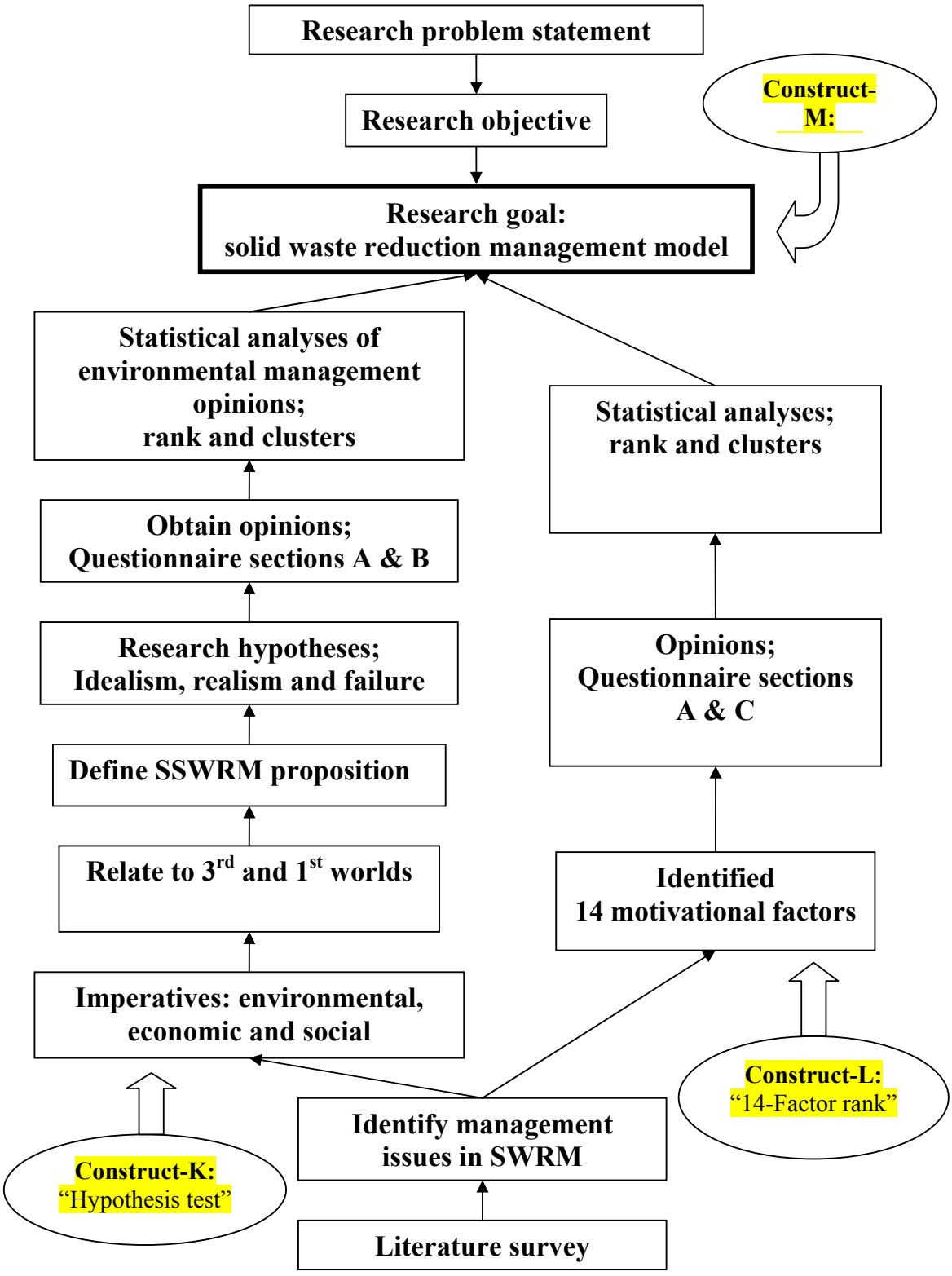
Stage 6: Defining feasible and desirable changes,

Stage 7: The action required to improve the problem situation.

Stage 5 above is generally not included in **hard system** methodology. It is indicated that this is not a cookery book recipe, and that systems thinkers often work at various stages in an iterative process. People are involved in the **real world** activities, which are stages 1, 2, 5, 6, and 7. Stages 3 and 4 are **systems thinking** activities, which require individual studies and expression. This research on SWRM follows similar steps to find answers to the identified problem.

Thompson & Strickland (1999) proposes a mechanistic strategic planning model using the systems approach. Their model follows a structured plan of setting the **goals** of the subject followed by scanning of the environment, both internally and externally, which results in the **critical strategic factors** to be addressed. This strategic planning model is generally used by business management when doing their strategic planning. Parts of this model are also used to construct the approach to this research. The goals are set and environmental scanning is done by means of the literature searches as per chapters 2, 3 and 4. Evaluating the environmental scanning results takes place during the constructs K and L research parts of the process as per figure 3. The critical strategic factors requiring attention are reflected in the final model constructed, chapter 6, to act as a guideline for future SWRM planning.

Figure 3: Research design and methodology, including constructs K, L and M



The initial steps of this research are to define the research problem, objective and goal as indicated by figure 1 followed by the research methodology as outlined by figures 2 and 3. Thereafter, with reference to the bottom part of figure 3, literature surveys are done and analysed as per chapters 2, 3 and 4 and used to identify the environmental management issues requiring opinion ratings. These issues are the factors that would augment a SWRM programme as well as highlighting the most important aspect in question. The approaches for evaluating the identified augmenting factors are two-fold and divided into **construct-K** and **construct-L**. **Construct-K** on the bottom left of figure 3 indicates the independent variables or imperatives of environmental friendliness, economical feasibility and social acceptability being evaluated, whilst on the bottom right, **construct-L** provides an insight into the process followed to obtain opinions and ranking of 14 identified management issues as per chapters 2, 3 and 4. The collection of data is done by means descriptive surveys using questionnaires sent to all the participants and then analysed using statistical techniques. Quantitative research methodologies are used for researching the objectives by evaluating the beliefs and practices of industry managers and environmental specialists in South Africa. This is empirical research using normative surveys. The knowledge obtained from the research done through the two **constructs, K** and L, is then utilised to create **construct-M**, which is the Strategy-benchmarking-model for augmenting SWRM projects.

Sustainable development lies at the heart of ecosystem management and being topical, in an environmental sense, is constantly under review. The world is under threat of environmental degradation (chapter 2) and idealists promote sustainable ways of reducing solid waste generated. For example burning waste rids the community of the waste but in the process pollutes the environment and creates other long term problems. Burning is therefore not a sustainable option. This runs hand-in-hand with the **Triple Bottom Line,** presently being adopted by some businesses as a principle for responsible sustainable management and reporting. Belief systems, which include values, experiences and attitudes play a major role in the activities of man and require measurement to gauge present insight. The research instrument in the format of a structured questionnaire is sent out to obtain the opinions of managers and experts in the field of SWRM. Identified variables which include i**dealism**, **realism and failure** of SWRM projects are also evaluated in terms of **3rd and 1st world** practices using hypotheses. The **three imperatives relating to social, environmental and economic factors** are treated (assumed) as independent variables as dependency relations would complicate this research extensively. A total of 14 management and leadership processes are identified and used under construct-L to rank them in

terms of priority augmenting SWRM projects. Constructs K and L, figure 3, form the basis of construct-M in designing the **Strategy-benchmarking-model**.

The design of this research centres on an empirical study and ultimately requires analytic philosophy exploring possible answers to the problem raised. The importance or otherwise of management and leadership factors towards sustainable SWRM development need to be identified. Hypotheses are tested using statistical techniques to support the theories on the aspects of management processes that would augment (progress) sustainable ecosystem management at an accelerated pace compared to past efforts in environmental management.

Successful sustainable development for a country (Blignaut & de Wit, 2004) is a realistic and practical focus on the choice between economic efficiency, social development and environmental sustainability in the context of political leadership and approach to policy instruments and implementation. The lack of proper economic supportive infrastructure and markets (Johnson, 2000) within developing countries remain the major stumbling blocks in the path of sustainable waste management. There are however, indications (Yap, 1999) that certain projects are succeeding within poor nations. There might be other socio-economic factors, which require identification, to assist and clarify the augmenting factor(s) that would spark off a sustainable waste management programme within, especially, 3rd world countries.

The **Triple bottom line** (Klee, 2002) guides companies towards sustainable development and refers to the implementation of successful economic, social and environmental imperatives within the company. The three imperatives all need to be in place for a company or operation to comply with the Triple Bottom Line concept. This is the **ideal** being striven towards. By implication this also applies to any organisation, be it private or governmental, endeavouring to install sustainable SWRM projects. The problem of distinguishing between **realism** and **idealism** arises in the quest to find a solution to the incapacity of countries, to be able to solve their mounting solid waste problems and move towards sustainable development. Causality is in this instance important. Dealing with and understanding the **reality** of the forces at play might lead to better formulation of **ideal** processes contributing to sustainable development.

The overall methodology or approach of this research is to review the literature available surrounding sustainable solid waste reduction management (SSWRM) in an effort to identify augmenting (motivational) factors that would progress the SWRM process. This research also

requires literature searches to identify the reasons for SWRM projects that are launched and fail or do not progress beyond the planning stage. This research reviews the broad spectrum of literature identified that can bear light on the motivational factors towards SSWRM. The literature review starts with chapter 2 and deals with the environmental issues surrounding SWM and assists in building an understanding of SWRM. Tools used to analyse management processes surrounding this subject are also referenced. Chapter 3 is an evaluation of the ethics and social issues relating to SWM. It deals with the motivation within belief systems and leadership of individuals and corporate managers towards SWRM. A focus is placed on the belief systems of man in an endeavour to identify certain traits that would motivate managers and leaders towards sustainable SWRM. The findings are that few positive aspects are indicated by previous research work. Issues such as education and starting with the young are some of the positive issues available. Chapter 4 is a review of the literature on the economics surrounding the subject of SWRM and includes socio-economics as the two disciplines that cannot in general be segregated. The various main socio-economic factors that are deemed important during the design or implementation of SWRM projects are also identified. The literature explored as per chapters 2, 3 and 4 does not assist in identifying a **single major contributor** that would augment (instigate) the process of sustainable SWRM. Therefore, other opinions are to be obtained before combining the important references at the end of this research. Propositions are formulated for empirical testing as hypotheses in support of defining these important management processes. An analytical philosophical, empirical approach is used to research the SWRM issues relating to the problem statement herein and is a conceptual analyses, which tests the concepts using hypotheses. Support or otherwise for these theories has to be found by means of field data collection using a questionnaire as research instrument. The results of this should then provide the directives for creating the final model (construct-M) as a proposal to answer the objectives of this research. These models will incorporate the literature reviews done in chapters 2, 3 and 4 through constructs K and L.

Much of this research also requires a philosophical approach in addition to the pure statistical analyses. The reason for this is the magnitude of independency between the three imperatives referred to within sustainability or Triple Bottom Line concepts. It is outside the scope of this research to evaluate the linkages between the three imperatives. Creating a proposition requires a philosophical approach in addressing the three imperatives in a single logical argument. The branches of philosophy (Britannica Student Encyclopedia, 2004) that apply are **epistemology, ethics** and **logic**. Epistemology deals with the logic or theory of knowledge. Knowledge consists of two parts which are what one sees, hears, touches, tastes and smells, and the organisation of

these perceptions in the mind to form ideas and concepts. The understanding of the relationship of the mind (knowledge) to the rest of **reality** is the essence. The beliefs and actions of people towards SWRM as dealt within chapter 3, bears testimony to this approach. This research aims to distinguish **reality** from the **idealistic**. The concept of sustainability is based on idealism as that is what environmentalists strive towards. The underlying essence of this research engages the search for the **augmenting** elements that would form practical and realistic motivating factors for man towards the idealistic goal of sustainability. In other words, is it not possible to identify the augmenting elements that would move reality closer to idealism?

The next branch of philosophy is **ethics**. It is concerned (Britannica Student Encyclopedia, 2004) with human behaviour, morality and responsibilities of people to each other and to society. There are **relativists** who say that ethical decisions are related to specific circumstances. People's reaction at any given moment is determined by the specific situation at hand. The reference (Britannica Student Encyclopedia, 2004) also indicates that if ethics is practical philosophy then it is reasonable to assume that politics and economics fall into the same category. Politics per se is not the subject of this research however economics is one of the imperatives being evaluated. Every country has some form of politics that play a role in the everyday life and ethics of citizens. The same reference (Britannica Student Encyclopedia, 2004) quotes the philosopher, Whitehead, who says that the task of philosophy is to "frame a coherent, logical, necessary system of general ideas in terms of which every element of our experience can be interpreted". The findings of chapter 3 of this thesis indicate that people are basically unpredictable when they deal with solid waste, when guided by their belief systems, and that other incentives normally direct their action. Experience determines the outcome of peoples' reaction. There is a need for this research to interpret the experience issues and frame a coherent system (model) that could be applied to attain the objectives of this work. The **philosophy of logic** (Hintikka, 2004) "may be characterized as the study of truths based completely on the meaning of the terms they contain". The concept of logic creates the meaning between relations and contain propositional connectives such as "not", "and" etc, and quantifiers (independent variables in this case), concept of identity "=" and notion of predication (coefficients). This relationship is termed first-order logic (Hintikka, 2004) with identity if all the aspects of the equation are used. Calculable functions are termed recursive. The **proposition logic** (hypotheses) formed in this chapter is based on this concept of logic as it contains imperatives (**economic, social** and **environmental**) that are independent of each other with each containing a wealth of information. Propositions are the meaning of sentences (Hintikka, 2004) and as functions correlate possible worlds with truth values. In the usual logical semantics

of the proposition, no finer distinctions are utilised in the semantic discussions than logical equivalence. The independent variables, **economic, social** and **environmental** imperatives, which are basically sets of information, are too complex to present as a straightforward mathematical complex equation or function. What is important is the individual contribution made by each of the imperatives within the empiric (arising from observations) analysis of the proposition within the construct or hypothesis. Probability theory and statistics are used to evaluate the empirical results of the propositions tested.

In dealing with the relationships between **activities** and **results** in the problem solving development of a subject, Checkland (1981) as far back as the early 1980s, suggests a **systems approach** methodology. A methodology, he infers, is intermediate in status between a philosophy and a technique. The area of **reality** contains concerns, issues, problems and aspirations. These **realities** and other sources generate ideas from which theories are formulated. Models can be used to present, analyse and manipulate problems by the use of certain techniques. This research is planned along the same lines by investigating **reality** with theories and propositions and then formulating a model as per construct-M, figure 3.

Checkland (1981) also indicates that case studies are utilised to criticize and test theories, which leads to better theories being formulated together with developing better models, techniques or methodology. Human-activity related problems can not be solved (Checkland, 1981) using the **hard systems approach** because the real world also has **soft and ill-structured problems**. A large amount of research resulted in the human activity systems. According to Checkland (1981: 16) “In the methodology, the situation in which the perceived problem lies (rather than the problem itself) is **expressed** and this is done, not in systems terms, but by using the concepts **structure** and **process**, and the relation between the two. These are gentle guidelines, which do actually guide the analyst whilst not distorting the problem into a preconceived or standard form". The subject of this research also has soft and ill-structured problems (human activity systems) and addresses the concepts of structure and process and their relations in this and later chapters.

Checkland (1981: 17) also proposes that “the soft systems methodology is a learning system, which uses systems ideas to formulate basic mental acts of four kinds: perceiving, predicating, comparing and deciding on action. The output of the methodology is thus very different from the output of hard systems engineering: it is learning which leads to a decision to take certain actions, knowing that this will lead not to the problem being now solved but to a changed situation and

new learning". It is the future sustainable development that is being addressed by this research and will require comparison between **conceptual models proposed** and the **problem situation expressed**. It will take many years of leadership application to make, in particular, especially developing countries ecologically sustainable in terms of SWRM.

Another view of philosophical analyses according to King (1994) exploits a **framework** containing elements that are independently motivated and defended, and in such a manner that the answers are eventually obtained. The answers are, to a large extent, a **fall out** from this framework. King (1994) contends that one element employed in addressing the questions about analyses, using the framework, claims there are properties and relations and that at least some properties and relations are complex and are made up of other properties and relations. The properties or relations that are combined in a certain way to form the complex property or relationship are called the **components** of the complex property or relation. Components can also contain sub-components. Therefore, in this research on SWRM some **socio-economic factors** that contribute to the success or otherwise of SWRM programmes, are identified and form the **components** with complex properties or relations, within the framework of the philosophical analytical approach. Furthermore, a second element of the framework, a **theory of propositions** is used to address the question of analyses. Sentences are the syntactic (according-to sentence construction) input to the rules of semantic (relating to meaning in language) interpretation. These rules map the syntactic inputs to structured propositions. The semantics also include a definition of truth for propositions. The syntactic representations are the inputs to semantic interpretation (SI). Structured propositions follow when recursive (returning) assignments of propositions (statements or theories) are mapped. This is one SI mapped to another SI. It is important to note that ambiguity is possible within semantic interpretations. King (1994) believes that the difference between a philosophical and a scientific analysis of a proposition (theory) has to do with the sort of epistemic (scriptures) relations typical members of the linguistic community bring to the analysed property. The semantic value (SV) of words (or phrases) is associated with linguistic competence understanding the complex properties (relation) in question. Therefore, a proposition (theory) will be a philosophical analysis only relative to a linguistic community. The notion of a standard of linguistic competence is assumed within the cadre of philosophical analyses. Formulations of complex relations contain dependent and independent variables, complex entities and truth functions. This leads to the formulation of interdependent formulae to find support for, or not for, hypotheses using statistical methods. This verifies the analytical philosophical discourse proposed for this research.

A measuring scale has to be defined to use and analyse the questionnaire instrument to evaluate the propositions and hypotheses formed hereunder. Scott (1998) uses, in his PhD thesis, *Understanding the contemporary recycling ethos*, the five point Likert scale to measure assimilations of households, as well as one-way-ANOVA and multi regression statistical tests. The five point Likert scale will also be used in the measuring instrument (the questionnaire) of this research as it is often used in the social sciences (Diamantopoulos & Schlegelmilch, 2000; Babbie, 2000).

As per Diamantopoulos & Schlegelmilch (2000) and Howell (1999) the following steps are used to test the hypotheses and find support for the theories

- Formulation of the null (Ho) and alternative hypotheses (H1) and deciding on what would be expected to be found if the null hypotheses are supported,
- Specifying the significance levels of confidence,
- Selection of an appropriate statistical test,
- Identifying the probability distribution of the test applied and defining the regions of rejection,
- Computing the values of the test statistics from the gathered data (questionnaire) and decide to reject or not to reject the null hypotheses,
- This research is also **helical** of nature by means of posing questions, finding answers to them through research and supporting the hypotheses or otherwise, which then completes the cycle.

A philosophical analysis of a situation or a problem, such as the theme of this research, can lead to complexity. It is the aim of this research to reduce the complication of an already involved subject which contains a lot of research, as done specifically over the past 300 years. Blignaut & de Wit (2004: 430) state "although simplicity may buy an increased understanding, this understanding might come at the expense of an appreciation of the complexity of reality". It is this **reality** that this research aims to understand.

5.1.1. Construct-K: Hypothesis testing; Idealism versus realism versus failure

The first **construct-K** (figure 3) is to survey the opinions of subject experts and managers in SWRM in terms of sustainable idealism, realism and reasons for failure of SWRM (SSWRM: sustainable solid waste reduction management). Logic (proposition) is created in search of answers to create a model as foreseen for construct-M, figure 3.

Sustainable SWM as indicated in chapter 2 is defined in terms of idealistic accomplishment of environmental friendliness, economic justifiability and socially acceptable norms (sustainable triangle). This also applies to the **Triple bottom line** code of business imperatives encompassing the same principles. Sustainability can only be achieved if the forces of reality match the idealistic goals. It is this reality that requires research, for if the main driving forces (augmentations) become known, future directives could drive **reality** in the right direction (causality). The rest of the sustainable triangle should then, more easily, fall in place. Solid waste reduction management (SWRM) should therefore be approached in terms of **realism**. Some issues identified from chapters 2, 3 and 4 seem important when considering SWM:

- Good SWM is not simply end-of-line treatment with the associated environmental quality issues. The life cycle of commodities need to be considered in the SWRM process. This reduces the end-of-line measures required to rectify waste reduction,
- It is also not only command-and-control (legislation and policing) that matters. This alone will not force the issue in the correct direction,
- Environmental resource economics are becoming important. This encompasses the entire costs associated with SWRM,
- The **4R** environmental principals are now important. (Reduce, re-use, recover and recycle)

In terms of **idealism** within SWRM the following issues are important:

- Environmental sustainable development is the ultimate goal and is based on projects that are **environmentally friendly, socially acceptable** and **economically viable**,
- Related to sustainable development is the **Triple Bottom Line**, integrated sustainability, which is based on projects that have the imperatives of **social equity, environmental quality** and **economic prosperity**.

The cardinal issues required to create a proposition for construct-K are answers to the following:

- What makes SWRM projects **successful** and by implication sustainable?
- What is the difference between **realism** and **idealism** in terms of SWRM?
- Why do SWM projects **fail**, especially in developing countries?

The point of departure is to consider the management of solid waste reduction management in terms of a business. The basic business principle of measurement utilised in environmental management is **the Triple Bottom Line** that measures corporate performance in terms of economic growth, environmental performance and social responsibility. The theory being developed places the following imperatives within the philosophical **framework** of research:
It defines the following sustainable imperatives as independent variables:

- Social Equity as **Social imperatives,**
- Environmental Quality as **Environmental imperatives** and,
- Economic Prosperity as **Economic imperatives.**

Each of the three imperatives above is defined in terms of the factors that contribute to their composition as identified from literature (Blignaut & de Wit, 2004) and practice.

Construct **sustainable solid waste reduction management** (SSWRM) as the following **proposition**:

SSWRM = f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With **P**, **Q** and **R** being the **coefficients** and S**SWRM** the **dependent variable**.

The above **proposition** forms the **first order** logical proposition of the analytical philosophical approach to the problem and the independent variables form the components with their complex properties or relations. **P**, **Q** and **R** are the notions of predication. The purpose of this proposition is to gauge the contribution made by each independent variable to SSWRM as per the opinion of environmental specialists.

The format of the **data matrix** (Diamantopoulos & Schlegelmilch, 2000) to be used for the **proposition** created above is contained within Table 2. The proposition will be used in the context of **idealism, realism** and **failure** in terms of the opinions of environmental specialists questioned. The same data matrix will apply to all three hypotheses created below for **idealism, realism** and **failure**. The **dependent variables** are the outcomes of the SWRM with the imperatives of

economical, social and environmental being the **independent variables** with their **coefficients** P, Q and R. The **unit of analysis** is the opinion of the environmental specialists in SA which is chosen as the sample population.

An important step in the empirical evaluation of the proposition is the use a measuring instrument such as a questionnaire to gather data for a statistical analysis. The three imperatives within the proposition need to be evaluated in the form of hypotheses. Their evaluations reside in the format of their contributions to the dependant variables. The **contributions** or **weights** of the three independent variables **Econ imperatives, Environ imperatives** and **Soc imperatives** are measured by the values of their respective coefficients P, Q and R. To measure the contributions requires some scale of measurement. The Likert scale is used in this instance with the questionnaire and ranges from '1'=**strongly disagree** meaning no contribution, to '5'=**strongly agree**. In the proposition the coefficients are rated from '1', meaning **nil** or having **no** contribution to '5' making a **full** contribution to the proposition surveyed. Therefore '1' on the Likert scale means no contribution, '3' average contribution and '5' maximum contribution, with '2' and '4' slotting in-between within the range.

Table 2: Data matrix for the hypotheses using Likert scale 1 to 5

Unit of analysis	Variables	Variables	Variables
Sample of population	**Economic imperative**	**Environmental imperative**	**Social imperative**
Environmental Specialist '1'	5 (example)	3 (example)	2 (example)
Environmental Specialist '2'	3 (example)	4 (example)	4 (example)
Etcetera ↓			
↓			
Environmental Specialist 'n'	4 (example)	1 (example)	1 (example)

Table 2, is the data matrix constructed (Diamantopoulos & Schlegelmilch, 2000) that will be used for creating the propositions of the hypotheses. It defines the sample population to be employed and the independent variables identified. The Likert rating application is also indicated.

5.1.1.1. Construct-K: Hypothesis K1, Idealism

Hypothesis K1 is created by using the **proposition** for SWRM formulated above for **construct-K.** The hypothesis K1 is evaluated by obtaining the opinions of environmental specialists to test the statement that Successful SWM under i***dealism*** requires Economic, Environmental and Social Imperatives to all be significant contributors.

Hypothesis K1 is defined as:

SSWRM(ideal) =f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With the coefficients P, Q, R all being significant; it is all close to 5 on the Likert scale.

The null (Ho) and research (H1) hypotheses need to be formulated to test the hypothesis K1. These are formulated as per Table 3.

Table 3: Hypothesis K1: SSWRM(ideal); null and alternate hypotheses

	Hypothesis K1 SSWRM(ideal)
Null hypothesis: Null hypo Ho	Coefficients P, Q and R are not significant contributors to SSWRM
Research hypothesis: Alternative Hypo H1 (directional)	P, Q and R are all significant contributors to SSWRM

Table 3 indicates the **research hypothesis of SSWRM under the idealistic scenario,** being the opposite of the **null hypothesis** in defining the contributions expected to be made by the imperatives. The alternate or research hypotheses would indirectly be supported (Diamantopoulos & Schlegelmilch, 2000) should the null hypotheses not be sustained after the results analysis as per chapter 6.

5.1.1.2. Construct-K: Hypothesis K2, Realism

Realism dictates and requires that successful solid waste reduction management (SSWRM) solely depends on positive **economic imperatives** whilst the contribution of the **environmental and social imperatives** are not significant. Economic imperatives are the determining factors.

Hypothesis K2 is defined as:

SSWRM(real) =f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With the coefficient P being significant (close to 5 on the Likert scale) and Q and R not significant. (Closer to 1 on the Likert scale)

The null and research hypotheses to test the hypothesis K2 are formulated as per Table 4.

Table 4: Hypothesis K2: SSWRM(real); null and alternate hypotheses

	Hypothesis K2 SSWRM(real)
Null hypothesis: Null hypo Ho	Coefficient P is not a significant contributors to SSWRM
Research hypothesis: Alternative Hypo H1 (directional)	P is important whilst Q and R are not all significant contributors to SSWRM

Table 4 indicates the **research hypothesis of SSWRM under the realistic scenario,** being the opposite of the **null hypothesis** in defining the contributions expected to be made by the imperatives. The 'economic' imperative with coefficient P is the important aspect in this scenario.

5.1.1.3. Construct-K: Hypothesis K3, Failure

A ***Failed*** SWRM project results from the Economic Imperatives being ignored despite the Environmental and Social Imperatives being positive:

Hypothesis K3 is defined as:

SWRM(fail) = f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With the coefficient P being ignored (close to 1 on the Likert scale) despite Q and/or R positive. (Q and R could be close to 5 on the Likert scale)

The null and research hypotheses to test the hypothesis K3 are formulated as per Table 5.

Table 5: Hypothesis K3: SWRM(fail); null and alternate hypotheses

	Hypothesis K3 SSWM(fail)
Null hypothesis: Null hypo Ho	P was not ignored.
Research hypothesis: Alternative Hypo H1 (directional)	P ignored despite Q and/or R being positive contributors

Table 5 indicates the **research hypothesis of SSWRM under the failure scenario,** being the opposite of the **null hypothesis** in defining the contributions expected to be made by the imperatives. The economics imperative is the important aspect in this hypothesis.

Hypotheses K1, K2 and K3 will be tested using a questionnaire as measuring instrument. Statistical analysis of the results, as indicated by chapter 6, will determine degree of support for the null hypotheses.

5.1.2. Construct-L: Ranking of 14-motivational factors; management processes

The second part of this research analysis as per figure 3, and termed **construct-L,** is to:

> Rank the identified management motivational factors that would augment (promote) the process of sustainable solid waste reduction management (SSWRM).

The methodology for construct-L is to obtain the **opinions** of environmental specialists in ranking the identified motivational factors and then using them to create a model, which is the goal as per construct-M, figure 3. Data needed for the compilation of the augmenting factors are the identified management and leadership processes obtained from the literature reviews as per chapters 2, 3 and 4. These are to be ranked, as augmenting factors towards sustainable SWRM, following its subjection to an opinion survey.

Table 6 lists the motivational factors identified at the end of chapter 4 requiring ranking in terms of importance towards augmenting SSWRM.

Table 6: Management motivational factors augmenting SSWRM

Management factor	Description
Corporate governance	Business acting responsibly in terms of environmental matters
Corporate leadership	Private sector leadership taking lead with SWRM
Economic incentives	Economic incentives to promote solid waste reduction programmes
Education	Educating and training public or employees in SWRM
Environmental taxes	Taxes raised by government to reduce impact on environment and increase tax base
Governmental leadership	Government leadership taking lead with SWRM
Legislation	Environmental legislation to empower and enforce SWRM programmes
Life cycle assessment	Assessments by private sector to determine and direct product design and manufacture for least impact on environment
Personal values and belief systems	Belief systems in respect of SWRM
Producer responsibility	Business taking up cradle-to-grave responsibility for their product or service
Risk management	Assessment by government or corporate of risks posed by environmental issues
Social pressure	Social pressure on government and corporate to act environmentally responsibly
Standards, local and international	Environmental related standards to establish producer responsibility
Value of waste material as raw material	Value of a waste material by becoming the raw material for a new product or process

Table 6 contains a brief description of each of the management factors listed. The criteria, that govern the admissibility of this data into the research design, are:

- The inclusiveness of the identified subject matter complying with the outcome of the sustainable project goal. It is therefore an issue that would assist in augmenting the process of SSWRM,
- Subject to understanding and developing the economic factors involved in the process,
- The third criterion for use of each management factor in the final model (construct-M) is the longevity of the issue because sustainability is the ultimate goal.

5.1.3. Construct-M: Strategy-benchmarking-model augmenting SSWRM

The third part of this research analysis, termed **construct-M** is to:

> Create a strategy-benchmarking-model of the responsible person, process or organisations that would augment (promote) the process of sustainable solid waste reduction management (SSWRM).

Data needed for its solution is a matrix of the environmental and socio-economic factors identified and ranked by means of construct-K and construct-L (paragraphs 5.1.1 and 5.1.2) to facilitate the sustainable development process of successful solid waste reduction management (SSWRM).

The criterion for construct-M is to create a comprehensive plan including all the identified socio-economic and environmental factors that would lead to success and sustainability. Also to clearly identify and rank all the internal and external strategic factors and indicate the critical items that will lead to successful solid waste reduction management.

5.2. Measuring instrument

The empirical measuring instrument being used for this research in obtaining the required quantitative primary data is a descriptive survey in the form of a questionnaire to evaluate, compare and rank the variables.

Chapter 3 contains references to belief systems in terms of solid waste management. Methods have been developed to study belief systems. Giacomino, Akers & Fujita (2001) cite two survey instruments that are primarily used to research **values**. Most studies use a survey instrument designed by Milton Rokeach (1968) in his reference *Beliefs, Attitudes and Values* that categorises values as terminal or instrumental. Other researchers use the Maccoby survey instrument (Maccoby, 1976: 173-209) to measure the perceptions of **head-and-heart traits**. Researchers Schwartz & Sagiv (1995) present a theory about universals in the content of the value of individuals and identify ten motivational distinct types of values, postulated to be recognized in all cultures. The Schwartz questionnaire on values is the most widely used instrument for measuring personal values, and it examines a greater number of personal values than the Maccoby

instrument. Giacomino, Akers & Fujita (2001) also confirm that the Schwartz questionnaire, developed for multi-cultural research, is the most widely used instrument for measuring personal values. Deductions made from the literature research as per chapters 2, 3 and 4 lead to the requirement to first research the ranking of importance of the augment factors identified before focusing on belief systems.

The limitation of this research is therefore to restrict surveys to ranking of the augment factors and not head-and-heart traits**.** If the results of this research prove that personal values rank high in the opinion of waste experts towards augmenting SSWRM, then it aught to be subjected to further research. Multi-cultural research provides further opportunities for this study.

This research is designed as an empirical study as well as partly using philosophical analyses. **Empiric** is defined by the Oxford Dictionary (*Compact Oxford English Dictionary of Current English*, 2005: 326) as an adjective which is "based on observation or experience rather than theory or logic". This research relies on observation in the form of questionnaires. It is therefore an empirical study using surveys and statistical analyses to offer support for-or-against the underlying hypotheses and propositions.

A questionnaire is required for this research as a measuring instrument to gauge the opinion of waste specialists on the importance or otherwise of augmenting factors towards SSWRM. A number of variables such as the imperatives of environmental friendliness, economic sustainability and social acceptability within 3rd and 1st world, also referring to idealism, reality and failure of projects, need to be contained within the questionnaire. Furthermore, the 14 motivational factors identified from the literature research need to be ranked. Provision for comment is also required. The measuring instrument is complicated by the numerous variables being evaluated.

Dillman (1978) in his book *Mail and Telephone Surveys* provides details of conducting successful surveys using either mail or telephone. Dillman exhaustively tested these methods over many years. The directives provided by Dillman are extensively used to create the style and approach of the questionnaire designed for this research. As per Dillman (1978) the important issues to deal with in respect of the questionnaire are; limiting the length, keeping the layout simple and logical, obtaining answers to all the questions, and avoiding bias. Answering time is set to a maximum of 20 minutes to ensure good response rates. The layout as prescribed is also followed in respect of issues such as vertical flow, numbering and font sizes. The respondents need to feel that rapid

progress is being made with the answering to prevent them from not completing the questionnaire. Specific attention is given to the kind of information sought being, attitudes, beliefs, behaviour and attributes. Common question wording problems are highlighted by Dillman and receive attention. The questions asked are of the close-ended type with ordered answer choices to enable statistical analysis of the results. Space created for opinions will be used during the analysis part of the responses to highlight thinking of the respondents. Lastly, Dillman (1978) recommends pre-testing the questionnaire and the use of a covering letter to appeal for response.

The questionnaire designed, as per appendix A, consists of 5 sections. The first section contains a summarised version of the letter of support, appendix B, from the business school to strengthen the legitimacy of the document sent out. The next part, section 'A' starts with a straightforward question to ease the respondent into the document as recommended by Dillman (1978). It is then followed with a request for biographic data. The third section 'B' contains questions to obtain the opinion of waste specialists on the three imperatives of environmental friendliness, economic sustainability and social acceptability within 3rd and 1st world, as well as referring to idealism, reality and failure of SWRM projects. This is to provide answers to construct-K, figure 3 of the research design. The 3rd and 1st world questions are set side by side to enable the respondent to evaluate their responses to the same question weighted for the different categories of country. Too many questions are avoided for two reasons. Firstly, the limited answering time available and secondly, an opinion is requested which is actually repeated six times in different ways. The questions are also structured to avoid vagueness, being too precise, objectionable, double meaning, assuming too much knowledge or too cryptic without leading the respondent towards the hypotheses being tested. The questions are also not listed in a set pattern the aim being to create randomness of answers. The fourth part, section 'C' of the questionnaire, is a request to rank the 14 augmenting factors (management factors) identified from literature. Construct-L will be evaluated using this part of the questionnaire. Respondents are also requested to check their ranking and avoid duplication of rank. The fifth and last part of the instrument makes provision for comment and requests for information.

The question structure used is predominately of the **close-ended** type to obtain ordered choices. Answer choices are provided and each question is a gradation of a single dimension of SWRM. This should provide for the required statistical analyses to compare and rank the factors raised.

Use is made of the Likert rating scale of 1 to 5, which is the most widely used scale for attitude (opinion) measurement technique in social sciences research (Diamantopoulos & Schlegelmilch, 2000), yielding metric data of the interval type. The scale used (Babbie, 2000) to obtain the direct rating format for the data analysis is as follows:

'1' = strongly disagree

'2' = disagree

'3' = neither agree nor disagree

'4' = agree

'5' = strongly agree

The specific order of starting at '1' strongly disagree is specifically done to prevent bias of simply agreeing to the questions statements from the start. Dillman (1987) recommends this approach. A scale of '1' to '7' or larger is not used as it is believed the respondents would not be able to distinguish their opinions to a higher degree than '5'. It is also the intent to basically obtain a three level response which is **not-agree, neutral** or **agree**.

It was decided not to do interviews and rather use a structured questionnaire with close ended questions with an option at the end for general comment. It was felt that the structure of the questionnaire would provide for detailed statistical analysis in measuring opinions of environmental specialists.

Pilot runs of the questionnaires are required (Dillman, 1978) to verify understanding and to correct mistakes. The questionnaire is to be sent by electronic mail instead of posting. Sending out the questionnaires, up to three times, to 20 people with modifications each time proved valuable in correcting misunderstandings and in obtaining coherent responses. Comments from academic members of the Business School, SBL, UNISA also proved valuable. The layout changed in the process to improve understanding and questions with double meanings were eliminated. Comparisons between 3rd and 1st world countries were enhanced and improvements made due to the comments received. The introduction letter required shortening to reduce the reading time factor and retain interest.

Various coded checks on the correct allocation of the answers to the database at the internet service provider revealed mistakes and alterations were made in order to guarantee complete correct record keeping before the questionnaire was finally sent out.

5.3. Sample design and sampling methods

The subject of this research cuts across various countries including third and first worlds (developing and developed countries) and the belief systems of the societies living within these regions. Various countries can be selected as reference base for this research. Countries are generally classified by the United Nations (UN) by means of their per capita income and socio-economic status as well as their own choice of classification. The classification (OWNO, 2005) is third world, 133 countries; first world, 32 countries; second world, 32 formerly communist-socialist countries and least developed countries (LDC), 50 states which are included in the list of third world countries. Total countries are 197. Angola, Democratic Republic of the Congo, Malawi, Tanzania and Zambia within the Southern African region are identified as LDCs. For the purpose of this research distinction is only be made between **first world** and **third world** countries, where third world countries include second, third and least developed countries. The two categories of countries, first and third world, conform more to what is generally known as **rich** (industrialised) and **poor** (low average income) countries.

The criterion for the research sample is to obtain the opinion of **environmental specialists**. In this instance sustainable solid waste reduction management (SSWRM) is researched by evaluating the views, beliefs, attitudes and management application, of environmental specialists from a representative sample. The sample should also be representative of these specialists deployed in government, industries, and non-governmental organisations (NGOs) in developed and developing countries.

The populations (universe) of this research are the people of developed and developing countries who have an influence on SWRM programmes. It being difficult to survey the opinions of environmental specialist of other countries, South Africa is chosen as the **population element** with a cross section of environmental specialists as the **sampling frame** from this country forming the **unit of analysis**. South Africa is identified by the UN as a developing country. It is **assumed** to be a good point of departure and reference base as it contains first and third world socio-economic structures. Further studies can be done to compare these results with outcomes from other countries, either in developed or least developed countries.

Most of the environmental specialists in Southern Africa belong to the Institute of Waste Management of South Africa (IWMSA). They have 600 members working as specialist consultants or managers in private companies, government and education. The sample is **probabilistically** drawn by sending questionnaires to all the environmental specialists listed by the association. According to Leedy (1997, 211) the ideal statistical response out of a population of 600 is 234 returns. It is assumed (Diamantopoulos & Schlegelmilch, 2000) that a large sample drawn will result in a normal distribution of result intervals. The members of the IWMSA are chosen as sampling frame instead of the entire country. This is done to improve the normality of result distribution and to reduce the probability of error due to taking a sample instead of sampling the entire population being studied. The samples are drawn from one grouping in the population to contain the complexity of analyses. This group represents the specialists in environmental matters.

The value of the sample is important because missing responses to some questions would reduce the confidence of the analyses. It is assumed that these specialists would be serious about their subject and produce good responses. Missing answers within the questionnaires are dealt with during the cleaning up of the data.

The qualifiers specified for the person completing the questionnaire are that they have to be environmental specialists, actively involved in waste management and members of IWMSA. This institute is a non-statuary, non-profit, non-governmental, multi-disciplinary professional organisation with voluntary membership, and established to promote the science and practice of waste management. They have six grades of membership ranging from student to organisation member.

With reference to the **data matrix**, table 2, the nature of measurement is done by comparison of the different opinions of one responding group, the unit of analysis, being the environmental specialists. Three independent variables (economics, environmental and social imperatives) are measured, and considered to be independent from each other and mutually exclusive. Therefore the numbers of sampling variables are limited by sampling only one group within the population, being the people within a developing country, South Africa. Therefore, uni-variate and multivariate analysis will be required to analyse each of the independent variables to confirm the statistical response in the form of a Likert value.

Bias might be within the sampling procedures. The sample chosen, which is all IWMSA members, should represent any race, gender, religion, and adult from South Africa. These are environmental specialists employed by government, industries or consulting companies and residing throughout the country of South Africa. Making the sample large enough by sending the questionnaire to all members reduces the bias. It is expected that this sampling method would produce a normal distribution of scores. Bias might also be created by only using South Africa as the population element. The members of the IWMSA are generally well educated, travelled and experienced and in a way represent the opinion of environmental specialists in the world.

5.4. Data collection methods and field work practice

Mailing of the research instrument, the questionnaire, is an option but on investigation seems to be too expensive in terms of cost of stationery, postage and time versus using the internet option. Every reminder posted needs to contain a new copy of the questionnaire as well as a postage paid return envelope which adds to the cost. Calculations made, after obtaining postage costs, proved that using the internet would cost less than 10% of the traditional route of using paper and the post office. The other problems identified with postage are, the time wasted waiting for responses, the unknown additional financial cost, and time of remitting reminders. Up to four reminders might be required according to Dillman (1987). This was confirmed by the management of the IWMSA who have done surveys in the past using both postage and internet options. Another problem identified is getting the busy executive to actually mail back the answers.

Surveying a specific group of managers using the internet can be achieved in one of two ways. The first is to request the members to visit a website and download the questionnaire for answering and resubmission. The answers are then automatically stored in a database maintained by the website owner, which in this case is the Business School, SBL, Midrand, South Africa. The other option is to send the questionnaire as an attachment to an email to each member and request them to complete it before returning the answers to the author's email inbox or to the IWMSA email inbox. These answers then have to be transferred into the final database. Questionnaires were sent to all of the 600 members of IWMSA with the consent of their Executive Committee. Their office manager actually sent out the requests to their members using their own membership database. A pro forma of the questionnaire was attached to their email request to the member to participate in the survey. The questionnaire in all cases had to be answered by selecting the corresponding

answer chosen for sections 'A' and 'B' and entering the rank number for section 'C' of the questionnaire document. Comments, if proffered, had to be typed into the final part of the document.

The data collection process initially used was to send electronic questionnaires to all 600 members of the IWMSA from the end of February 2005. The first attempt to obtain response of the finalised questionnaire used the Business School's website (http://www.sbleds.ac.za/eds/surveyhuman.nsf) as the return address for respondents. Three reminders to the members of IWMSA only resulted in 20 responses. Overloaded internet networks used by many companies proved to be a major problem with the respondents not being able to enter the requested website when endeavouring to log onto it. The response groups represented by the IWMSA members are also in general less experienced with internet options and do not always understand execution routine. The next route of emailing a word document to the members of the IWMSA proved a lot more successful. Most returned the document, with their answers, by email whilst a few simply faxed the document back. Some even requested the original questionnaire to be faxed to them for completion. Of the 600 IWMSA members 91 completed returns (15%) were obtained. Five additional responses were rejected due to missing information. Most of the failures are ascribed to lack of understanding of internet operations. Another four respondents indicated the subject was beyond their comprehension and did not respond with answers.

Testing the perception of respondents as to whether SWRM as a subject, is complex in nature, is the first question of the questionnaire as per appendix A. In table 7 a summary is provided of the degree-of-complexity of SWRM foreseen by the environmental specialists answering the questionnaire. Percentages are indicated for each category of answer.

Table 7: Response to question 'SWRM is complex'

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2
	Somewhat disagree	8	8.8	11.0
	Neither agree nor disagree	3	3.3	14.3
	Somewhat agree	45	49.5	63.7
	Strongly agree	33	36.3	100.0
	Total	91	100.0	

From table 7 it is of interest to note that combining 'somewhat agree' with 'strongly agree' indicates that the majority of the final responses received, namely 86%, agreed that SWRM is a complex subject. This fact of perceived complexity adds to the requirement for using specialists or experts to answer the questionnaire.

It took 60 days to exhaust the five repeat response requests. The original data is stored in Microsoft Excel spreadsheets and then transferred to the statistics programme SPSS 12.0 data base. The answers contained in the final SPSS database, as per appendix D, were checked twice for accurate transfer from the various sources received and cleaned of mistakes.

Emailing a word document to prospects proved to be the most successful and fastest technique. Respondents did not bother to reply if they failed to do so within two days of receiving the internet request. Reminders requesting answers, together with the complete questionnaire needed to be sent out again to improve the response rate. Unlike letters lying on the prospects desk to act as a reminder, emails simply disappear amongst the other electronic mail. People seldom return to un-answered emails.

5.5. Data capturing and data editing

The two internet options used to obtain answers to the questionnaire sent to the members of the IWMSA produced two data bases, one maintained by the Business School SBL using Lotus Notes,

and the other an Excel spread sheet maintained by the author. All the data was finally transferred to the Excel spread sheet using copy/paste commands to minimise errors. The few fax copies received were manually transferred to the Excel spread sheet. All data was checked more than twice to confirm accuracy.

Coding used for the questionnaire is contained in appendix C (code book). In summary, section 'A' of the questionnaire is coded numerically according to the question whilst, section 'B' is coded for the Likert scale according to chapter 5.2.
Value 1 = **strongly disagree**
Value 2 = **disagree**
Value 3 = **neither agree nor disagree**
Value 4 = **agree** and
Value 5 = **strongly agree**
The ranking of section 'C' is coded from 1 to 14 as per appendix C. The comments received remain in the Excel spread sheet.

The values returned from the SBL database were checked twice with dummy answers before the actual questionnaires were dispatched. Mistakes with coding sequences identified were corrected and again checked. All the raw data was then transferred to the SPSS 12.0 database (appendix D) for statistical analyses and again checked twice for correct transfer. An error was corrected and again verified.

The **code book**, appendix C contains details of all the coding and recoding done for capturing of data as well as statistical analyses.

5.6. Data analysis and model construction

The **objective** and **goal** of this research is restated in order to describe the rationale behind the selection of the data analysis procedures and actual procedures used:

- It is the **objective of this research** to identify the motivational factors of social capital including management processes, leadership and people management that would augment solid waste reduction management (SWRM) projects that are lethargic at starting or deteriorating, to achieve sustainability, with special reference to developing countries.

- The **goal of this research** is to use the results of the research objective, the identified motivational factors, in constructing a strategy-benchmarking-model or road map, that can be used by governmental, NGO and private sector leaders to augment SWRM projects towards sustainability.

Models are developed in chapter 6 to create this road map.

To analyse the objective of this research requires propositions to be stated and formulated. **Sustainable solid waste reduction management** (SSWRM) is defined by the following **proposition**:

SSWRM = f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With variables **P**, **Q** and **R** being the **coefficients** and S**SWRM** the **dependent variable**.

The above **proposition** forms the **first order** logical proposition of the analytical philosophical approach to the problem and the independent variables form the components with their complex properties or relations. **P**, **Q** and **R** are the notions of predication. The purpose of this proposition is to research the contribution each independent variable (P, Q and R) makes to SSWRM in the opinion of environmental specialists.

The objective of this research is explored (Leedy, 1997: 114-115) by creating and expanding each construct in terms of its required data and the criteria for admission of that data into the study and justification for the methodology used. Three constructs (construct-K, construct-L and construct-M, figure 3) are used to reach the end goal of this research which is the management model (**Strategy-benchmarking-model)** proposed.

The three constructs, K, L and M, as stated in chapters 5.1.1, 5.1.2 and 5.1.3 require different approaches and analyses in reaching conclusions.

The statistical analysis programme SPSS version 12.0 is used to calculate the various statistical tests.

All the **hypothesis testing** is to be done using a statistical test in conjunction with a **significance** level on deciding whether or not to reject a null hypothesis. Throughout this research the 5% significance level (it is $\alpha = 0.05$) will be specified for all statistical testing. In the case of

hypothesis testing this means that the null hypothesis will only be rejected when in fact it is true 5 times out of 100 (Diamantopoulos & Schlegelmilch, 2000).

5.6.1. Construct-K data analysis methodology

Construct-K deals with the **success** or **failure** of solid waste reduction management (SWRM) projects and uses hypotheses to research the theories stated in chapter 5.1 in an endeavour to reach a conclusion about the importance of the **economic imperatives** within the construct. SWRM is defined in terms of the **complex contributions** made by each of the independent variables which relates to the economic, environmental and social imperatives of the Triple Bottom Line or sustainability concept. The ranking of these in terms of importance versus **realism**, **idealism** and **failed** projects, as well as within **3rd** and **1st world economies**, is the subject of researching the hypotheses defined in chapter 5.1. The three independent variables stated in the hypotheses have coefficients P, Q and R, of which the magnitudes are to be determined from the questionnaire responses.

Construct-K, as per figure 3, is the research design and process proposed to measure the contributions made by each imperative (chapter 5.1.1) towards SWRM in terms of idealism, realism or failure in 3rd and 1st world countries. Section 'A' of the questionnaire deals with the biographical data of the respondent. (The first question of section 'A' is a general straightforward, non-biographical question.) Section 'B' of the questionnaire relates to the coefficients P, Q and R of the hypotheses K1, K2 and K3 being measured by means of the Likert scale. The Likert scale of 1 to 5 is used within the questionnaire to report the opinions of environmental specialists to rate each of the imperatives ranging from value 1 being respondent **least agrees,** 3 **neutral** and 5 **most agrees**.

The statistical analysis of the data received from the respondents for sections 'A' and 'B' of the questionnaire, is to be done using a number of logical steps:

(a) The data should first be **cleaned** of obvious mistakes and missing data. Thereafter the profile of the sample population should be evaluated analysing the data received from the respondents to the questionnaire. This is to provide insight into the data make-up of the male-female ratio, level of education, years work experience and occupation of the

respondents. Statistical tests such as **frequency** and **descriptive statistics** will be used to evaluate the magnitude and distribution of the data.

(b) Measuring 'what is believed it should measure' is the next step in evaluating the **validity** of the questionnaire**.** A qualitative evaluation will be required (Diamantopoulos & Schlegelmilch, 2000) to satisfy this criterion.

(c) Thereafter follows the quantification of the **reliability** of the questionnaire to gauge if 'it provides for consistent results'. From amongst all the various statistical tests available the Cronbach's Alpha reliability test (Nunnaly, 1978; Santos, 1999) will be used.

(d) One-way ANOVA tests are then to be used (Howell, 1999) to inspect the opinion data of the environmental specialists for any **statistical relationship** to their biographical information. The test will indicate a relationship if the 'significance' levels obtained are less than 0.05 as the 5% level is adopted for this research.

(e) The next step in analysing the data is to **rank** the means of the responses according to the importance allocated by the respondents to the questions. Initially it was decided to use analysis of variance testing to rank the data of the variables used in construct-K. Research into statistical methods available (Leedy, 1997; Howell, 1999; Diamantopoulos & Schlegelmilch, 2000) proved that the statistical test such as the non-parametric Friedman rank tests, in conjunction with a chosen significance level (5%) should rather be used for construct-K, chapter 5.1, to decide whether or not to reject the null hypotheses. Non-parametric tests are best used (Diamantopoulos & Schlegelmilch, 2000) in cases containing various population distributions and relatively smaller samples. One or two-tailed tests are used depending on the significance regions. The significance level (alpha) is set at 0.05 indicating the maximum risk willing to be taken in rejecting a true null hypothesis. Assuming a 5% risk probability of alpha minimises the risk of wrongly rejecting the Ho and committing a Type I error. Alpha is kept at a moderate level (Diamantopoulos & Schlegelmilch, 2000) and not lowered too much to prevent the Type II error. The highest ranking imperative would indicate the considered contribution it makes to the sustainability process in question and support levels of the hypotheses.

(f) The final step to be used in interpreting the data of construct-K is to identify the type of **interdependent relationships** of the imperatives by means of Multivariate data analysis techniques (Hair et al, 1998). This works very well in cases where "the variables or observations are related in ways not captured by the dependence relationship … one of the most basic abilities of human beings is to classify and categorize objects and information into simpler schema, such that we can characterize the objects within the

groups in total rather than having to deal with each individual object" (Hair et al, 1998: 467). The structure among the variables can then be identified that offers not only simplification but also a means of description and even discovery (Hair et al, 1998). Of the suite of statistical processes available the Multidimensional scaling analysis (MDS) technique is to be used to evaluate the attributes measured in metric form. This allows for the spatial representation of the data in proposed two dimensions, as an aid in interpreting underlying relationships. The questions as per the measuring instrument (appendix A) is complex in nature and MDS will assist greatly in grouping the 'objective' and 'perceived dimensions' of the answers received from the respondents. This perceptual mapping of the results (Hair et al, 1998) will provide for inspection to uncover similarity judgments that correspond to closer spatial positioning on the two dimensional graphic. Each 'dimension' represents some attribute consciously or subconsciously considered by the respondent when answering the questionnaire. It is often not possible to know exactly what the various dimensions represent but attempts can be made to infer what attributes the dimensions represent.

5.6.2. Construct-L data analysis methodology

The second part of this research analysis, termed **construct-L** is to:

Rank the identified management motivational factors that would augment (promote) the process of sustainable solid waste reduction management (SSWRM).

Section 'C' of the questionnaire represents the augmenting (motivational) factors identified by means of the literature reading as per chapters 2, 3 and 4 and is summarised within tables 1 and 6. Section 'A' of the questionnaire contains the biographical data of the respondents and is, in this case, to be evaluated in conjunction with section 'C' data, using statistical analyses. Respondents were requested to rank section 'C' data by allocating a ranking of '1' to the motivational factor that, according to their opinion, makes the largest contribution to augmenting the SWRM process and '14' to the least important contribution.

The following range of statistical analyses of the data received from the respondents for sections 'A' and 'C' of the questionnaire is planned:

(a) Firstly, the data received from the respondents should be **cleaned** of missing or obvious mistakes. This would apply to section 'C' of the questionnaire as section 'A' would have been cleaned with the previous analysis, as planned in paragraph 5.6.1 for construct-K.

(b) The next step is to **rank** the 14 motivational factors of section 'C' of the questionnaire using the non-parametric Friedman rank test. Non-parametric tests are the most appropriate for this type of data (Diamantopoulos & Schlegelmilch, 2000). This should provide for an initial '**importance'** ranking of the motivational factors, ranging from most important (lowest value) to the least important (highest value). This test also includes measuring the **significance** of the ranking as indicated by the 'asymptotic significance' value. This value should be less than 0.05 for the ranking to be significant which indicates a statistical difference in the various distributions of values between the ranking values obtained.

(c) The next step is appropriate because an issue was identified during the pilot testing of the questionnaire in that the respondents generally found it difficult to perfectly rank 14 items in answering the questionnaire. The initial pilot test group of 20 people commented on problems experienced with the questionnaire and indicated they wouldn't spend more than 20 minutes answering the questionnaire. The environmental specialists used for the final survey are senior people with busy work schedules and with limited time available. Therefore, not much time is available for deliberation during the answering of the questionnaire, although according to Dillman (1978) the first answer provided by a respondent tends to be the most accurate. It is for this reason that a statistically more advanced test method such as **cluster analysis** of the data is done in obtaining the ranking. Cluster analysis is one of the tests available within the Multivariate data analysis techniques (Hair et al, 1998) that groups objects based on the characteristics they possess. During the analysis various numbers of clusters are chosen, for example 2, 3 or 4, to see which number of specified clusters provides the most logic result. Resulting clusters of the 'objects' should exhibit high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity (Hair et al, 1998). The SPSS 12.0 statistical programme also calculates, for the clusters, by means of an ANOVA test, the **significance** levels of the objects. Again the significance value for each motivational factor (the object) should be less than 0.05 to be functional. Within each cluster, only the factors with the lowest (most important) and highest (least important) values should be considered. The in-between items are useful for detail interpretation.

(d) Next in the statistical testing process of section 'C' of the questionnaire is applying the multidimensional scaling analysis (MDS) technique to spatially display **grouping** of the 14 motivation factors for interpretation. This can then be compared to the cluster analysis previously done (paragraph 5.6.2c). Two dimensions are to be specified for the analysis.

(e) The next step is then **cross tabulation** of the clusters of the 14 motivational factors to the biographical data of the respondents, obtained from section 'A' of the questionnaire, to establish any relationship between the respondents' **biographic data** and their section 'C' responses. Any set of relationships needs to be supported by the Pearson Chi-square test and have an asymptotic significance of less than 0.05 to indicate significant results.

(f) A one-way ANOVA test is then required to search for any **relationship** between section 'B' of the questionnaire and the clusters of the 14 motivational factors. Should any relation be found, it could be reasoned they influence the outcome of the clusters. Again the significance value for each motivational factor (the object) should be less than 0.05 to be noteworthy.

(g) The last statistical test to be done in this series is to run a Kruskal-Wallis test to gauge the independency of the three clusters and the ranking of the 14-factors, of section 'C' of the questionnaire. This test also produces an asymptotic significance value that should be below 0.05 to indicate significant difference between the clusters and the ranking of the 14-factors.

5.6.3. Construct-M data analysis methodology

The third part of this research analysis, termed **construct-M** is to:

> **Create a Strategy-benchmarking-model of the responsible person, process or organisations that would augment (promote) the process of sustainable solid waste reduction management (SSWRM).**

Data needed for its solution is a **Strategy-benchmarking-model** created using the motivational factors identified and ranked with the analyses of construct-K and construct-L (paragraphs 5.1.1 and 5.1.2) that would augment or facilitate the sustainable development process of successful solid waste reduction management (SSWRM). This model should facilitate leaders in governmental and private sectors in benchmarking their plans for starting a new, or to resuscitate a, SWRM project.

It should provide guidelines of the principal management items that need to be installed to achieve sustainability.

5.7. Assumptions and limitations of chosen procedure

The **critical assumptions** accepted are:

- That sampling the opinion of environmental specialists in South Africa as a testbed would represent a base for the universal theories developed. South Africa does at the time of research; represent many aspects of a **developed** and **developing** world,
- That the three independent variables, economic, social and environmental imperatives, are independent of each other. Their interdependencies are not researched,
- That the opinions of environmental specialists are sought and it is outside the scope of this research to verify the accuracy of these opinions given the limited time afforded by the question completion action of the respondent,
- The IWMSA as an association best represents the environmental specialists in Southern Africa,
- It is assumed that nothing much gets done with regards to SWRM without private sector initiatives.

The **limitations** of the chosen procedure are:

- Questionnaires are limited to South Africa. Other developed and developing countries could be surveyed to validate the results,
- For the purpose of this research distinction will only be made between **first** and **third world** countries which includes second world and LDCs,
- The respondents chosen need to have at least 10 years of primary and secondary schooling and to have worked for a minimum of 1 year,
- Interviews are not conducted, as it is not planned to influence respondents,
- No distinction is made between different types of solid waste other than for mentioning in the questionnaire that medical, nuclear and hazardous wastes are excluded,
- That the response received (Babbie, 2000) from the questionnaire in itself can create bias.

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6. CHAPTER 6: RESULTS; PRESENTATION AND DISCUSSIONS

This chapter contains the results and statistical analyses of the questionnaire sent to the environmental specialists of the Institute of Waste Management of Southern Africa (IWMSA). The SPSS 12.0 programme was used to do the statistical analyses of the responses obtained. All the data and analyses are contained in the appendices C to L. Additionally, the constructs K, L and M are evaluated in this chapter using the results obtained.

6.1. Profile of unit of sample's demographics

The unit of sample used for the questionnaire survey is all 600 members of the Institute of Waste Management of Southern Africa (IWMSA). The most important aspect is for the person completing the questionnaire to be an environmental specialist, that is, actively involved in waste management. The members of the IWMSA comply with this requirement. Chapter 5.3 describes the sample design and sampling methods. Of the questionnaires returned and received, 91 are considered complete and usable. Most of the discarded returns contained very little or no information. This is ascribed to the respondents not being sufficiently conversant with the electronic media and most of the return data being lost in the process. The 91 returns used for the analyses are of good quality and many offered constructive comments.

The response profile of the sample population used for this research is described by the **frequency tables** listed as per appendix E. In table 8 a summary of the gender partitioning of the responses to the questionnaire is presented as a percentage of the total answers received.

Table 8: Gender of respondents

		Frequency	Percent
Valid	Female	32	35.2
	Male	59	64.8
	Total	91	100.0

From table 8 it is indicated that males represent 65% and females 35% of the 91 respondents which provides an assumed good representation of females who are normally in the minority in many similar occupations.

Table 9 contains the education demographics of the response group. It is divided into three categories representing secondary schooling, technical diploma holders and finally, tertiary education with a university degree. In South Africa secondary schooling relates to 12 years of basic education before a student enters tertiary education to obtain, a diploma at a technical institute, or a university degree.

Table 9: Education levels of respondents

		Frequency	Percent	Cumulative Percent
Valid	Secondary schooling	8	8.8	8.8
	Technical diploma	17	18.7	27.5
	University degree	66	72.5	100.0
	Total	91	100.0	

The education demographics from table 9 indicate that the majority of the respondents, 72%, have a university degree, 19% a technical diploma, with the balance of 9% having a secondary schooling education level. Therefore this specialist group, working within the waste management ambit, contains 91% at the tertiary education level making it a large proportion of the total. It places the calibre of their opinions at a highly educated level. This large proportion of the respondents with tertiary education contributes significantly to the **validity** of the results.

In table 10 the years work experience of the respondents is reflected by five categories ranging from '2-to-5 years' up to '20-years-and-more'. The 'frequency' represents the unit of responses of the total of 91 returns received. These are also divided into percentages.

Table 10: Years work experience of respondents

		Frequency	Percent	Cumulative Percent
Valid	2 to 5 years	8	8.8	8.8
	6 to 10 years	14	15.4	24.2
	11 to 15 years	9	9.9	34.1
	16 to 19 years	13	14.3	48.4
	20 years and more	47	51.6	100.0
	Total	91	100.0	

From table 10 the 91 respondents to the questionnaire represent an experienced group of people with 66% having more than 16 years work experience. This group of environmental specialists will have been exposed to a variety of work experience during that time. The younger generation is also well represented with 24% having less than 10 years experience. The balance of younger versus older respondents is satisfactory as the issues raised require opinions of experienced specialists to be contrasted with the younger generation. The literature covered in chapters 2, 3 and 4 indicate differences in opinions and beliefs between older and younger generations with the older group having a more responsible attitude towards the environment and employment (Cherrington, 1977; Read 1999).

The occupation demographic is summarised in table 11. This contains the 6 different work categories listed in the questionnaire, representing a wide range of occupations that covers government and the private sector. The non-government group contains those that work directly with waste, those operating in private companies making or providing other commodities or services but dealing with waste, and related academics dealing in waste principles.

Table 11: Occupation of respondents

		Frequency	Percent
Valid	Waste consulting	24	26.4
	Government	17	18.7
	Waste collection or transport	10	11.0
	Waste equipment supplier	2	2.2
	Waste recycling or waste use	9	9.9
	Other: academic or private company	29	31.9
	Total	91	100.0

From table 11 it is apparent that the different occupations of the respondents represent a good cross section of professions with 19% from government, 32% academic or private companies and the balance of 49% from companies directly involved in waste management. This is a good mix of specialists, dealing directly with waste, with sufficient influence on the results from other private companies and academic professionals.

The response frequency distribution of the balance of the questions answered by the specialists, being the non-biographical issues, is contained in appendix E termed 'frequency statistics of all basic data'. The Likert scale used for categorising the answers provided for 5 sections, therefore, as indicated by the distribution graphs at the end of appendix E, it is not surprising that a normal distribution of many of the responses is not always observed. People answering these questions often have strong opinions about waste matters, and, therefore, distributions in general tend to have one long tail with the graph skewed to one end. To statistically normalise this result, the five Likert categories are reduced to three. This is appropriate (Howell, 1999) because the nature of the questions and the Likert scale of 1 to 5 used, in essence required the respondent to either, **agree**, **not agree** or have **a neutral opinion** about the subject matter questioned. Averaging techniques resulting in appendices G and H are used to address this issue in a statistical manner. The Likert scale of 1 to 5 is converted (recoded) to scale 1 to 3. This is done by recoding level 1 and 2 to 1; 3 to 2 and 4 and 5 reverted to 3.

6.2. Validity of survey instrument

Diamantopoulos & Schlegelmilch (2000: 34) refer to validity assessment as answering the question "are we in fact measuring what we think we are measuring?" According to these authors the approach to **validity** assessment to be followed refers to matters such as **content, criterion** and **construct**. Table 7, paragraph 5.4 confirms the complexity content of SSWRM as a subject. Using the general public to answer the questionnaire would result in low validity. In this research environmental specialists were approached to answer expert questions on issues that have been debated and studied by themselves for many years. Therefore, asking their opinions on matters such as sustainability, Triple Bottom Line and waste management, **enhances the validity** of the questionnaire, appendix A, used as research instrument. The response by the specialists to each question contains the education, experience, beliefs and best judgment of the respondents which contributes to the validity of the measuring instrument. A large proportion, 91% of the respondents have tertiary education. The respondents also represent an experienced group of people with 66% having more than 16 years work experience. This level of education and experience contributes significantly to the **validity** of the results. Using the Likert scale of 1 to 5 improves the sensitivity of the measure and captures subtle attitude changes (Diamantopoulos & Schlegelmilch, 2000) adding to the validity of the research instrument used.

The next aspect to assess is the reliability of the research instrument used.

6.3. Reliability of the survey instrument

According to Diamantopoulos & Schlegelmilch (2000: 35) the question in regard to **reliability** of the measuring instrument is "are we getting consistent results from our measure?" The Cronbach's Alpha test is used in this research, as the measuring instrument, to test the **consistency and reliability** of the questionnaire (Nunnaly, 1978). This only applies to sections 'A' and 'B' of the questionnaire (appendix A) as "the Cronbach's alpha measures (UCLA Academic Technology Services, 2005: 1) how well a set of items (or variables) measures a single uni-dimensional latent construct". This coefficient of reliability cannot be applied to section 'C', where questions require ranking of the motivational factors, as the data have a multidimensional structure and the Cronbach's alpha will be low and therefore meaningless. The complete test results of the Cronbach's Alpha are contained in appendix F.

Nunnaly (1978) indicates that a Cronbach's alpha of 0.7 is an acceptable reliability coefficient and that lower thresholds are sometimes used in literature. Santos (1999) demonstrates how the removal of some responses with weak correlations can improve the Cronbach's alpha. In this research (appendix F) it is seen that some of the questions relating to **failure** prove to have less significant Pearson correlations at the 0.05 or 0.01 levels. The deduction is that these "failure" factors prove to be difficult to answer and more research will be required to identify reasons for failure.

Table 12 displays the result of the SPSS statistical programme for the Cronbach's Alpha test on all the responses of the 18 questions in sections 'A' and 'B' of the questionnaire.

Table 12: Cronbach's Alpha reliability test; sections 'A' and 'B' of questionnaire

Reliability Statistics

Cronbach's Alpha	No of Items
.716	18

Table 12 displays the Cronbach's Alpha result of all the replies to the questions of section 'A' and 'B' as 0.716 which indicates **good reliability** (Nunnaly, 1978). This result is statistically acceptable (Howell, 1999) because most correlations are significant according to the Pearson test (appendix F) at the 0.05 (5%) or even at the lower 0.01 (1%) level (two-tailed). Therefore, the deduction is that, given the Cronbach's Alpha at a good reliability level of 0.7, consistent results from the questionnaire are obtained.

Table 13 contains the result of the SPSS statistical programme for the Cronbach's Alpha reliability test on all the responses to questions of the **social variables** of section 'B' of the questionnaire. Here 6 questions in terms of this variable are evaluated for consistent response results.

Table 13: Cronbach's Alpha reliability test; Social variable questions

Reliability Statistics

Cronbach's Alpha	No of Items
.632	6

Table 13 reflects the Cronbach's Alpha test, which has been limited to the replies on the 6 **social variable questions** of section 'B' as 0.632 which indicates **acceptable** reliability. This result is statistically acceptable because most correlations (appendix F) according to the Pearson test are significant at the 0.05 or even at the 0.01 level (two-tailed). Therefore, it is concluded that consistent results from the questionnaire are obtained for the social variable questions.

Table 14 reflects the result of the SPSS statistical programme for the Cronbach's Alpha reliability test on all the responses to the 6 questions on the **environmental variables** of section 'B' of the questionnaire. Here the questions are evaluated for consistent response results.

Table 14: Cronbach's Alpha reliability test; Environmental variable questions

Reliability Statistics

Cronbach's Alpha	No of Items
.674	6

From table 14 the Cronbach's Alpha test, which has been limited to the replies on the questions of the **environmental variables in** section 'B', is 0.674 which indicates **acceptable** reliability. This

result is statistically acceptable because most correlations (appendix F) according to the Pearson test are significant at the 0.05 or even at the 0.01 level (two-tailed)

Table 15 contains the result of the SPSS statistical programme for the Cronbach's Alpha reliability test on all the responses to questions of the **economic variables** of section 'B' of the questionnaire. Here 6 questions in terms of this variable are evaluated for consistent response

Table 15: Cronbach's Alpha reliability test; Economic variable questions

Reliability Statistics

Cronbach's Alpha	No of Items
.586	6

From table 15 the Cronbach's Alpha test, which has been limited to the replies on the questions of the **economic variables in** section 'B', is 0.586 which indicates **acceptable** reliability. This result is statistically acceptable because most correlations (appendix F) according to the Pearson test are significant at the 0.05 or even at the 0.01 level (two-tailed)

From tables 12, 13, 14 and 15 including their comments, it is deduced that consistent results are obtained from the measure using the Cronbach's Alpha to gauge the **consistency and reliability** of the questionnaire.

6.4. Presentation of results

Following analysis of the response data profile (paragraph 6.1) and the validity and reliability (paragraphs 6.2 and 6.3) of the questionnaire, inspections for any relationship between the responses and its biographical data is required. The measuring instrument used for this research is the **questionnaire** as per appendix A and the **letter of support** that accompanied the questionnaire as represented by appendix B.

The statistical analyses are done using the SPSS version 12.0 programmes licensed to UNISA, Pretoria. Details of the data management within the SPSS programme are contained in the **code book** as per appendix C. The SPSS data output (data master) is listed in appendix D which contains the cleaned and checked master data. Appendix G represents the recoded, simplified

response range, SPSS data output prepared for analyses. Frequency tables and graphs of the data are presented by appendix H. Appendix I contains the final recoded data in SPSS data format prepared for the multivariate data analyses. The biographical data is simplified as per appendix G, although the rest of the data maintains the original Likert 1 to 5 scales. Averages are calculated for section 'B' of the questionnaire to create continuous scales.

Section 'A' of the questionnaire refers to the biographic data, section 'B' to the variables and section 'C' to the motivational factors being researched. The variables listed for opinions in section 'B' of the questionnaire relate to the Likert 1 to 5 scales rated; **strongly disagree** as '1', **Neutral** as '3' and **strongly agree** as '5'.

6.4.1. Results of sections 'A' and 'B' of questionnaire

Further analysis, of the data received in response to sections 'A' and 'B' of the questionnaire follows. The testing methods are described in paragraphs 5.6.1 and 5.6.2 in terms of methodology. Some of the data need to be averaged in order to do the statistical tests. The following calculations are done to determine the **mean** of **the variables** within the data output file as per appendix I:

- Calculated mean scores for Ideal, Real and Fail [e.g. Average Ideal = (B1a + B1b + B2a + B2b + B3a + B3b)/6] Refer to code book, appendix C for coding used.
- Similarly for Economic, Environment and Social [e.g. Average Economic = (B2a + B2b + B6a + B6b + B9a + B9b)/6]
- Also calculated average scores for First and Third World [e.g. Average for First World is (B1b + B2b + B3b + B4b + B5b + B6b + B7b + B8b + B9b) / 9]
- Finally calculated is an average score over all 18 questions.
- "QCL_n" refers to the cluster number into which each case is classified by the cluster analysis.

The terms 'A', 'B', and 'C' in the following paragraphs refer to the sections 'A', 'B' and 'C' of the questionnaire.

6.4.1.1. Relation of variables 'B' versus biographic data 'A'; one-way ANOVA

It is important to inspect the data received from the respondents to identify any statistical relationship that might exist between this data and the biographical data of the respondents. This prevents generalisation of deductions and conclusions made in the final analysis. One-way ANOVA tests are used to determine whether the average scores obtained of **the variables, section 'B' of the questionnaire,** are related to **the biographical** information, section 'A' of the questionnaire. The ANOVA results are listed in appendix K. For presentation purposes the results are only duplicated from the appendices if they prove to be of significant relationship. In general, a result of the one-way ANOVA test indicates some relationship exists if the 'significance' is less than 0.05. The 5% level of significance is chosen as bench mark for this research. 'Significance' is abbreviated as 'Sig.' in the appendix tables.

In the case of **type of employer** of the respondent (appendix K) the one-way ANOVA test uncovers no significant relationships. All the significance levels are greater than 0.05 in value. Therefore the 'type of employer' does not result in different responses from the respondents with respect to the variables being researched.

In table 16 the one-way ANOVA test relates the biographical data 'education level' of the respondents to section 'B' of the questionnaire. The terms 'IDEAL', 'REAL', 'FAIL', 'SOCIAL', 'ECONOMIC', 'ENVIRONMENT', '1st World' and '3rd world' refer to all the questions relating to these common factors in the questionnaire as per appendix A. The abbreviation of the term 'df' means 'degree of freedom" (normally one less than the number of answers in the calculation) and 'F' the F-factor calculated. Significant relations are identified if the 'significance' levels (far right hand column) calculated is less than 0.05 in table 16.

Table 16: One-way ANOVA; education of respondents versus variables

ANOVA		Sum of Squares	df	Mean Square	F	Significance
Average of 6 IDEAL opinions	Between Groups	.039	2	.020	.137	.872
	Within Groups	12.575	88	.143		
	Total	12.614	90			
Average of REAL opinions	Between Groups	2.117	2	1.058	2.510	**.087**
	Within Groups	37.104	88	.422		
	Total	39.221	90			
Average FAIL opinion	Between Groups	.125	2	.063	.124	.884
	Within Groups	44.459	88	.505		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	1.895	2	.947	2.748	**.070**
	Within Groups	30.331	88	.345		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.535	2	.268	.724	.488
	Within Groups	32.541	88	.370		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.277	2	.138	.354	.703
	Within Groups	34.403	88	.391		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.037	2	.019	.082	.921
	Within Groups	19.947	88	.227		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	1.066	2	.533	2.236	.113
	Within Groups	20.983	88	.238		
	Total	22.049	90			

From table 16, investigating the relationship between **education** of the respondent and the variables of section 'B' of the questionnaire, two 'almost significant' differences (significant at the 10% level but not at the 5% level) are observed. The items are in bold print in table 16. 'Average of REAL opinions' (all the questions relating to the 'REAL' issues) resulted in a significance level of 0.087 and average SOCIAL opinion (all the questions relating to the 'SOCIAL' issues) with a significance of 0.070. As per table 16 these are variables relating to the questions on **reality** and **social** opinions. These identified relations will be ignored for the balance of this research because they are of lesser significance than the 0.05 level being used as benchmark.

In the case of '**years of experience'** of the respondent (appendix K) the one-way ANOVA test indicates no significant relationships. All the significance levels are greater than 0.05 in value. Therefore the 'years of experience' does not result in different responses from the respondents with respect to the variables being researched.

In table 17 the one-way ANOVA test relates the biographical data 'gender' of the respondents to section 'B' of the questionnaire. Other details of the table are the same as table 16. Significance levels of less than 0.05 (right hand column) indicates a relationship.

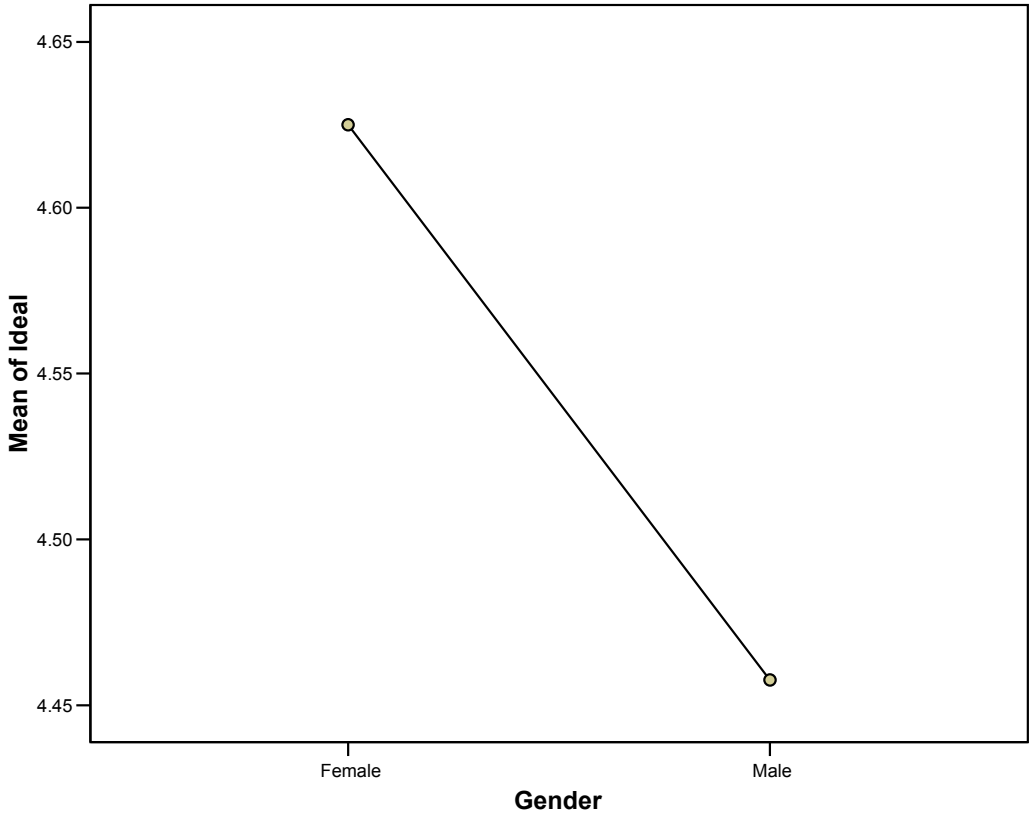
Table 17: One-way ANOVA; gender of respondents versus variables 'B'

ANOVA		Sum of Squares	df	Mean Square	F	Significance
Average of 6 IDEAL opinions	Between Groups	.581	1	.581	4.299	**.041**
	Within Groups	12.033	89	.135		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.202	1	.202	.462	.499
	Within Groups	39.019	89	.438		
	Total	39.221	90			
Average FAIL opinion	Between Groups	1.080	1	1.080	2.208	.141
	Within Groups	43.505	89	.489		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.718	1	.718	2.029	.158
	Within Groups	31.507	89	.354		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.045	1	.045	.122	.727
	Within Groups	33.031	89	.371		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	1.418	1	1.418	3.793	.055
	Within Groups	33.262	89	.374		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.258	1	.258	1.164	.284
	Within Groups	19.726	89	.222		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.986	1	.986	4.166	**.044**
	Within Groups	21.063	89	.237		
	Total	22.049	90			

In the case of Gender, table 17, there are significant differences ('significance' less than 0.05, marked in bold print) with respect to **Average Ideal opinions** and **Average 3rd world opinions.** It is significant that females and males recorded different scores. This aspect is analysed by means of the next two graphs as figures 4 and 5.

In figure 4 the statistical mean of the Likert scores obtained from male and female responses, for all questions relating to the IDEAL approach to SWRM, is graphically displayed. A Likert score of '1' suggests 'strongly disagree' (not important) up to a score of '5' meaning 'strongly agree' (most important).

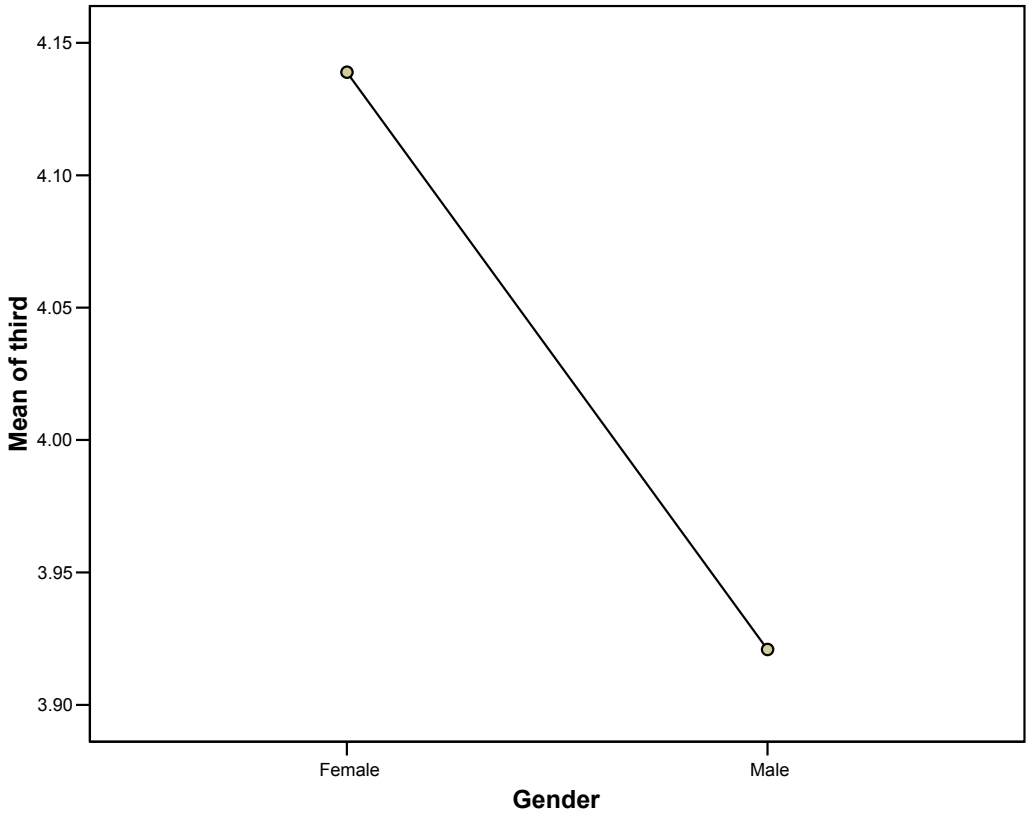
Figure 4: Graph of gender scores versus mean of 'ideal' questions



From figure 4 it is significant to note that females have higher average Likert scores, inferring that males thought the questions relating to the IDEAL SWRM issues less important than females did.

In figure 5 the statistical mean of the Likert scores obtained from male and female responses, for all questions relating to the 3rd World countries in terms of SWRM is graphically displayed.

Figure 5: Graph of gender scores versus mean of '3rd world' questions



From figure 5 it is important to note is that females have higher average scores, inferring that males thought the questions relating to 3rd world countries of less importance than females do. Figures 4 and 5 infer that females consider the sustainable imperatives towards SWRM more important than males do in terms of the idealistic approach and 3rd world countries.

The general pattern or trend of females, who responded, weighing the imperatives more important than males is illustrated by the following. In table 18 and figure 6 the mean scores of responses obtained from females and males in terms of all the questions raised in section 'B' of the questionnaire, are presented. Table 18 contains the descriptive statistics for female and male as well as the one-way ANOVA test for significance of differences between the scores.

Table 18: One-way ANOVA; gender versus all 18 variables, questionnaire section 'B'

Descriptives: Average rating of 18 questions

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Female	32	4.1892	.41065	.07259	4.0412	4.3373	3.39	4.89
Male	59	4.0245	.42476	.05530	3.9138	4.1352	2.94	5.00
Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

One-way ANOVA: Average rating of 18 questions

	Sum of Squares	df	Mean Square	F	**Significance**
Between Groups	.563	1	.563	3.194	**.077**
Within Groups	15.692	89	.176		
Total	16.255	90			

From table 18 an 'almost significant' difference of 0.077 (at 0.1) level is noticed between gender on all 18 questions from section 'B' of the questionnaire.

In figure 6 the mean scores of females and males in terms of all the questions raised in section 'B' of the questionnaire, are graphically displayed. The 'means plots' of all the data is contained in appendix K.

Figure 6: Graph of means; gender versus variables for all 18 section 'B' questions

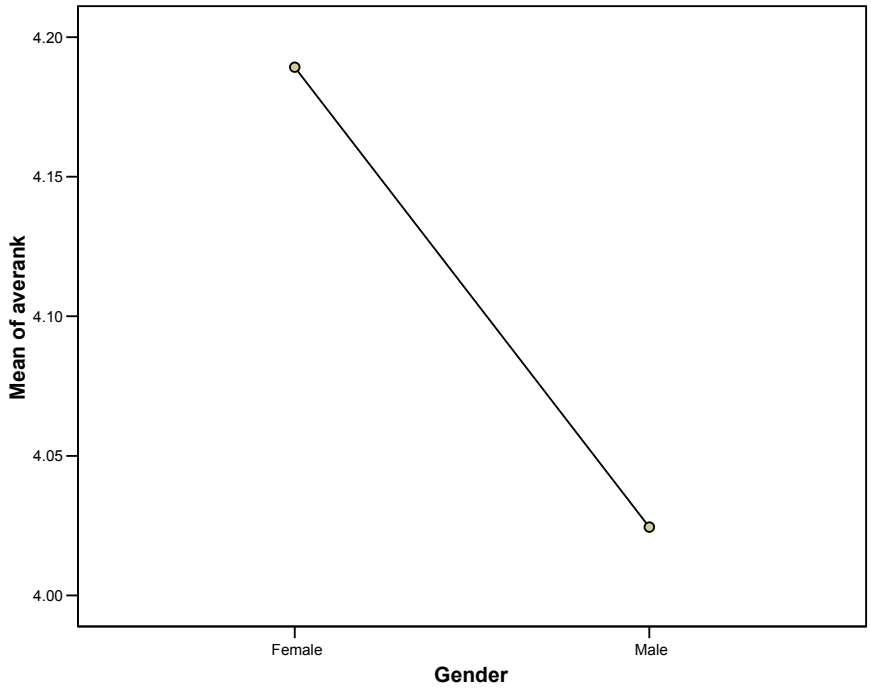


Figure 6 confirms that the responding males, are less in agreement than females to the contributions of the variables to SWRM. Although females only constituted 35% of the total respondents, as per table 8, their opinion is slightly more slanted towards greater importance of the imperatives contributing to SWRM than males. In general, throughout corporate and governments, females are still in the minority and therefore the overall opinion of males will still carry for some time into the future until females occupy more executive positions.

6.4.1.2. Comparing variable groupings; Friedman rank tests of section 'B'

The ranking of the **means** of the Likert values acquired from the respondents' data is the next step in evaluating the importance attached by the environmental specialists to the imperatives measured. More importance is attached to the issues that obtained the higher Likert mean values. In table 19 the non-parametric Friedman rank test is used to compare the means of all the questions

relating to **Ideal, Real** and **Fail** scores. The table contains the '**mean' values** for the three variables tested as well as the '**mean rank'. The significance of the result is indicated by the 'asymptotic significance' value.**

Table 19: Friedman rank test; mean of 'ideal', 'real' and 'fail', section 'B'

Non parametric Tests: Descriptive Statistics

	No	**Mean**	Std. Deviation	Minimum	Maximum
Average of 6 IDEAL opinions	91	4.5165	.37438	3.67	5.00
Average of REAL opinions	91	3.8370	.66014	1.67	5.00
Average FAIL opinion	91	3.8938	.70383	1.00	5.00

Friedman Test: Ranks

	Mean Rank
Average of 6 IDEAL opinions	2.73
Average of REAL opinions	1.52
Average FAIL opinion	1.75

Test Statistics (a)

No of responses	91
Chi-Square	79.699
Df (degrees of freedom)	2
Asymptotic Significance	**.000**

(a): Friedman Test

From table 19 the results are especially significant (asymptotic significance less than 0.05) as the **asymptotic significance** is close to zero (0.000) that indicates significant differences in the rankings. From the **mean rank** data in table 19, the average **IDEAL** receives the highest rank score (most agree) of 2.73 and **REAL** the lowest score (least agree) of 1.52 in the ranking. The respondents allocated the highest scores or importance to the contributions of the imperatives in the case of 'ideal' (idealistic) approach. The ranking of the average **REAL** opinion (1.52) is close to **FAIL** (1.75). The environmental specialists therefore agree that **reality** is far removed from **idealistic** sustainability requirements in terms of SWRM.

In table 20 the non-parametric Friedman rank test is used to compare the means of all the questions relating to **Social, Economic** and **Environment imperative** scores. The table contains the '**mean' values** for the three variables tested as well as the '**mean rank'. The significance of the result is indicated by the 'asymptotic significance' value.**

Table 20: Friedman rank test; mean of 'social', 'economic' and 'environment'

Non parametric Tests: Descriptive Statistics

	No	**Mean**	Std. Deviation	Minimum	Maximum
Average SOCIAL opinion	91	3.9835	.59838	2.50	5.00
Average ECONOMIC opinion	91	4.0842	.60623	1.67	5.00
Average ENVIRONMENT opinion	91	4.1795	.62075	2.67	5.00

Friedman Test: Ranks

	Mean Rank
Average SOCIAL opinion	1.85
Average ECONOMIC opinion	1.91
Average ENVIRONMENT opinion	2.24

Test Statistics (a)

No of responses	91
Chi-Square	9.006
df	2
Asymptotic Significance	**.011**

(a) Friedman Test

From table 20 the results are significant (less than 0.05) as the **asymptotic significance** is close to 0.01 that indicates significant differences in the rankings. From the **mean rank** data in table 20, the average **Environment imperative** has the highest rank score (most agree) of 2.24 and the **Social imperative** the lowest score (least agree) of 1.85 in the ranking. The respondents allocated the highest scores or importance to the contributions of the imperatives in the case of 'environment' issues. The ranking of the contribution of economic imperatives, 1.91, is midway between the other two imperatives. The environmental specialists therefore agree that the **environmental imperatives** are the **most important** issue contributing to sustainable SWRM in any country.

In table 21 the non-parametric Friedman rank test is used to compare the means of all the questions relating to **3rd and 1st World** scores. The table contains the '**mean' values** for the two variables tested as well as the '**mean rank'.** The **significance** of the result is indicated by the **'asymptotic significance'** value.

Table 21: Friedman rank test; mean of '3rd' and '1st world'

Non parametric Tests: Descriptive Statistics

	No	**Mean**	Std. Deviation	Minimum	Maximum
Average 1st world opinion	91	4.1673	.47122	3.00	5.00
Average 3rd WORLD opinion	91	3.9976	.49496	2.78	5.00

Friedman Test: Ranks

	Mean Rank
Average 1st world opinion	1.67
Average 3rd WORLD opinion	1.33

Test Statistics (a)

N	91
Chi-Square	13.164
df	1
Asymptotic Significance	**.000**

(a) Friedman Test

From table 21 the results are significant (less than 0.05) as the **asymptotic significance** is close to zero, which indicates significant differences in the rankings. From the **mean rank** data in table 21, the average for **1st World** questions has the highest rank score (most agree) of 1.67 and the **3rd World** the lowest score (least agree) of 1.33 in the ranking. The respondents allocated the highest scores or importance to the contributions of the imperatives in the case of 1st World issues. The environmental specialists therefore agree that the **imperatives** are **more important** in 1st World countries than in lesser developed countries.

6.4.1.3. Multivariate data analysis; multidimensional scaling of variables 'B'

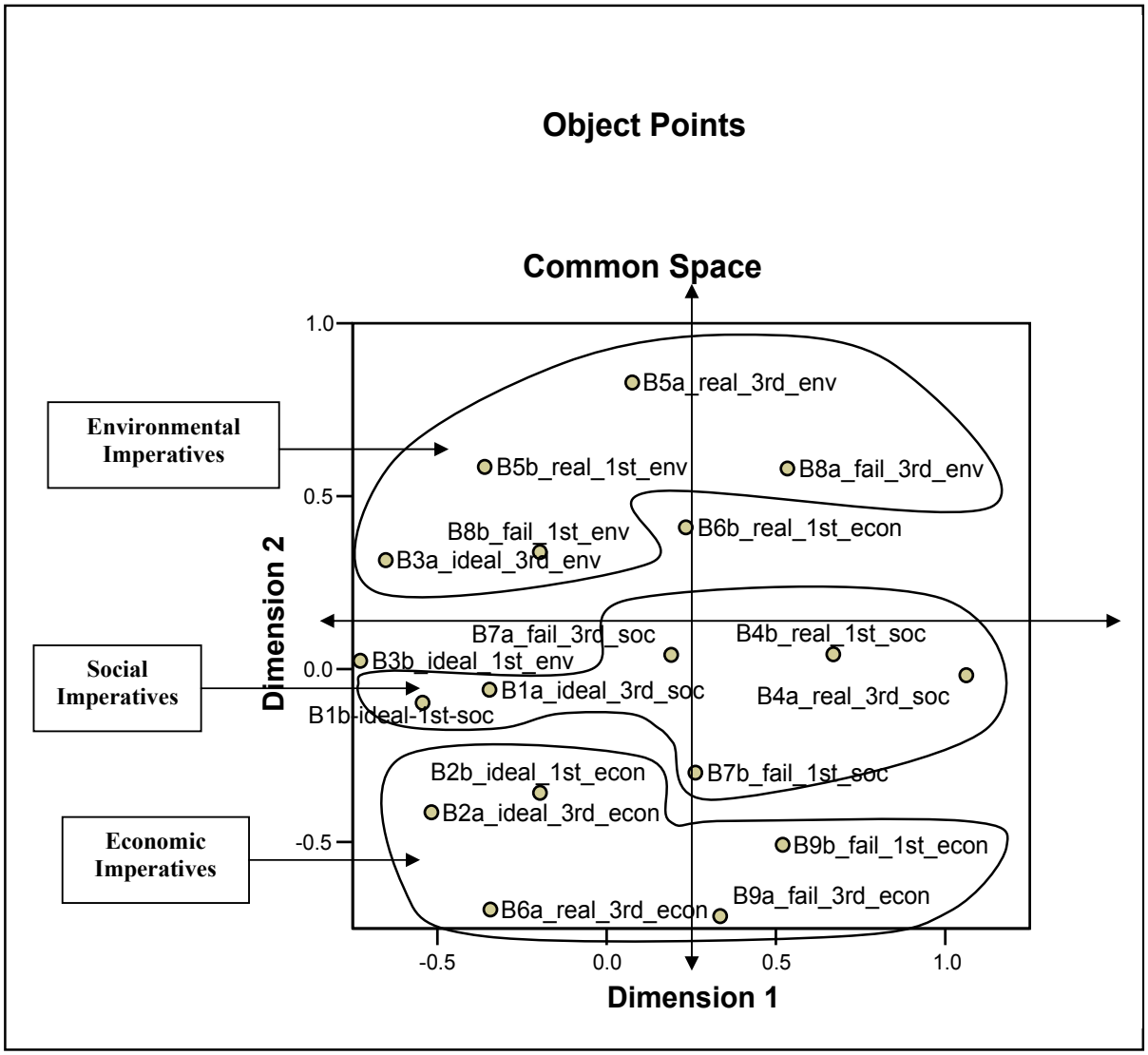
In the previous chapter 6.4.1.1 the one-way ANOVA test is used to inspect the data received from the respondents to identify any statistical relationships that might exist between the data from section 'B' and the biographical data, section 'A' of the questionnaire. This is to prevent generalisation of deductions and conclusions to be made in the final analysis. Thereafter, in chapter 6.4.1.2, the Friedman rank test is used to compare the averages of the variables from section 'B' of the questionnaire. The next step in the statistical analysis is to use multivariate data analysis to uncover spatial relationships between the response data of section 'B', of the questionnaire. This is in an effort to gain more insight into the complex relations between the variables being analysed. The variables pertain to the opinions of environmental specialists who used multiple private benchmarks in answering the questionnaire. Multidimensional scaling as one of the multivariate data analysis techniques is used to clarify underlying relationships. Appendix J contains the full analysis data.

Multidimensional scaling is used because "in non-metric multidimensional scaling the computer programme takes as inputs a subject's rank ordering of the distances or dissimilarities between pairs of objects. This determines which objects are like each other and which are unlike" (Jackson, 1983: 197-199). Furthermore, Hair et al (1998: 527) refer to perceptual mapping and in particular multidimensional scaling (MDS) being appropriate in achieving an exploratory technique "to identify unrecognized dimensions affecting behavior … as means of obtaining comparative evaluations of objects when the specific bases of comparison are unknown or undefined". The computer programme used for the following tests is again SPSS version 12.0.

In figure 7 the Multidimensional scaling (MDS) of section 'B' data is presented in a two dimensional spatial format. Two dimensions were specified for the test to uncover the objective and/or perceived references used by the respondents. In this perceptual mapping closeness of **objects** (respondent's opinion) means there is some underlying relationship (Hair et al, 1998). The abbreviations used throughout this research, as indicated in figure 7 have the following meaning: for example **'B5a_real_3rd_env'** is termed an object and refers to question 'B5a' of the questionnaire, in relation to 'reality' in '3rd world countries' and the 'environmental imperative importance'. The groupings of the objects by means of encircling them, together with descriptions in the left hand text boxes, have been added to clarify the visual. Throughout this thesis the

opinions of the respondents will be indicated as **objects** in the MDS spatial presentation, as for example figure 7. A further general shorthand notation used in this thesis is 'environmental' or 'economic' or 'social' referring to the specific **imperatives** of the issue in question.

Figure 7: Multidimensional scaling of all the variables, section 'B'



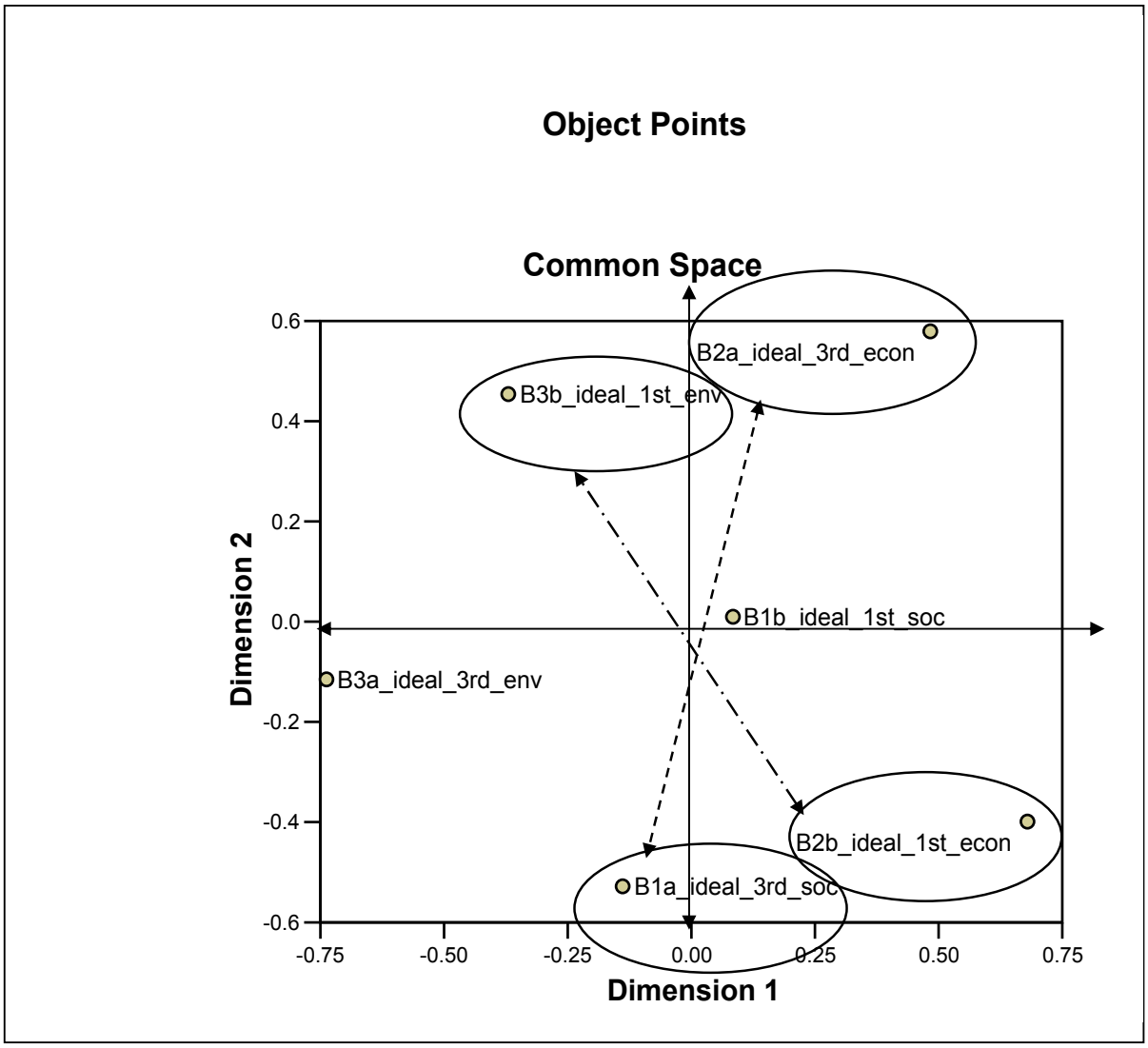
From figure 7 the **dimension 2** relationship identified by the programme is clearly separating the three imperatives (economic, social and environmental) referred to in the three hypotheses K1, K2 and K3 as per paragraph 5.1.1 of construct-K. The closeness of objects indicates similar (Hair et al, 1998) importance allocated to them by the respondents to the questionnaire. In this case the deduction is made that it relates to their contribution to sustainability of SWRM projects. It is further deduced that the outlying objects, environmental and economic imperatives, are of more

importance than the objects in the centre of the dimension 2 relationship, which in this case, represent the social imperatives. Figure 7 represents the overall statistical means of all the Likert values of the respondents' opinions and indicates a uniform direction of the general beliefs of the respondents. This is interpreted as indicating that the environmental imperatives for 3rd and 1st world countries are being seen **as important as** the economic imperatives and that the social imperatives play a lesser role in achieving sustainability. It also indicates that the economic indicators are not the pronounced overall important imperative. This confirms the Friedman rank test, table 20, that the environmental imperative is most important, followed by the economic and with the social imperative as the least important of the three. Most of the environmental imperatives for 3rd and 1st world countries are contrasted to the economic imperatives. An important outlying difference to the observed rankings is the real 1st world economic factor (B6b_real_1st_econ) that is not associated with its counter parts in the lower section of figure 7. The opinion is therefore that **realistically** speaking, in the 1st world, economic imperatives are as important as the perceived real environmental issues (B5b_real_1st_env).

In general, the underlying perceived references used by dimension 1 of the MDS statistics, are not considered as it would complicate the analysis beyond the scope of this research.

In figure 8 the Multidimensional scaling (MDS) of section 'B' data is focused on one aspect being the **idealistic** approach to SSWRM and presented in a two dimensional spatial format. This also represents the three imperatives as defined by the hypotheses of paragraph 5.1.1 of construct-K.

Figure 8: Multidimensional scaling of the 'ideal' variable

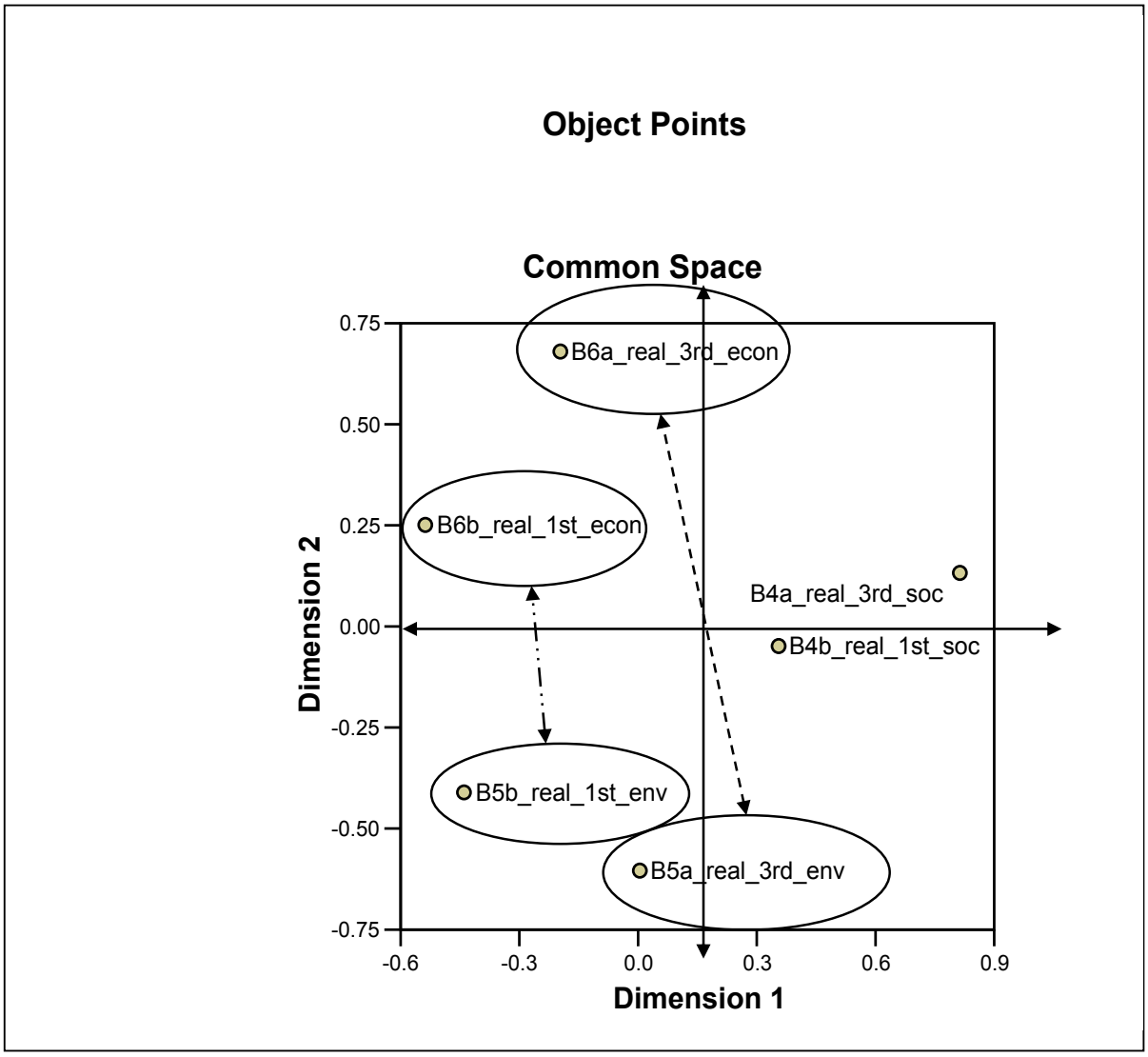


From figure 8 **dimension 2** isolates the **idealistic imperatives** of SSWRM and indicates the 3rd world **economics** in the ideal situation (B2a_ideal_3rd_econ) contrasting with 3rd world **social** factors (B1a_ideal_3rd_soc) as being important. The 3rd world ideal **environmental** factors are not considered as important. Therefore, in the idealistic approach, the 3rd world economics and social issues require more attention than the environmental imperatives. In contrast to the dimension 2 view of the 3rd world requirements towards SSWRM, the 1st **world ideal** important factors are

represented by environmental (B3b_ideal_1st_env) and economic factors (B2b_ideal_1st_econ). The **social** imperatives in the 1st world (B1b_ideal_1st_soc) seem to have a lower ranking being placed in the middle of dimension-2.

In figure 9 the Multidimensional scaling (MDS) of section 'B' data is focused on the **realistic** approach to SSWRM and presented in a two dimensional spatial format.

Figure 9: Multidimensional scaling of the 'real' variable

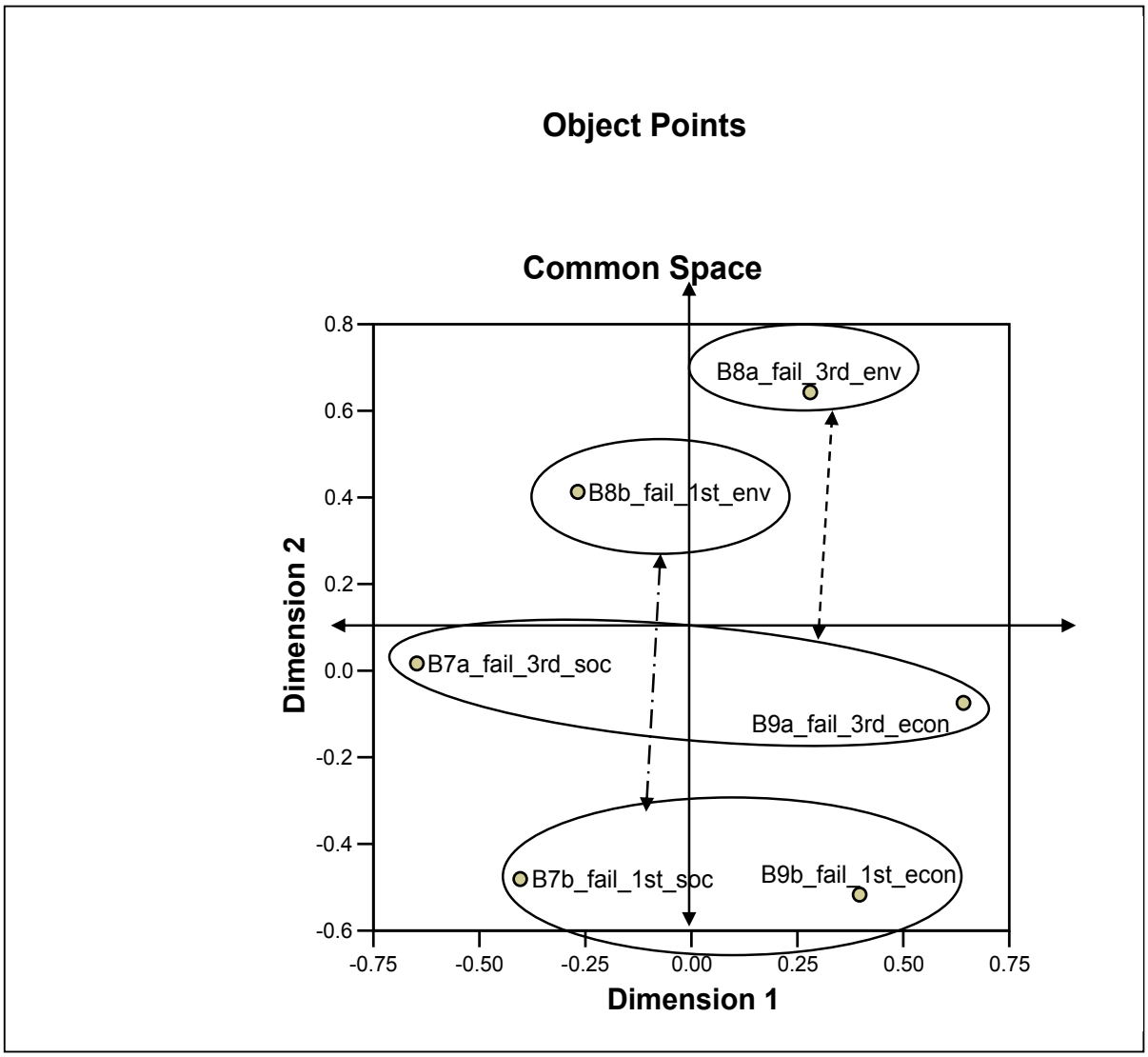


From figure 9 the spatial presentation of the opinions of environmental specialists in terms of their **reality** perception for dimension-2 refers. For both the **3rd and 1st world** they rank economic and environmental imperatives as opposing important factors. The **social** factors placed in the middle

of the dimension 2 criterion are considered less important. Figures 8 and 9 indicate a change in perception in terms of the 3rd world, with the **ideal** environmental imperatives moving from a centralist ranking (figure 8; B3a_ideal_3rd_env) to important in the **real** perception (figure 9; B5a_real_3rd_env).

In figure 10 the Multidimensional scaling (MDS) of section 'B' data is specifically focused on the reasons for **failure of** SWRM and presented in a two dimensional spatial format.

Figure 10: Multidimensional scaling of the 'fail' variable

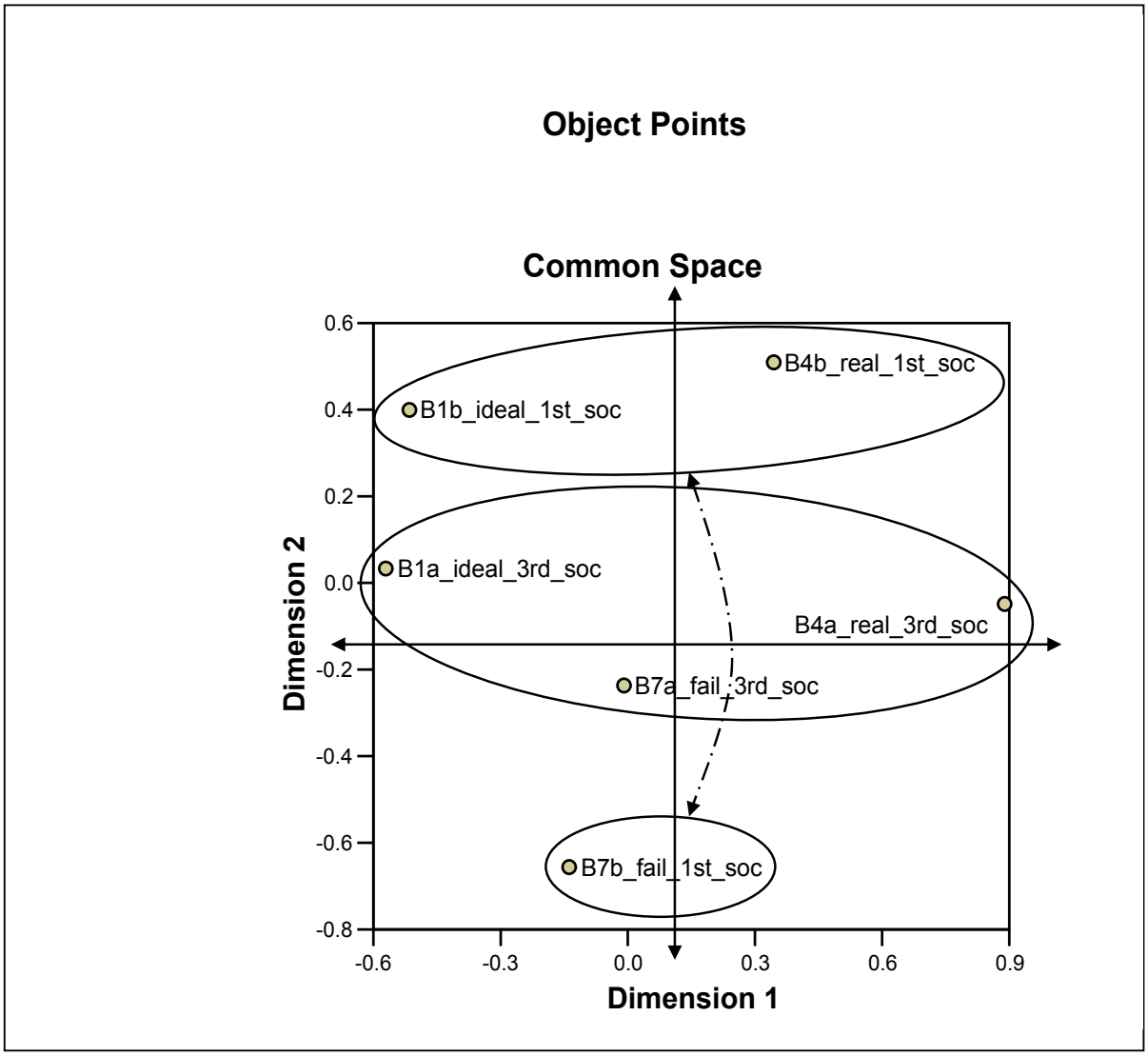


From figure 10 the opinions of the reasons why SWRM projects **fail** in **3rd and 1st world economies**, diametrically rank the environmental issues against the economic and social issues

(dimension-2). The position of the 3rd world social imperatives (B7a_fail_3rd_soc) indicates that it is slightly less important than the economic factors (B9a_fail_3rd_econ). The environmental issues for 3rd world seem to be considered more important than the economic or social imperatives. The positions of 1st world economic (B9b_fail_1st_econ) and social imperative (B7b_fail_1st_soc) seem to carry more weight than their counterpart 1st world environmental imperative (B8b_fail_1st_env) in terms of a failing situation.

In figure 11 the Multidimensional scaling (MDS) of section 'B' data is focused on the **social imperative aspect of** SSWRM and presented in a two dimensional spatial format.

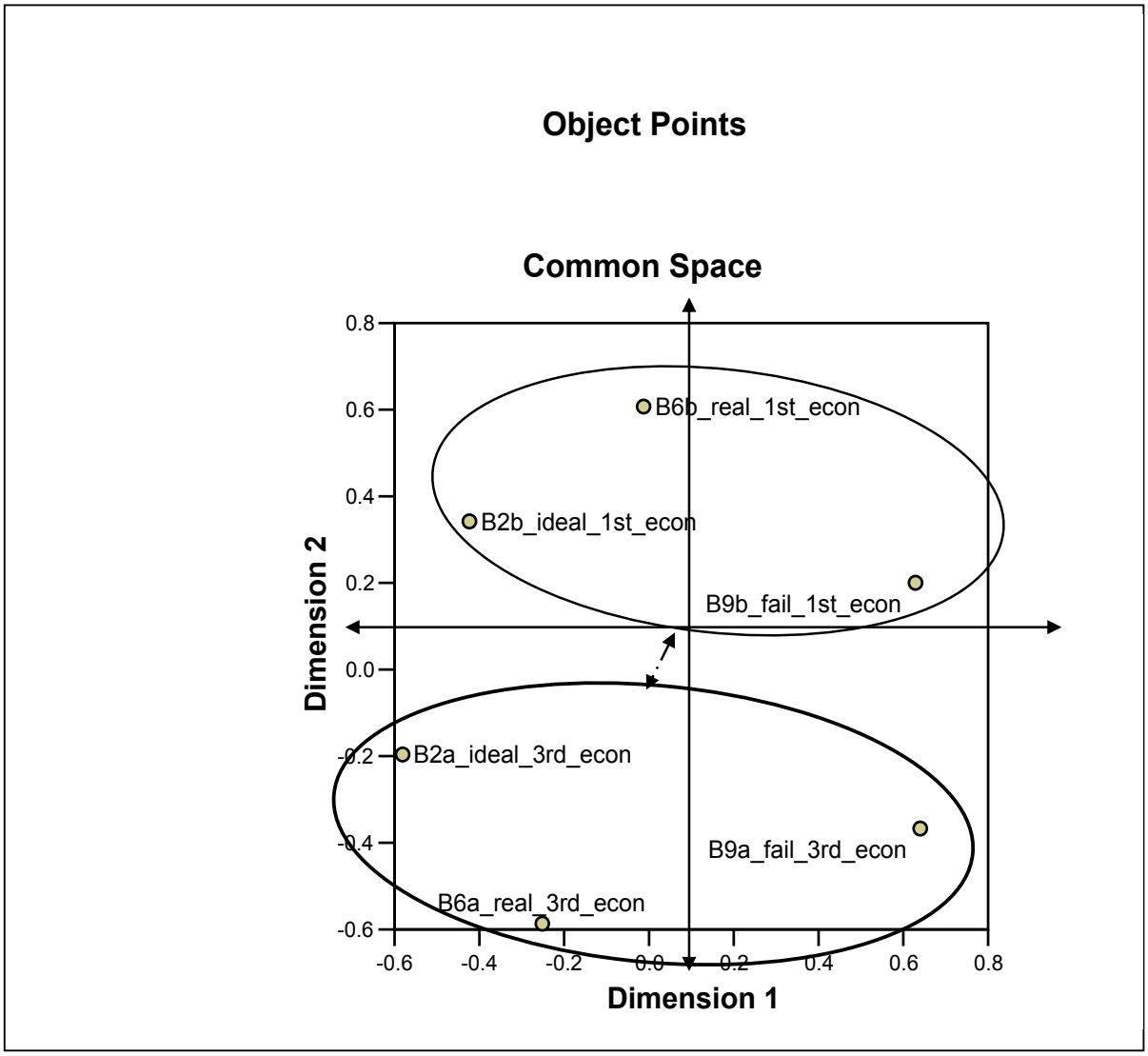
Figure 11: Multidimensional scaling of the 'social' variable



From figure 11, along dimension 2, the opinions in regard to the **social imperatives** contributing to SWRM it appears that in the 3rd world countries, no differences in opinion appear in situations of **ideal, real** and **failure.** The deduction is that the social imperative within 3rd world economies is not really important. The opinions regarding 1st world differ to 3rd world in that **ideal** and **real** stand in contrast to **failure** along dimension-2 object relationship, and all three are considered important.

In figure 12 the Multidimensional scaling (MDS) of section 'B' data is focused on the **economic imperative aspect of** SSWRM and presented in a two dimensional spatial format.

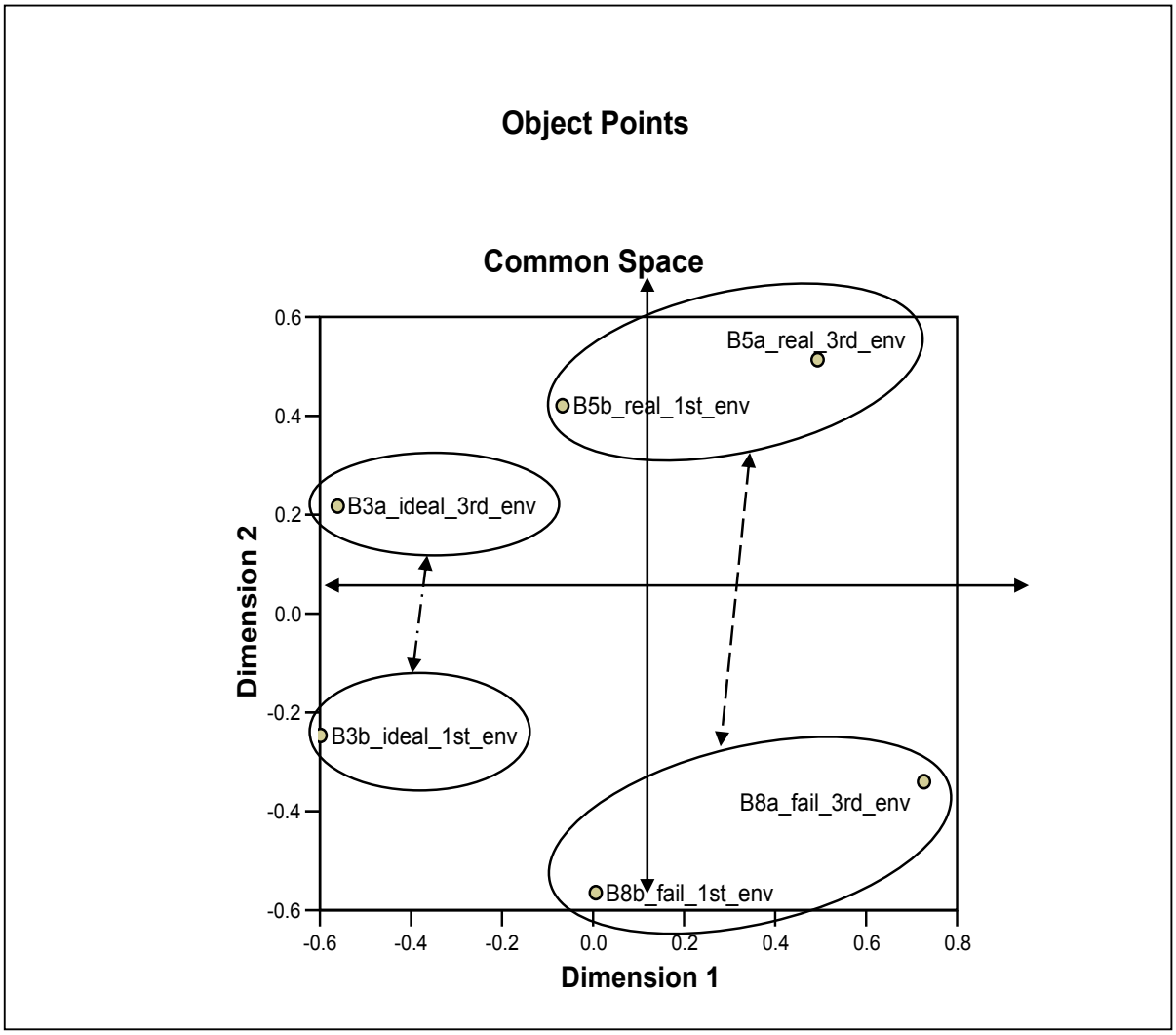
Figure 12: Multidimensional scaling of the 'economic' variable



From figure 12 the **economic imperatives** of the **3rd and 1st worlds** oppose each other in terms of the **real, ideal** and **fail** economic factors along the dimension 2 relationship. The economic imperative in the **real (reality)** situation for both the 3rd and 1st world economies are important being at the outer edges of dimension 2. The deduction is that economics become very important in **reality** situations and less so in the idealistic and failure situations.

In figure 13 the Multidimensional scaling (MDS) of section 'B' data is focused on the **environmental imperative aspect of** SSWRM and presented in a two dimensional spatial format.

Figure 13: Multidimensional scaling of the 'environmental' variable

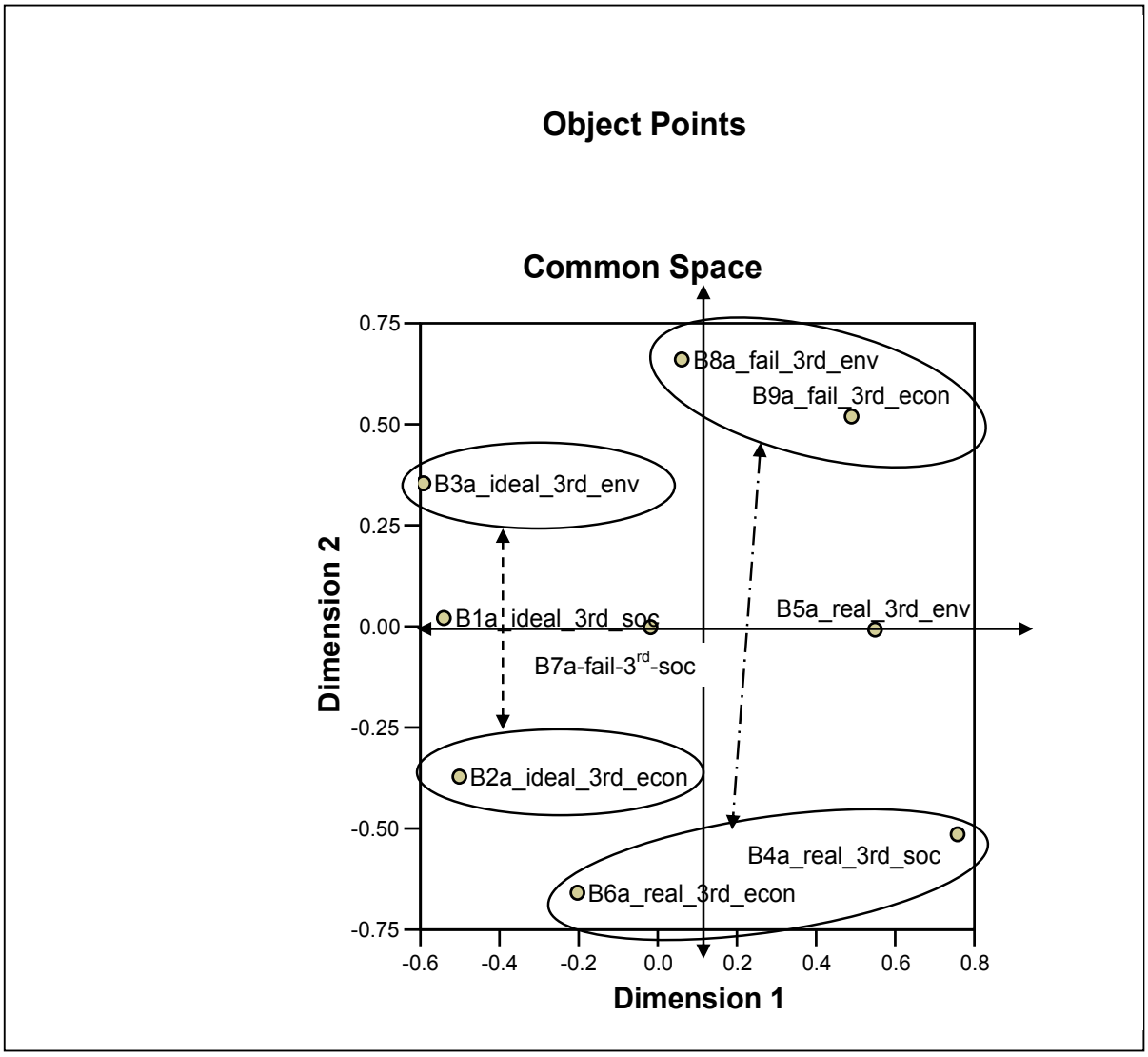


From figure 13, investigating the **environmental** imperative as per the specialists opinions, dimension-2 indicates that the **real** and **fail** situations oppose each other, both for 3rd and 1st

worlds. The **ideal** positions for both worlds are less pronounced. The deduction is that **environmental imperatives** are important in **reality** and **failure** situations.

In figure 14 the Multidimensional scaling (MDS) of section 'B' data is focused on all the objects in relation to the 3rd world economies in terms of SSWRM and presented in a two dimensional spatial format.

Figure 14: Multidimensional scaling of all '3rd world' variables

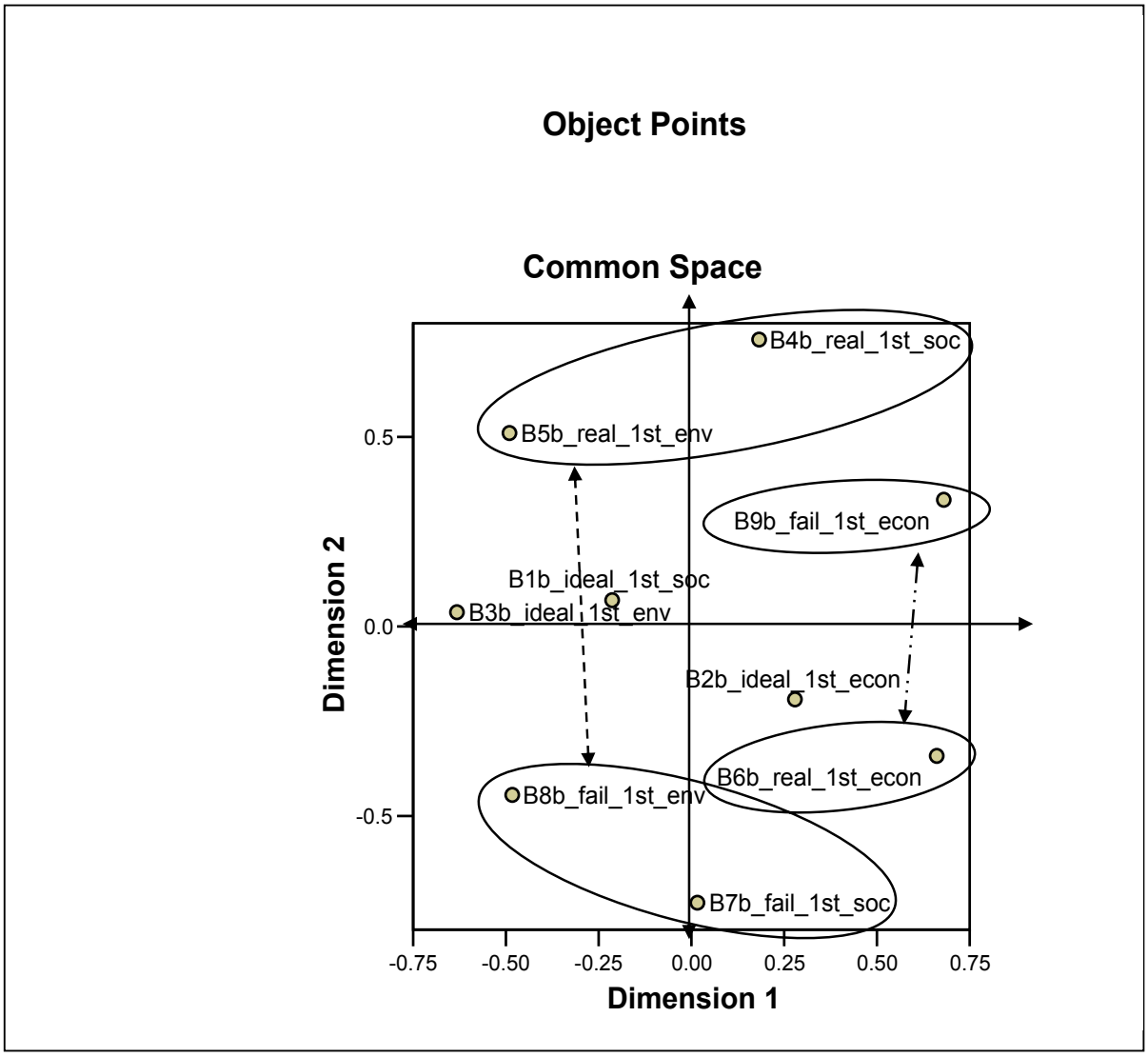


From figure 14 the MDS of all the variables relating to **3rd world** signify the opinions that **social** issues in **idealism** are not as important as the **environmental** and **economic** factors. In **reality** the **social** and **economic** factors are **important** whilst in **failure** the **environmental** and **economic**

factors are important, whilst the **social** imperative is not important. The deduction is also made that in **reality** the **environmental** factors, being in the middle of dimension-2, are less important.

In figure 15 the Multidimensional scaling (MDS) of section 'B' data is focused on all the objects in relation to the 1st world economies in terms of SSWRM and presented in a two dimensional spatial format.

Figure 15: Multidimensional scaling of all '1st world' variables



From figure 15 the MDS of the opinions about the **1st world**, as common denominator, the important imperatives under **reality,** being the environmental and social factors, oppose the same factors during **failure** perception of a SWRM project. It is also seen that the **economic** factors

stand in stark contrast to their relative **environmental** and **social** counterparts under failure and reality, but being closer to the centre, considered less important. The three **idealistic factors** remain central to the dimension-2 and therefore of similar identity and considered important.

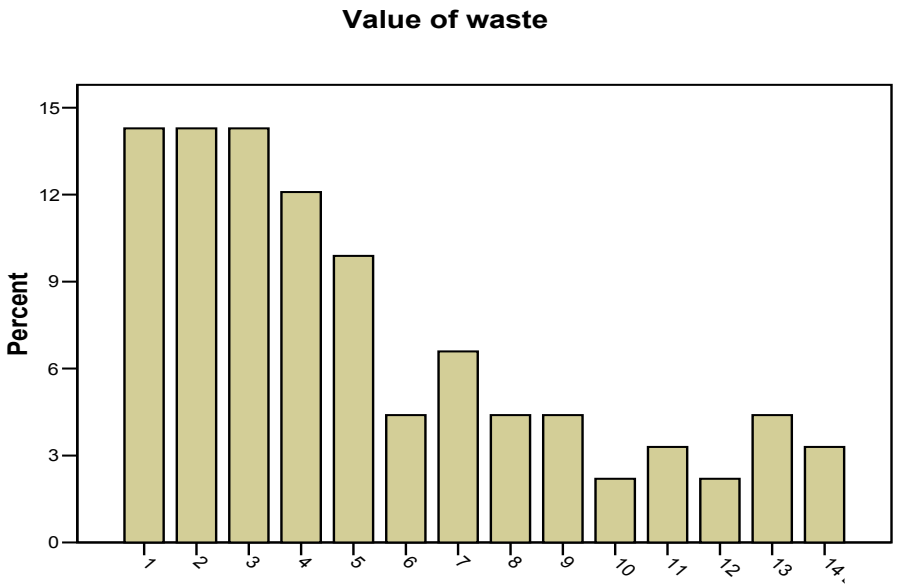
6.4.2. Results of sections 'A' and 'C' of questionnaire

The biographical data of the environmental specialists consulted, as per section 'A' of the questionnaire, and their responses to the ranking of the motivational factors as per section 'C' of the questionnaire, require analysis. This is to be done as described in paragraph 5.6.2 'Construct-L data analyses methodology'.

All the responses were cleaned by deleting incomplete or erroneous responses before compiling the final data base used for the SPSS 12.0 programme statistical testing. The 14 augmenting (motivational) factors listed in section 'C' of the questionnaire require ranking from the most important to the least important. On a value scale of 1 to 14, a 1 is allocated to the most important factor and 14 to the factor considered the least important in contributing to sustainable SWRM. The responses to the questionnaire are presented by the frequency statistics as per appendix E which reveals distribution curves of various shapes. Two examples are represented by figures 16 and 17.

In figure 16 the frequency distribution is presented as percentages of responses that allocated a specific ranking to a question. In this case the question is: ‘rank, on a scale of 1 to 14 the importance of **value of the waste** as a motivational factor augmenting SWRM’.

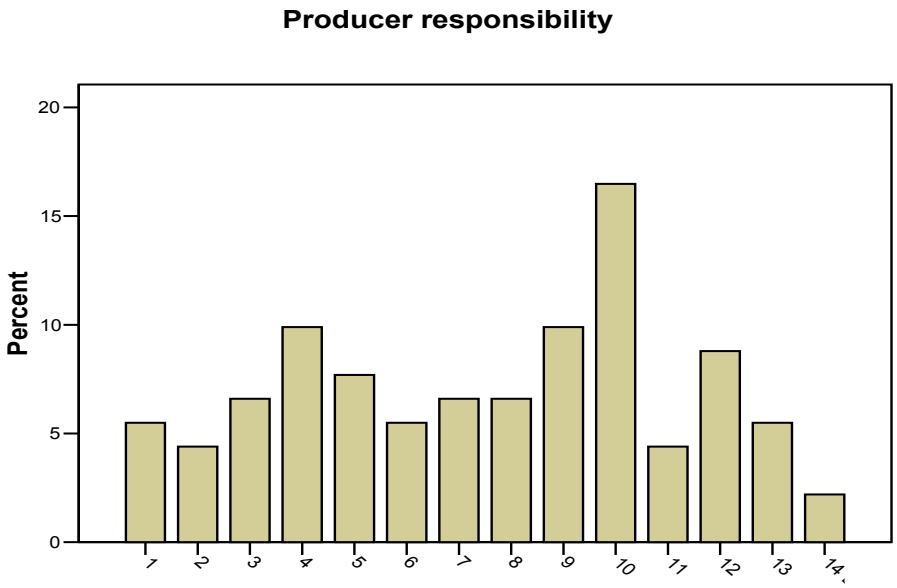
Figure 16: Responses to 'value of waste' as motivating factor



From figure 16 the frequency distribution of the responses is skewed to the left, indicating most respondents consider ‘value of waste’ as an important augmenting factor. The graph has a tail to the right hand.

In figure 17 the frequency distribution is presented as percentages of responses that allocated a specific ranking to a question. In this case the question is: ‘rank, on a scale of 1 to 14 the importance of **producer responsibility** as a motivational factor augmenting SWRM’.

Figure 17: Responses to 'producer responsibility' as motivating factor



From figure 17 the frequency distribution of the responses tends towards a normal distribution, although it has two peaks, indicating most respondents consider ‘producer responsibility’ as an ‘average’ important augmenting factor.

The next step in analysing the 14 motivational factors is to rank them using the non-parametric Friedman ranking test together with the significance factors.

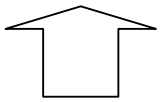
6.4.2.1. Ranking of 14 motivational factors; Friedman test and its significance

In table 22 the ranking, according to the Friedman rank test, place in order of importance the augmenting factors from the highest, most important ranking (having the lowest score) to the least important (having the highest score). Table 22 also displays the associated ‘test statistics’ containing the ‘no or respondents’, ‘Chi-square value’ which is calculated and used to determine the ‘asymptotic significance’. The ‘df’ represents the ‘degrees of freedom’ used in the test formula, which in this instance is one less than the number of factors (14 minus 1).

Table 22: Friedman rank test; 14 motivational factors, base data

Non Parametric Tests: Ranks

	Mean Rank
Economic incentives	4.55 **(most important)**
Legislation	4.86
Value of waste	5.29
Government leadership	6.73
Education	6.87
Environmental taxes	7.46
Producer responsibility	7.63
Social pressure	7.75
Standards environmental	7.93
Corporate leadership	8.1
Personal values	8.68
Corporate governance	8.76
Risk management	9.74
Life cycle assessments	10.65 **(least important)**



Test Statistics (a)	Result
No of respondents	91
Chi-Square	208.993
df (degrees of freedom)	13
Asymptotic Significance	**.000**

(a): Refers to the Friedman Test

From table 22 The Friedman rank test places in order of importance, the augmenting factors with a significance of 0.000 (read: not absolute nil) which is less than 0.05 (<0.05) and therefore significant. Consequently, in statistical terms the ranking has proper order because the programme is able to distinguish between the statistical means of the responses, with their associated frequency distributions, as for example figures 16 and 17. Of importance is the ranking starting with augmenting factors such as 'economic incentives' being the most important, then 'legislation' followed by 'value of waste'. Least important is 'life cycle assessment' followed by 'risk management'. As indicated in paragraph 5.6.2 more statistical testing is required to analyse and interpret the data received in terms of section 'A' and 'C' of the questionnaire.

6.4.2.2. Ranking of 14 motivational factors; Cluster analysis

Because of the wide distribution of the opinions on the frequency graphs as per appendix E and examples figures 16 and 17, further inspection of the responses is required to interpret the outcome. To this end, as described in paragraph 5.6.2, the Cluster analysis is used, which is one of the suites of tests within Multivariate data analysis. The primary purpose of Cluster analysis is to group objects (responses) based on the characteristics they possess (Hair et al, 1998). The Friedman rank test in the previous paragraph 6.4.2.1 provides a 'simple' ranking according to the importance of the motivational factors augmenting SSWRM. Clusters will provide more insight into groups of objects that share similar 'unknown' classification references used by the respondents during their answering of the questionnaire.

In table 23 the output of the 'quick cluster' method of the SPSS 12.0 programme is portrayed. In collaboration with the stipulated number of clusters to be created, the 'parallel threshold method' was used to establish the seed points which are required to run the programme. 'Stopping rules' are used to determine the number of clusters providing the best results (Hair et al, 1998). In this case two, three and four clusters were stipulated and the SPSS programme run. In the end, following 'a priori criteria', practical judgment was used that indicated that the reported three clusters best represents the groupings. The un-recoded data of section 'C' of the questionnaire was used for the cluster analysis. Refer appendix C containing the 'code book' for details. Table 23 contains listing of the motivational objects, for example 'value of waste' which is ranked under each of the three clusters number 1, 2 and 3. Values within each cluster for each object represent importance, with values closer to 1 being the most important, and those closer to 14 being less important. The next group of data in table 23 contains the ANOVA significance testing of the objects within each cluster. It contains the heading ANOVA and the significance value in the right hand side of the table. The degree of freedom (df) used in the test to calculate the **significance** from the F-values obtained, is also presented. The significance levels of all the objects are less than 0.05 which rank the clusters significantly differently, except for the objects 'standards environmental' and 'education' where the exact ranking within the clusters seems uncertain. It is for this reason that the 'outer groups', such as the most important or the least important objects, rather be used. These objects being the most important, or least important, are bold printed under each cluster number 1, 2 or 3. The last section in table 23 with sub heading 'Number of cases in each cluster' indicates the number of respondents, out of the available 91, used in each cluster.

Table 23: Cluster analysis; section 'C' of questionnaire, highlighting cluster no 1

Quick Cluster: Final Cluster Centres	Cluster		
	No 1	No 2	No 3
Number of respondents:	**39**	35	17
Value of waste	**3**	6	8
Standards environmental	8	8	7
Social pressure	5	9	9
Risk management	**10**	10	8
Producer responsibility	7	9	5
Personal values	7	11	7
Life cycle assessments	**11**	12	7
Legislation	5	4	7
Government leadership	**10**	5	4
Corporate leadership	**10**	7	4
Environmental taxes	7	6	10
Education	6	7	8
Economic incentives	**3**	4	8
Corporate governance	**11**	8	5

Ranking figures mean:
Closer to value of:
'1' is 'important'
'14' is 'not important'
contributor to
sustainable SWRM.

ANOVA	Cluster		Error		F	Significance
	Mean Square	df	Mean Square	df		
Value of waste	137.743	2	11.277	88	12.215	.000
Standards environmental	14.309	2	13.023	88	1.099	**.338**
Social pressure	164.872	2	12.050	88	13.683	.000
Risk management	47.195	2	10.212	88	4.622	.012
Producer responsibility	110.869	2	10.919	88	10.154	.000
Personal values	200.767	2	12.784	88	15.705	.000
Life cycle assessments	166.805	2	8.399	88	19.860	.000
Legislation	62.792	2	9.938	88	6.318	.003
Government leadership	287.995	2	11.369	88	25.332	.000
Corporate leadership	228.693	2	8.846	88	25.853	.000
Environmental taxes	85.211	2	13.504	88	6.310	.003
Education	18.051	2	12.619	88	1.430	**.245**
Economic incentives	175.058	2	7.841	88	22.326	.000
Corporate governance	261.785	2	8.793	88	29.771	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Number of Cases in each Cluster

Cluster number	**1**	**39**
	2	**35**
	3	**17**
Valid		91
Missing		0

From table 23 the focus is placed on cluster no 1 representing 39 respondents. Cluster no 1 result indicates Economic Incentives and Value of Waste as important rankings (average 3) and Risk Management, Life Cycle Assessment, Government Leadership, Corporate Leadership and Corporate Governance unimportant rankings (average 10 and 11). The two most and least important ranking objectives coincide with the Friedman rank test results, table 22.

In table 24 the focus is on cluster no 2 with its associated most and least important objectives in bold print. The number of respondents per cluster with similar characteristics is also indicated.

Table 24: Cluster analysis; section 'C' of questionnaire, highlighting cluster no 2

Quick Cluster: Final Cluster Centres	**Cluster**		
	No 1	**No 2**	No 3
Number of respondents:	39	**35**	17
Value of waste	3	6	8
Standards environmental	8	8	7
Social pressure	5	9	9
Risk management	10	**10**	8
Producer responsibility	7	9	5
Personal values	7	**11**	7
Life cycle assessments	11	**12**	7
Legislation	5	**4**	7
Government leadership	10	5	4
Corporate leadership	10	7	4
Environmental taxes	7	6	10
Education	6	7	8
Economic incentives	3	**4**	8
Corporate governance	11	8	5

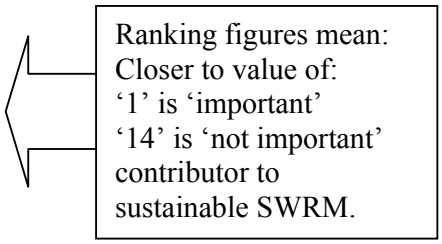
Ranking figures mean:
Closer to value of:
'1' is 'important'
'14' is 'not important'
contributor to
sustainable SWRM.

From table 24 the cluster no 2 contains 35 respondents resulting in Legislation and Economic Incentives as important rankings (average 4) and Risk Management, Personal Values and Life Cycle Assessment unimportant rankings (averages 10, 11 and 12). This makes legislation an important augmenting factor in contrast to the Friedman ranking in table 22.

In table 25 the focus is on cluster no 3 with its associated most and least important objectives in bold print. The number of respondents per cluster with similar characteristics is also indicated.

Table 25: Cluster analysis; section 'C' of questionnaire, highlighting cluster no 3

Quick Cluster: Final Cluster Centres	Cluster		
	No 1	No 2	**No 3**
Number of respondents:	39	35	**17**
Value of waste	3	6	8
Standards environmental	8	8	7
Social pressure	5	9	9
Risk management	10	10	8
Producer responsibility	7	9	5
Personal values	7	11	7
Life cycle assessments	11	12	7
Legislation	5	4	7
Government leadership	10	5	**4**
Corporate leadership	10	7	**4**
Environmental taxes	7	6	**10**
Education	6	7	8
Economic incentives	3	4	8
Corporate governance	11	8	5



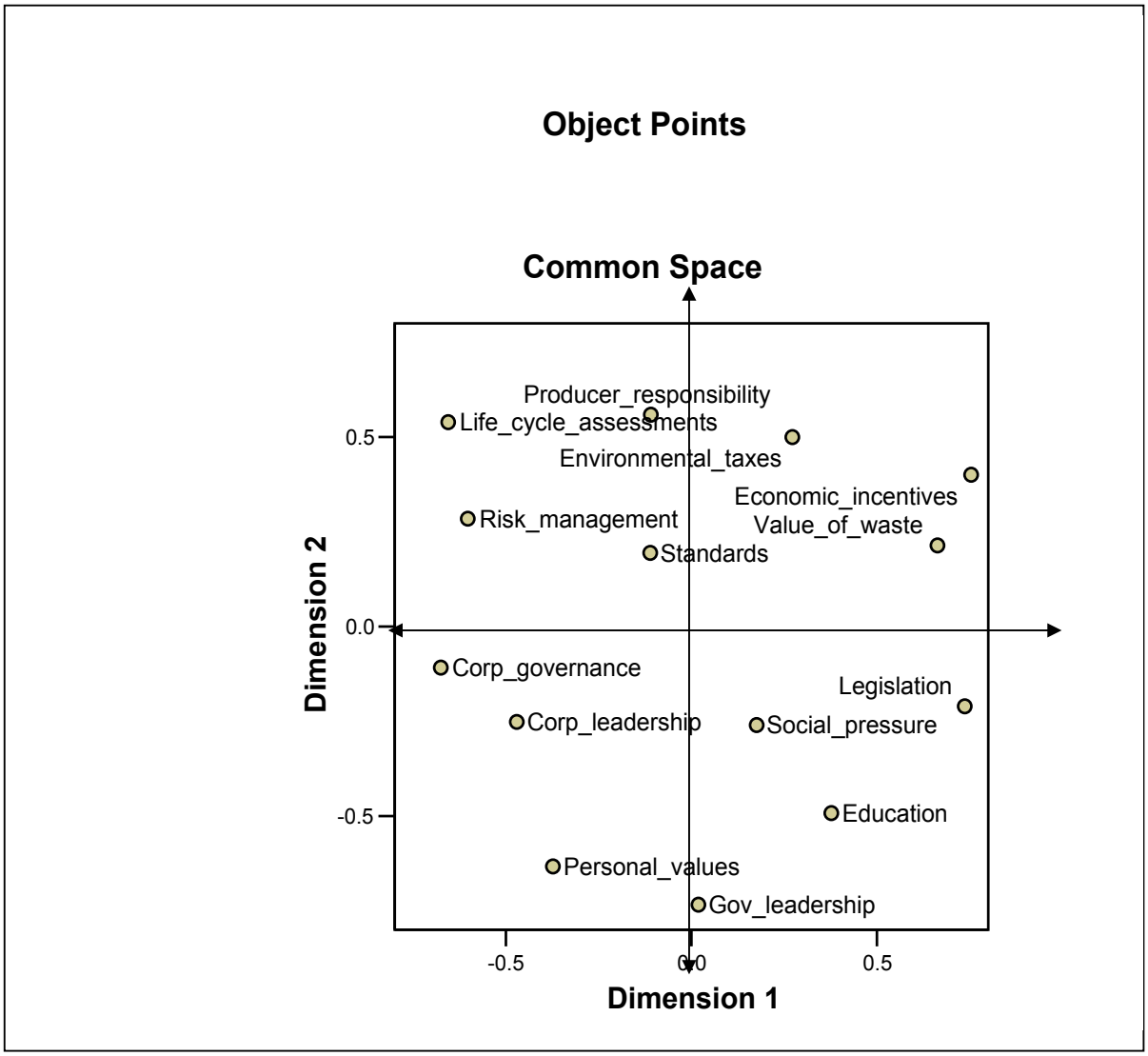
From table 25 the cluster no 3 contains 17 respondents resulting in Government Leadership and Corporate Leadership as important rankings (average 4) and Environmental Taxes a low ranking (average 10). This accentuates the importance of leadership as augmenting factors.

6.4.2.3. Ranking of 14 motivational factors; multidimensional scaling

As indicated in paragraph 5.6.2 a multidimensional scaling analysis is to follow the cluster testing of paragraph 6.4.2.2. Various routes, analysing a situation or set of data, need to be followed in an endeavour to gain more insight when formulating a strategy or plan of action, which in this case is sustainable SWRM. Section 'C' of the questionnaire generated opinions from environmental specialists that require analysis for interpretation. "The development of soft systems methodology showed us that a means of putting on different kinds of thinking caps was crucially needed. The formulation of route definitions, the building of systems models implied by them and the comparison of these models with the real world constitute an attempt to do this" (Checkland, 1981: 220). Therefore, next, in the statistical analysis process of section 'C' of the questionnaire

(construct-L) is applying multidimensional scaling analysis (MDS), which is part of the suite of multivariate data analysis techniques, to spatially display **grouping** of the 14 motivation factors for interpretation. This is the third statistical test of the section 'C' data following the Friedman rank test (paragraph 6.4.2.1) and the Cluster analysis (paragraph 6.4.2.2) ranking of the factors within 3 clusters. In figure 18 the Multidimensional scaling (MDS) of section 'C' data is presented in a two dimensional spatial format. Appendix J contains the full MDS analysis. Plotting of the factors along two dimensions is done by the SPSS 12.0 statistical programme, used for this analysis, after it identified some trends within the statistical means of the ranking values. The two dimensions need to be interpreted by the analyst (Hair et al, 1998).

Figure 18: Multidimensional scaling of the 14 motivational factors, construct-L



From figure 18 the augmenting factors are spatially displayed with their relative distance to each other along the two dimensions, indicating some, to be identified, relationship (Hair et al, 1998). In this regard reference to **systems methodology** assists the process. The Systems approach described by Checkland (1981) indicates how **hard systems** such as engineering can be dealt with by means of systems engineering or systems analysis. The **soft systems methodology** (Checkland, 1981; Delbecq ,1999) starts off with an urge to bring about improvement to a social system in which there is felt to be an ill-defined problem situation. This is then expressed by examining elements of structure and process and their mutual relationship. Checkland (1981) also signifies how soft systems-based methodology is used for tackling **real world problems**. This soft system methodology is a never-ending learning process. Today, this is termed a philosophical approach. Figure 18 is an aid to develop construct-L, figure 3. From figure 18, inspection of dimension-2 reveals grouping of the factors (or objects) into 'hard' and 'soft' categories. 'Hard issues' in this case, is defined as mostly referring to 'economic capital' and the 'soft' issues to 'social capital'. The bottom section of dimension-2 relates to the 'soft issues' such as leadership, education, social pressure, personal values, corporate governance and legislation. The top section of dimension-2 groups the 'hard issues' such as economic incentives, value of waste, standards, life cycle assessments, taxes and producer responsibility. The interpretation is that the hard issues need to be supported or counteracted by the soft issues in the overall approach to the management of sustainable SWRM (SSWRM). From figure 18 it is also of importance to note that 'economic incentives' and 'value of waste' are close to each other and seem to be perceived by the environmental specialists as having similar importance. Along dimension-1 of figure 18 corporate governance and corporate leadership are in contrast to economic incentives, value of waste and legislation, which compares to the cluster results of paragraph 6.4.2.2. All of these will be combined in models to be developed hereafter.

6.4.2.4. 14-Motivational factors; cross-tabulation, clusters and biographical data

The next step in the analysis methodology, as describe in paragraph 5.6.2, following the MDS analysis (paragraph 6.4.2.3) is **cross tabulation** of the clusters of the 14 motivational factors to the biographical data of the respondents, obtained from section 'A' of the questionnaire. This is to establish any relationships between the respondents' **biographic data** and their section 'C' responses.

In table 26 the results of a cross tabulation test between occupation of the respondents and the three clusters as per paragraph 6.4.2.2 are listed. Complete details are contained in appendix L. The occupation of the respondents is reduced to three categories, which are; being involved in 'waste companies', 'government' or 'other companies'. 'Other companies' include private sector, institutions of learning and NGOs. Table 26 indicates the 'count' of respondents in each of the clusters number 1, 2 or 3 as well as the percentage listings in each case. Any set of relationships also need to be supported, as per the bottom of table 26, by the Pearson Chi-square significance test and have an asymptotic significance of less than 0.05 indicating significant results.

Table 26: Relationship clusters versus type of company

Occupation respondent * Cluster Number of Case: Crosstabulation

			Cluster Number of Case			Total
			1	2	3	
Occupation respondent	Waste companies	Count	19	21	5	45
		% within Occupation respondent	42.2%	**46.7%**	11.1%	100.0%
		% within Cluster Number of Case	48.7%	60.0%	29.4%	49.5%
	Government	Count	14	3	0	17
		% within Occupation respondent	**82.4%**	17.6%	.0%	100.0%
		% within Cluster Number of Case	35.9%	8.6%	.0%	18.7%
	Other companies	Count	6	11	12	29
		% within Occupation respondent	20.7%	37.9%	**41.4**%	100.0%
		% within Cluster Number of Case	15.4%	31.4%	70.6%	31.9%
Total		Count	39	35	17	91
		% within Occupation respondent	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests	Value	Degree of freedom: df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.776(a)	4	**.000**
Likelihood Ratio	26.014	4	.000
Linear-by-Linear Association	6.492	1	.011
No of Valid Cases	91		

(a): 1 cell (11.1%) has expected count less than 5. The minimum expected count is 3.18.

From table 26 the cross-tabulation and associated Pearson Chi-square significance testing of the clusters with the biographical information indicates notable relationships between the opinion of specialist respondents and the type of company they work for. The largest proportion of government officials, 82.4%, support cluster 1 and consider value of waste and economic incentives as important with risk management, life cycle assessment, government leadership, corporate leadership and corporate governance as unimportant. The government officials that responded place most faith in economic incentives to augment the SWRM process and less in leadership functions. Not even their own leadership is considered important.

Also from table 26 the largest proportion, 46.7%, of respondents supporting cluster 2 are those working for waste companies. Waste companies include consulting, collection or transport, equipment suppliers, recycling and users of waste. They support economic incentives and legislation as the most important augmenting factors. These are people that deal intensively with waste on a daily basis.

The largest support group, 41.4%, for cluster 3 is 'other companies' (table 26) which includes respondents who work for private companies, NGOs and academic people. This cluster 3 group considers government leadership and corporate leadership as most important with environmental taxes and social pressure as the least important augmenting factors.

In summary, from table 26 the deduction is made that economic incentives, value of waste and legislation (clusters 1 and 2) are the most important motivational factors playing a role in augmenting the SWRM process. This principally is supported by government and waste company specialists. Cluster 3, chiefly supported by 'other company' employees, indicates corporate and governmental leadership as important factors.

In table 27 the results of a cross tabulation test between years work experience of the respondents and the three clusters as per paragraph 6.4.2.2 are listed. Complete details are contained in appendix L. The Pearson Chi-square test is significant for these relationships (less than 0.05).

Table 27: Relationship clusters versus years work experience

Years work experience * Cluster Number of Case: Crosstabulation

			Cluster Number of Case			Total
			1	2	3	
Years work experience	2 to 10 years	Count	9	11	2	22
		% within Years work experience	40.9%	**50.0%**	9.1%	100.0%
		% within Cluster Number of Case	23.1%	31.4%	11.8%	24.2%
	11 to 19 years	Count	5	7	10	22
		% within Years work experience	22.7%	31.8%	**45.5%**	100.0%
		% within Cluster Number of Case	12.8%	20.0%	58.8**%**	24.2%
	20 years and more	Count	25	17	5	47
		% within Years work experience	**53.2%**	36.2%	10.6%	100.0%
		% within Cluster Number of Case	64.1**%**	48.6%	29.4%	51.6%
Total		Count	39	35	17	91
		% within Years work experience	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests	Value	Degrees of freedom: df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.501(a)	4	**.004**
Likelihood Ratio	13.922	4	.008
Linear-by-Linear Association	1.383	1	.240
No of Valid Cases	91		

(a) 2 cells (22.2%) have expected count less than 5. The minimum expected count is 4.11.

From table 27 the influence of years work experience of respondents also provides insight into the ranking of important motivational factors towards augmenting SWRM projects. Most of the 2 to

10 years experience group (50%) support cluster 2 whilst most (45.5%) of the 11 to 19 years experience group support cluster 3. The more experienced specialist respondents with 20 or more years experience, (53.2%), supported cluster 1. It appears that, the more experienced specialists become, and the more they actually work with waste, the more they believe that economic incentives, value of waste and legislation become the augmenting factors.

Tables 26 and 27 have high levels of Pearson Chi-square significances (less than 0.05) indicating the results are statistically significant.

6.4.2.5. 14-Motivational factors; influence of variables 'B' on clusters, ANOVA

The next step in the analysis methodology, as describe in paragraph 5.6.2, following the cross tabulation of the three clusters and associated biographical data (paragraph 6.4.2.4) is **ANOVA testing.** This one-way ANOVA (analysis of variance) test is required to search for any **relationships** between section 'B' of the questionnaire, containing the independent variables, and the three clusters of the 14 motivational factors. Should any relation be found, it could be reasoned they (independent variables) influence the outcome of the clusters. Again the **significance value** for each relationship tested should be less than 0.05 to be statistically noteworthy.

In table 28 the one-way ANOVA tests results are displayed to compare the mean scores of the variables from section 'B' of the questionnaire (ideal, real, fail, social, economic, environment, 3rd world and 1st world, including overall mean) with the three clusters created (paragraph 6.4.2.2 and table 23) for the 14-factors of section 'C' of the questionnaire. The detail analysis is contained in appendix L. The significance values are contained in the last column of table 28.

Table 28: One-way ANOVA; mean scores of section 'B' versus clusters of section 'C'

		Sum of Squares	Degrees of freedom: df	Mean Square	F factor	**Significance**
Average of 6 IDEAL opinions	Between Groups	.051	2	.026	.180	**.836**
	Within Groups	12.563	88	.143		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.374	2	.187	.424	**.656**
	Within Groups	38.847	88	.441		
	Total	39.221	90			
Average FAIL opinion	Between Groups	.983	2	.492	.992	**.375**
	Within Groups	43.601	88	.495		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.353	2	.176	.487	**.616**
	Within Groups	31.873	88	.362		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.686	2	.343	.932	**.398**
	Within Groups	32.391	88	.368		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.205	2	.102	.261	**.771**
	Within Groups	34.475	88	.392		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.089	2	.044	.196	**.822**
	Within Groups	19.896	88	.226		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.325	2	.163	.658	**.520**
	Within Groups	21.724	88	.247		
	Total	22.049	90			
Average rating of 18 questions	Between Groups	.068	2	.034	.184	**.832**
	Within Groups	16.188	88	.184		
	Total	16.255	90			

From table 28 all the significance values in the right hand column, are greater that 0.05, indicating no significant correlation between the variables of section 'B' of the questionnaire and the three clusters created for section 'C' of the questionnaire. The variables therefore have no influence on the outcome of the cluster analysis.

6.4.2.6. 14-Motivational factors; clusters versus factors influences, Kruskal-Wallis

The last statistical test to be done in this series, as describe in paragraph 5.6.2, is to run a Kruskal-Wallis test to gauge the independency of the three clusters (paragraph 6.4.2.2 and table 23) and the ranking of the 14 factors, of section 'C' of the questionnaire. This test also produces an asymptotic significance value that should be below 0.05 to indicate significant difference between the clusters and the ranking of the 14-factors.

In table 29 the non-parametric Kruskal-Wallis tests results are displayed to test for significant differences between the three clusters and the ranking of the 14 motivational factors towards sustainable SWRM. The significance values are contained in the last column of table 29. The detail analysis data is contained in appendix L.

Table 29: Kruskal-Wallis Test; 14 factors versus cluster significance

Augmenting factor	Chi-Square	Degrees of freedom: df	Asymptotic Significance
Value of waste	19.281	2	.000
Standards environmental	2.256	2	**.324**
Social pressure	20.598	2	.000
Risk management	5.848	2	.054
Producer responsibility	16.700	2	.000
Personal values	24.796	2	.000
Life cycle assessments	23.668	2	.000
Legislation	8.510	2	.014
Government leadership	33.024	2	.000
Corporate leadership	32.487	2	.000
Environmental taxes	11.003	2	.004
Education	2.341	2	**.310**
Economic incentives	24.379	2	.000
Corporate governance	34.557	2	.000

From table 29 the non-parametric Kruskal-Wallis tests show significant differences between the three clusters with respect to all the rankings of the 14 motivational factors except for 'environmental standards' and 'education' because the significance are greater than 0.05 in value.

The cluster analysis, table 23, does not rank 'standards' and 'education' as very important as considered by the environmental specialists in augmenting sustainable SWRM. The other 12 factors with significance values less than 0.05 do rank the clusters significantly differently.

6.5. Discussion of statistical results by hypothesis and theme

The approach of this research is defining, the problem, objective and goal as indicated by figure 1, and then, the research methodology as outlined by figures 2 and 3. Thereafter, with reference to the bottom section of figure 3, literature surveys are carried out and analysed as per chapters 2, 3 and 4 to identify the environmental management **imperatives** requiring **opinion** ratings. These **imperatives** or **issues** are the factors that will **augment** a SWRM programme as well as indicate the most important aspects in question.

The approach for evaluating the identified augmenting factors is two-fold and divided into construct-K and construct-L. The bottom left hand side of figure 3, construct-K, indicates the independent variables or imperatives of environmental friendliness, economical feasibility and social acceptability being evaluated. Construct-K contains three hypotheses, K1, K2 and K3 to research the aspects of SWRM in terms of idealism, realism and failure. The bottom right hand side of figure 3, construct-L, provides an insight into the process followed to obtain opinions and ranking of the identified 14 management issues as per chapters 2, 3 and 4. The knowledge obtained from the research carried out through the two constructs, K and L, is then utilised to create **construct-M**, which is the **Strategy-benchmarking-model** for augmenting SSWRM projects.

It is the objective of this research to identify the motivational factors of social capital including, management processes, leadership and people management that would augment solid waste reduction management (SSWRM) projects that are lethargic at starting, or deteriorating, to achieve sustainability, with special reference to developing countries.

The goal of this work is to apply the results of the **research objective** in the creation of a **model** or road map that can be used by managers and leaders, particularly in developing countries, to augment sustainable development of solid waste reduction projects. **A** model is developed in paragraph 6.5.3 to create the road map.

In table 30 a synopsis of the statistical results, as per the tables and figures within paragraph 6.4.1, is presented as an overview of the outcomes. These results are required in verifying the hypotheses, K1, K2 and K3 forming part of construct-K, figure 3.

In table 30 the following abbreviations are used as space savers for the various imperatives: ‘env’ = environmental; ‘econ’ = economic; ‘soc’ = social.

Table 30: Summary of statistical results, paragraph 6.4.1; construct-K

Reference	Statistic	3rd world country	3rd world country	1st world country	1st world country
Number	**Test & parameter**	**Most important or Highest score**	**Less important or Lowest score**	**Most important or Highest score**	**Less important or Lowest score**
1	Table 19: Friedman; Ideal, Real, Fail	Ideal	Real (& Fail)	Ideal	Real (& Fail)
2	Table 20: Friedman; Soc, Econ, Environ	Env	Social	Env	Social
3	Table 21: Friedman; 3rd versus 1st	1st world	3rd world	1st world	3rd world
4	Figure 7: MDS; All variables	Env & Econ	Social	Env & Econ	Social
5	Figure 8: MDS; Ideal	Econ & Social	Env	Econ & Env	Social
6	Figure 9: MDS; Real	Econ & Env	Social	Econ & Env	Social
7	Figure 10: MDS; Failure	Env	Econ & Social	Econ & Social	Env
8	Figure 11: MDS; Social	Nil	Real, Ideal & Fail	Real, Ideal & Fail	Nil
9	Figure 12: MDS; Econ	Real	Ideal & Fail	Real	Ideal & Fail
10	Figure 13: MDS; Environ	Real & Fail	Ideal	Real & Fail	Ideal
11	Figure 14: MDS; 3rd world	Ideal: Env/Econ Real: Soc/Econ Fail: Env/Econ	Ideal: Social Real: Env Fail: Social	Nil	Nil
12	Figure 15: MDS; 1st world	Nil	Nil	Ideal:Env/Econ/Soc Real: Soc/Env Fail: Soc/Env	Ideal: Nil Real: Econ Fail: Econ
Reference	**Statistic**	**3rd world country**	**3rd world country**	**1st world country**	**1st world country**

From table 30 the statistical results, as displayed by the tables and figures within paragraph 6.4.1 indicate the considered important and less important variables for the 3rd and 1st world economies. The table contains a 'reference number', in the left column, for later use in identifying a specific test result. The second column indicates the table or figure number, type of test statistic and common parameter referred to. The last four columns indicate the results of the statistics for the 3rd and 1st world economies. Detailed descriptions of the results of each test are contained within paragraph 6.4.1 with its associated table or figure. The purpose of table 30 is to provide an overall view of the results required to interpret the hypotheses contained in construct-K as presented by figure 3.

6.5.1. Results: Construct-K; hypothesis testing (idealism, realism, failure)

The results, as summarised by table 30, are referenced to evaluate the variables, P, Q and R in this paragraph. As per paragraph 5.1.1, **sustainable solid waste reduction management** (SSWRM) is constructed as the following **proposition**:

SSWRM = f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}
With **P**, **Q** and **R** being the **coefficients** and S**SWRM** the **dependent variable**.

The proposition for SSWRM was used to construct the three hypotheses K1, K2 and K3, in the context of **idealism, realism** and **failure** in terms of the opinions of environmental specialists questioned.

6.5.1.1. Result: Hypothesis K1; idealism

In terms of 'idealism' hypothesis K1 is constructed as:

SSWRM(ideal)=f{P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}

With the coefficients P, Q, R all being significant, that is, all close to 5 on the Likert scale.

With the null and research hypotheses:

	Hypothesis K1 SSWRM(ideal)
Null hypothesis: Null hypo Ho	Coefficients P, Q and R are not significant contributors to SSWRM
Research hypothesis: Alternative Hypo H1 (directional)	P, Q and R are all significant contributors to SSWRM

The Friedman rank test table 19 on the responses of the environmental specialists, summarised by table 30 reference number 1, indicates '**idealism**' as scoring the highest and thereby the most important. This is in contrast to 'realism' and 'failure' having lower rankings. It is therefore the opinion of the specialists that all the coefficients P, Q and R (imperatives) contribute in a higher degree to SSWRM in terms of idealism, both for 3rd and 1st world economies.

Concentrating on the imperatives in terms of 3rd world and table 30 a number of deductions are made. Reference number 5, table 30 indicate 'environmental' as less important in terms of the 'idealistic' approach. This agrees with reference 10, using 'environmental' as the common denominator, and finding 'ideal' as less important. In contrast, reference 11 indicates 'environmental' as important. Therefore the deduction of importance for 'environment' is not conclusive. The 'social' imperative in reference 5 is important but not in reference 8 and also not in reference 11. Therefore the 'social' imperative has no conclusive importance as well. The 'economic' imperative is important in references 5 and 11 but not in reference 9. Therefore 'economic' imperative also has no conclusive importance. The null hypothesis Ho in terms of 3rd world economy is not conclusively supported and the research hypothesis therefore supported that the three imperatives all contribute to the 'ideal' approach to sustainable SWRM.

In terms of 1st world economy reference 5 in table 30 identifies 'social' as not important which is not supported by reference 8 where 'social' indicate 'ideal' as important. References 9 and 10 consider 'economic' and 'environmental' as not important although reference 12 applies

importance to all the imperatives in the case of 'idealism'. The null hypothesis Ho in terms of 1st world economy is not conclusively supported and the research hypothesis therefore supported that the three imperatives all contribute to the 'ideal' approach to sustainable SWRM. **Therefore, hypothesis K1 is supported in that all three of the imperatives contribute to SSWRM in the idealistic approach of the subject.**

6.5.1.2. Result: Hypothesis K2; realism

In terms of 'realism' hypothesis K2 is constructed as:

SSWRM(real)=f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}

With the coefficient P being significant (close to 5 on the Likert scale) and Q and R not significant. (Closer to 1 on the Likert scale)

With the null and research hypotheses:

	Hypothesis K2 SSWRM(real)
Null hypothesis: Null hypo Ho	Coefficient P is not a significant contributors to SSWRM
Research hypothesis: Alternative Hypo H1 (directional)	P is significant whilst Q and R are not all significant contributors to SSWRM

The important imperative researched with hypothesis K2 is the contribution made by the economic imperative with its coefficient 'P'. Reference 2, table 30 using the Friedman rank test finds 'environmental' imperative to be the most significant in 3rd and 1st worlds. Reference 6, table 30, using 'real' as the common space identifies 'economic' and 'environmental' imperatives as significant in terms of 3rd and 1st worlds. The same is confirmed by reference 11 using 3rd world as common space but not by reference 12 using 1st world as common space. Reference 9 table 30 using economic imperative as the common space finds it significant in terms of **reality** issues. Conclusive evidence is therefore not available to support **economics** as being the most significant imperative in reality. Therefore in regard to **hypothesis K2, the null hypothesis Ho is supported and the research hypothesis is rejected by implication**. **The important deduction is that the economics imperative is not the sole contributor to sustainable SWRM projects.**

6.5.1.3. Result: Hypothesis K3; failure

In terms of 'failure' hypothesis-K3 is constructed as:

SWRM(fail) = f {P*(Economic imperatives) and Q*(Environmental imperatives) and R*(Social imperatives)}

With the coefficient P being ignored (close to 1 on the Likert scale) despite Q and/or R positive. (Q and R could be close to 5 on the Likert scale)

With the null and research hypotheses:

	Hypothesis K3 SSWM(fail)
Null hypothesis: Null hypo Ho	P was not ignored.
Research hypothesis: Alternative Hypo H1 (directional)	P ignored despite Q and/or R being positive contributors

Hypothesis K3 is used to research the significance of the '**economic'** imperative being ignored causing **failure** of the SWRM project. The opinions of environmental specialists rank in reference 7, table 30 'environmental' imperative in 3rd world countries as the reason as opposed to economics and social for 1st world countries. Reference 9 table 30 using economics as the common space in the MDS analysis indicates it as less significant (as fail) for both 3rd and 1st worlds. References 11 and 12 of table 30 are also not conclusive. Therefore in this instance, for **hypothesis K3, Ho is supported and the research hypothesis is not supported**. **Therefore, the economics imperative alone cannot be the sole reason for failure of SWRM projects.**

6.5.2. Results: Construct-L; ranking of the 14-motivational factors

The second part of this research, termed **construct-L** is to:

> **Rank the identified management motivational factors that would augment (promote) the process of sustainable solid waste reduction management (SSWRM).**

The 14-motivational factors have been ranked by the environmental specialists responding to questionnaire as per appendix A. These 14 items had to be ranked from '1' being most important factor augmenting the SSWRM process to '14' making the least contribution. As per paragraph 6.4.2 the 14-motivational factors are analysed using three approaches which are the Friedman

ranking test, paragraph 6.4.2.1, followed by multivariate data analyses using cluster, paragraph 6.4.2.2, and multidimensional scaling (MDS) techniques, paragraph 6.4.2.3. The detail results are contained in the mentioned paragraphs and are summarised in the next paragraphs.

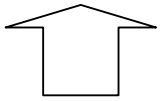
6.5.2.1. Result: Ranking of 14-motivational factors; Friedman test

In table 31 the motivational factors are ordered, according to the Friedman rank test, from 'most important' containing the lowest value, to the 'least important' factor having the highest value. The ranking represents the mean (average) values calculated from the environmental specialists' responses. Table 31 indicates the 'asymptotic significance' of the ranking as 0.000 (read close to zero), and therefore significant at the 5% level.

Table 31: Friedman rank test; the 14 -Motivational factors

Non Parametric Tests: Ranks

	Mean Rank
Economic incentives	4.55 **(most important)**
Legislation	4.86
Value of waste	5.29
Government leadership	6.73
Education	6.87
Environmental taxes	7.46
Producer responsibility	7.63
Social pressure	7.75
Standards environmental	7.93
Corporate leadership	8.1
Personal values	8.68
Corporate governance	8.76
Risk management	9.74
Life cycle assessments	10.65 **(least important)**



Test Statistics (a)	Result
No of respondents	91
Chi-Square	208.993
df (degrees of freedom)	13
Asymptotic Significance	**.000**

(a): Refers to the Friedman Test

From table 31 the Friedman ranking test of the responses considers economic incentives, legislation and value of the waste material as the most important aspects of SSWRM. The importance of the economic imperatives in terms of 'reality' towards SSWRM, are more strongly represented by this listing than when obtained under the research for hypothesis-K2, chapter 6.5.1.2. Corporate governance, risk management (of waste) and life cycle assessments (from cradle to grave), are indicated as least important in augmenting SWRM processes or projects. Personal values are also low on the scale. The opinions therefore reflect that economic incentives together with legislation are far stronger in augmenting the process than belief systems or social pressures.

6.5.2.2. Result: Ranking of 14 motivational factors; cluster analysis

As opposed to the Friedman ranking, paragraph 6.5.2.1, a more comprehensive method of analysing the ranking of the 14-motivational factors, the cluster analysis, provides a realistic representation of the responses. Three clusters formed out of the 91 responses provide significant results.

Cluster 1 (table 23) contains 39 respondents who give Economic Incentives and Value of Waste important rankings (average 3) and Risk Management, Life Cycle Assessment, Government Leadership, Corporate Leadership and Corporate Governance unimportant rankings (average 10 and 11). Again the economic imperatives are indicated as the most powerful augmenting factors. Leadership is not considered of significance, however it is always instrumental in creating the economic incentives that makes SWRM successful.

Cluster 2 (table 24) has 35 respondents resulting in Legislation and Economic Incentives achieving important rankings (average 4) and with Risk Management, Personal Values and Life Cycle Assessment unimportant rankings (average 10, 11 and 12). This second cluster provides similar results to cluster 1 emphasising the economics and legislative processes as augmenting factors.

Cluster 3 (table 25) has 17 respondents who give Government Leadership and Corporate Leadership important rankings (average 4) and Environmental Taxes a low ranking (average 10). This smaller group of respondents does consider leadership as the vehicle for successful SWRM and economic factors, such as environmental taxes, as less significant.

This cluster analysis therefore, emphasises leadership as additionally important to the economic imperatives.

6.5.2.3. Result: Ranking of 14 motivational factors; multidimensional scaling

The multidimensional scaling (MDS) of the 14-motivational factors, figure 18, also positions the factors along the two dimensions 1 and 2, in similar contrasting orders as does the cluster analyses paragraph 6.4.2.2. Checkland (1981) in the systems approach to strategic management refers to **hard** and **soft** issues. Inspection of figure 18 reveals similar aspects. The top part of the dimension-2 of figure 18 consists of the **hard issues such as economic factors, standards, responsibilities** and **risk management.** The opposing bottom part contains the **soft issues such as leadership, education, values** and **social issues.** The result, as per figure 18, is expanded in the next paragraph.

6.5.3. Result: Construct-M; strategy-benchmarking-model augmenting SSWRM

The third part of this research analysis, termed **construct-M** is to:

> **Create a Strategy-benchmarking-model of the responsible person, process or organisation that will augment (promote) the process of sustainable solid waste reduction management (SSWRM).**

Construct-L, paragraph 6.5.2 contains the 14-motivational factors identified during the literature survey, as per chapters 2, 3 and 4, that make the greatest contribution to the augmentation process of SWRM programmes. It is also an analysis of the opinions of waste management specialists who provided their ranking of the 14-motivational factors in terms of augmenting importance towards sustainable solid waste reduction management (SSWRM). Previously, as per paragraph 6.5.1, the various contributions of the three sustainable imperatives, in terms of developing and developed countries, were analysed. Support could not be found for the hypotheses that economic factors are substantially more important than environmental or social factors in the different types of economies, according to the opinions of the environmental specialists. In general, the environmental imperative was considered to be of similar importance as the economic factor. In the **idealistic** sense of sustainability, all three imperatives are considered important. In r**eality** social imperatives appear to have less importance in attaining sustainability. Construct-L provides

insight and support for the framework that some specific economic aspects, together with leadership and legislation, do in fact augment the process of SWRM as per paragraph 6.5.2.

The purpose of construct-M in creating a Strategy-benchmarking-model of the augmenting factors towards SSWRM is to provide leaders in government, corporate and non-governmental organisations (NGOs) with a tool, termed the 'strategy-benchmarking-model', to be utilized when dealing with SWRM projects. (The word **tool** and **model** will be used interchangeably in this thesis.) Whenever engaged with SWRM projects, leaders discover its complexity in terms of the design, management and approach. In contrast to setting up a private company as a project, SWRM projects are influenced by the social, economic and environmental imperatives of the region. It draws on a much wider external environment than a normal private business. The added complication is that the **general contemporary social desire** is to create a **sustainable** project in environmental terms. Corporate social responsibility (CSR) is now becoming part of corporate governance and therefore an imperative to be dealt with by leadership. Governments change, or have ulterior political motives, whilst corporations will only continue supporting a project as long as it benefits the stakeholders. Additionally, societies are not always willing to live up to the high moral ground of their belief systems (chapter 3). It is therefore now opportune to introduce the strategy-benchmarking-model for use by contemporary society. Jenkins & Yakovleva (2005) in researching corporate social responsibility (CSR) in the mining industry, remark on a major shift over the past decade in the reporting on issues of the Triple Bottom Line. Apart from the normal annual financial report, separate reports on the Triple Bottom Line and CSR are now being published by some large corporations. Importantly, similar trends are identified with reports from some companies within developing countries. The trend is spreading from first world to third world countries. They (Jenkins & Yakovleva, 2005) deduce that lately social and environmental imperatives are attracting a lot more attention and are of a broader scope than ever before. In dealing with SWRM leaders within government, NGOs and the private sector, will in the future, need to include CSR in the creation of projects and in the operational management of businesses.

The strategy-benchmarking-model is vital, not only to enhance sustainability of future SWRM projects, but also to assist the longevity of presently operating waste businesses. There are practical applications of solid waste projects that are working but that beg the question of sustainability. The issue is the continuation of SWRM projects once they reach maturity. An example of this problem is the study by Colon & Fawcett (2005) of waste collection in two Indian cities and refers to the systems operating as a result of triangular contracts between municipalities,

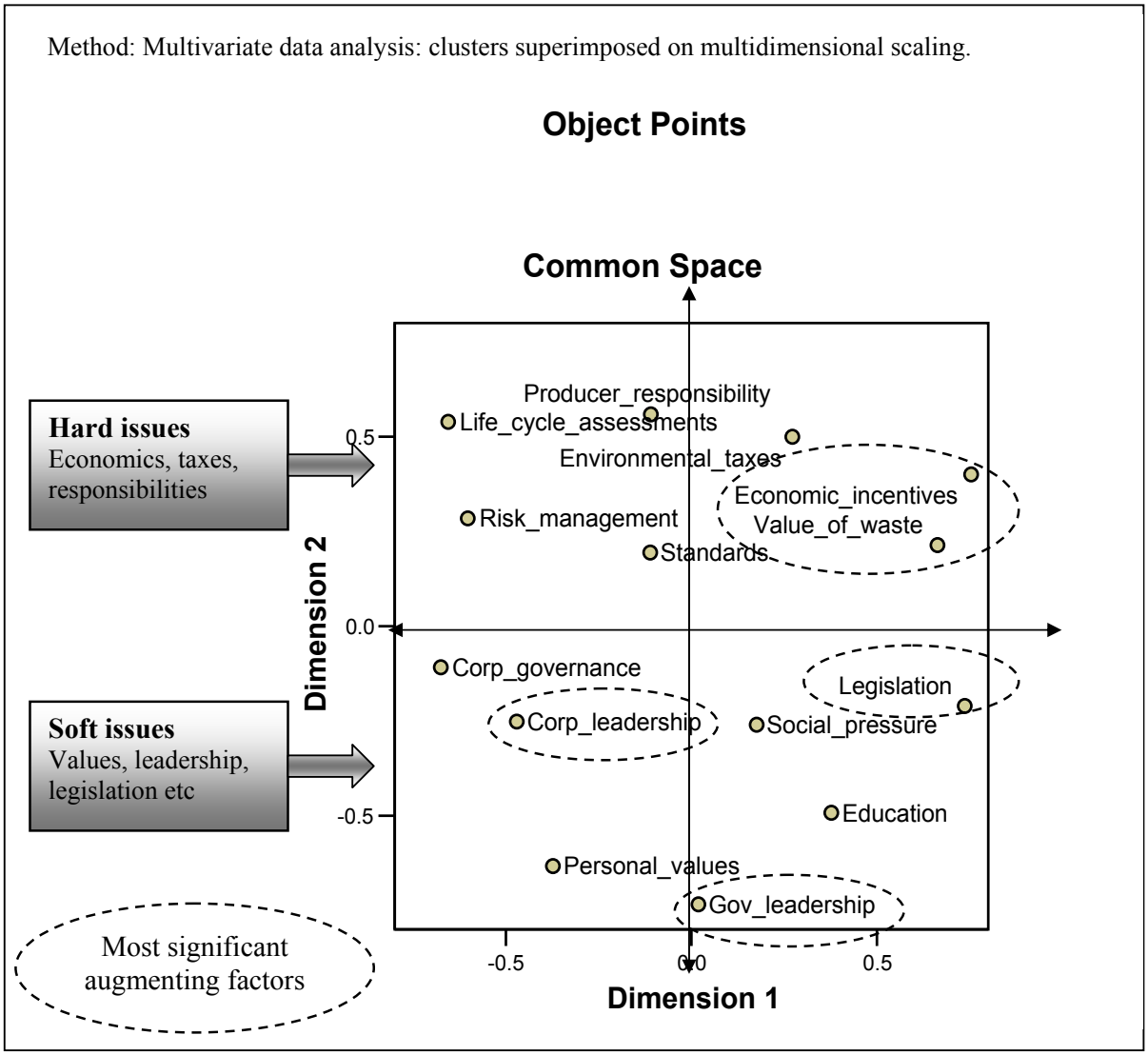
residents and micro-enterprises. The systems put in place differ in relationship to the economic status of the inhabitants. In India, the poorer communities have to do more themselves whilst the richer tend to contract the private sector to achieve results. In this instance economics do play a cardinal role in the design of the projects. Construct-M, as a strategy-benchmarking-model, is a tool to be used to facilitate the strategic approach to SWRM projects and should reduce the complexity of the project at hand, but at the same time, provide a form of guarantee towards sustainability. As indicated in chapters 2, 3 and 4, many projects falter, either at inception or in terms of sustainability, as a result of the complexity faced by leaders and project managers.

The creation process of the strategy-benchmarking-model is in part to visualise the importance and relationship of the 14-motivational augmenting factors. The process is analogous, but much less complicated than Game Theory. The decision sciences of the interaction between integrated waste management and economics form part of the application of Game Theory (Harvard Law Review, 2004), that seeks to explore how people make decisions if their actions and fates depend on the actions of others. Game Theory uses mathematics, economics (of the neoclassical type) together with social and behavioral sciences in the study of human behavior. Game Theory deals with rational strategies in the face of incomplete information and strategies chosen by people that might be rational or irrational. The route chosen to derive an answer for Construct-M is an alternate route to Game Theory achieving the same end goal in terms of strategy predication. The Prisoners' Dilemma situation, often studied with Game Theory, needs to be avoided. Project leaders of waste reduction ventures, should not be in doubt of what the stakeholders' responses will be. A tool is to be created, observing the belief systems of people, via corporate social responsibility (CSR), to create sustainability as the outcome of causality. This tool will also be introducing augmenting factors, in addition to the personal strategies chosen by people. This model also needs to be robust in its predictive capability whilst reducing the complexity of the project.

In figure 19, for constructing the strategy-benchmarking-model, use is made as a point of departure, of the results as per figure 18, which is the multidimensional scaling of the 14-motivational factors. Figure 18 contains the grouping of augmenting factors along the two dimensions '1' and '2' of the statistical configuration created by the statistical modeling. This layout alone is complex in nature and leans towards diverting the focus from the critical augmenting aspects. Clarification is obtained by superimposing the cluster analyses of the same factors, paragraph 6.5.2.2, as circles, onto the multidimensional scaling represented by figure 18, with the result presented as figure 19. The dimension-2 also contains the hard issues, contained in

the top half, and the soft issues in the bottom half. Figure 19 summarises the multivariate data analysis of the augmenting factors, being MDS and clusters.

Figure 19: Strategy-benchmarking-model towards SSWRM projects



From figure 19 a visual of the multivariate data analyses of the 14-motivational factors that augment the SWRM processes towards sustainability, is presented and is termed the '**strategy-benchmarking-model'**. Figure 19 indicates the paradigm shift required in the approach to SWRM projects if used by leaders as a tool in the strategic approach to SWRM projects. The **Systems approach** (Checkland, 1981; Collis & Montgomery, 1995; Thompson & Strickland, 1999) indicates how **hard systems** such as engineering can be dealt with by means of systems

engineering or systems analysis. The (previous) success of systems engineering then led to many attempts to use the same concept to solve problems of social systems, including those formulating public policy. These failed in many instances. The concept of human activity system is relevant to tackling **the soft ill-structured problems of the real world** (Checkland, 1981). In 'soft type' problems the designation of objectives is in itself a problem. Not surprisingly, hard systems thinking were not usable with these problems, which were always those of a kind to which the concept of human activity is related. This type of model, figure 19, is in alignment with **contemporary** leadership styles and reading in this field. Corporate social responsibility (CSR) is indicated (Hatcher, 2003; Kaplan & Norton, 2004) as being the most important socio-environmental demand being made on leaders today. Thus by implication, apart from the economic issues, contemporary leaders are also faced with balancing social and environmental imperatives in the process of ensuring the sustainability of a SWRM project. The proposed model, figure 19, indicates the bipolarity required of leadership along the **dimension 2** axis. The **soft issues** such as social pressure, values, leadership, education and legislation are contrapuntal to the **hard issues** such as economics, taxes, producer responsibility and standards. Along **dimension 1** axis issues such as corporate governance and corporate leadership face opposing balancing factors such as economic incentives, value of waste, education and legislation.

On the contemporary leadership front, Hamann (2003) also emphasises partnerships between companies, governments and civil society as an effective and efficient strategy for corporate social responsibility (CSR). The three parties to this social contract need to form partnerships in dealing with CSR. The outcome of the above model, figure 19, confirms the requirement of this contemporary leadership style in making waste reduction projects sustainable. This is because both governmental and corporate leadership are associated with present day social pressure as part of the **soft issues**. The views of environmental specialists consulted, in reaching this final result, underscores contemporary leadership requirements.

As a result and if management wishes to fast track SWRM projects, the above strategic SWRM strategy-benchmarking-model, figure 19, can be applied. It is a tool that serves as a reference, or can be used as a scorecard, in conjunction with SWRM project planning or review. The contribution it makes to the knowledge base of the subject is contained in its summation of the augmenting factors required and their relative importance. The complexity of approach to SWRM projects is reduced as the model focuses the project leaders on the cardinal augmenting factors that lead to sustainability. The model provides the mechanism of focus of all the aspects highlighted in

figure 18. **The cardinal factors, isolated by the model, to create sustainable SWRM are for corporate and governmental leadership to create legislation, manage the economic incentives, and use the value of waste as motivating aspects.** This model could prove to be invaluable in the practical approach to SWRM projects in dealing with the waste of commodities such as glass, paper, tyres, plastic, batteries, containers, fuel, building rubble, electronic and white goods etc. Government, corporate and social leaders should use the tool, the strategy-benchmarking-model, as a strategic guide to the cardinal motivational factors that will augment SWRM projects or processes. It is general practice that a great deal of time is wasted with the planning and discussions around SWRM projects because of the lack of guidance regarding the actual augmenting factors. As referenced in chapter 2, 3 and 4 literature exists regarding solid waste management and the various analytical techniques available. The above model creates a focus on all the most important augmenting factors required for sustainability.

It is also suggested that the model, as per figure 19, applies to various levels of economies such as in developed and developing countries. The practical application will vary according to the country and its environmental, social and economic values. Again the model predicates initiative from the private sector to enroll government to enact the legislation that will harness the value of the waste and create the economic incentives that will make SWRM projects succeed.

The model, as per figure 19, is the process, or **change agent, required** to modify the unacceptable waste **causes** into **sustainable** affects. The contemporary leadership style demanded by CSR is changing the influence management has on strategic direction. In the past corporate culture predicated management actions and the ability of leaders to enforce their own belief systems, was thereby, limited. Although belief systems did not feature high, on the priority listing of the respondents to the research questionnaire (appendix A) it could be argued that it is starting to become important as CSR is gaining in prominence. Social pressure is therefore being applied via corporate governance both from the external environment as well as through leaders within business. Belief systems therefore seem to become manifest in the social responsibility of corporate and government leaders in creating sustainable solid waste reduction management projects.

This strategy-benchmarking-model adds to the knowledge base, not only as an alternative to, for example, a Game Theory model, in reaching an answer to the augmenting factors of SWRM, but also as a practical application tool. Game theory deals with prediction and the unknown reaction

of, for example, people, their attitude and reaction. Should private corporate, NGO or government leaders be faced with producer responsibility, the strategy-benchmarking-model could be used as a reference to deal with SWRM projects. The model highlights the augmenting factors that require attention to aid the planning and benchmarking process. In the model, these are divided into hard and soft issues. Very importantly it also identifies the cardinal aspects that will provide sustainability as indicated by the circled items in figure 19. Future project leaders are advised to ensure inclusion of these essential researched augmenting factors to provide for project sustainability.

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7. CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

In conclusion this research endeavours to address a research problem, its objectives and finally the goal to be achieved. The **research problem identified** is that many solid waste reduction management projects in 3rd (developing) and 1st (developed) world economies do not progress beyond the drawing board or fail in terms of sustainability. It is therefore **the objective of this research** to identify the motivational factors of social capital including management processes, leadership and people management that would augment the solid waste reduction management (SWRM) projects that are lethargic at starting, or deteriorating, to achieve sustainability, with special reference to developing countries.

Pargal, et al, (2000) also propose that the term **social capital** be applied to a variety of ideas that generally concern economic returns including networks of social relationships. This is an important observation, which indicates the fundamental aspect of economic return forming the network of social relationships, and underscores social capital.

Finally it is the **goal of this research** to use the results of the identified motivational factors in constructing a **strategy-benchmarking-model** that can be used by governmental, NGO and private sector leaders to augment SWRM projects to achieve sustainability. The following conclusions and recommendations are made taking into consideration the literature survey as per chapters 2, 3 and 4, the research methodology stated in chapter 5, and the results as described in chapter 6.

7.1. Summary and interpretation of results in terms of literature and theory

Construct-K, as per figure 3, refers to the use of three hypotheses in an endeavour to prove, that in the opinion of environmental specialists, economic imperatives are the determining factors for SSWRM. Hypothesis-K1 relates to an **idealistic** approach to SWRM through the use of the Triple Bottom Line concept as well as the sustainable development approach. The results as per chapter 6 imply that hypothesis-K1 is supported and that the ultimate result for any SWRM project would be achieved if it could comply with all three of the imperatives. Hypothesis-K2 which proposes that economic imperatives alone would maintain SSWRM is, in **reality**, not supported by the opinions

surveyed. The same applies to hypothesis-K3 where it is confirmed that economics is not the sole reason for **failure** of a SWRM project.

Construct-L, as per figure 3, is research into the **ranking** of the identified 14-motivational factors that would augment a SWRM project or programme towards sustainability. The result adds to the outcome of construct-K because **economic factors** are identified as the most significant imperative but with a proviso that other issues follow directly in importance. A dichotomy is actually created when comparing the results of construct-K and construct-L as the latter finds economic factors to be the most significant whilst construct-K does not. The difference is that construct-L identifies other motivational factors to be used **in conjunction** with the economic imperatives. The other motivational factors supporting the economic imperatives form the pillars of support in making the process sustainable. The **five most significant motivational factors** identified as described in figure 19 and derived from chapter 6.5.2 are **economic incentives, value of waste, legislation, corporate leadership and governmental leadership.** It is noteworthy that environmental taxes are rated of lesser significance than direct economic incentives. The reasoning behind this opinion may be that whilst environmental taxes do indirectly influence environmental malpractices, they serve more as state revenue creation than as a vehicle for improved sustainable development. Environmental taxes are used to broaden treasuries' tax base in the hope that they would induce corporate to move in an environmental conscience direction. The problem, according to the environmental specialists surveyed, is that it is often abused and does not achieve sustainability.

Hamann (2003) reflects the change in leadership styles in terms of CSR over the years. From a business perspective it has moved from corporate considering NGOs as threatening, to a phase of involvement and now, entering into the partnership phase. Civil society on the other hand previously saw business as opposing social development, then as a mistrusted source of funding, and presently as a partner for social development. The external environment of the business in which it operates is changing as more pressure is placed on corporate by society to become more environmentally sustainable in its actions. In dealing with corporate social responsibility (CSR) issues, such as services and projects in a community, Boehm (2002: 173-174) reports that there is a swing towards privatisation and that "governments serve more as enablers for policy, regulation, monitoring, and auditing and less for direct service financing". On the other hand, private sector partners, such as the community and the corporation, will only continue participating in projects as long as the benefits are perceived as worthwhile. The community is quick to desire to partner a social project but will take no responsibility in failure. The **strategy-benchmarking-model**

developed in chapter 6 recognises this contemporary trend as it identifies corporate and governmental leadership, taking up their responsibilities in waste management, as two of the important factors. CSR responsibility is enforcing corporate governance, which in turn requires producer responsibility for waste to be taken up by private enterprise and leadership.

This research approaches the search for a model for SSWRM via two paths which are indicted as construct-K and construct-L (figure 3). Construct-M provides for the creation of a final strategy-benchmarking-model that can be used to ensure SSWRM.

Construct-K uses hypotheses to evaluate the significance of the three sustainable imperatives in terms of the opinions offered by environmental specialists. Multidimensional scaling and ranking of the variables tested, figure 7, figure 9 and table 31, indicate that the environmental and economic imperatives are the significant factors whilst social imperatives seem to be less significant. This applies to both 3rd and 1st world economies. The **ideal world** requires all three of the imperatives to be significant but **reality**, according to the opinion of specialists, indicates otherwise. In the **real world** it is as a rule difficult to arrive at a process that, despite the social implications, is economically justified and environmentally friendly. The devastation of forests is a good example of this; burning is economically justified but is to the detriment of the world's carbon dioxide reduction process. **Failure** of SWRM projects in the 3rd world are ascribed, as per figure 10, to problems experienced with environmental issues and in the 1st world with economic and social imperatives.

Construct-L provides for the use of the 14-motivational factors, identified during the literature surveys in chapters 2, 3 and 4, to be ranked by environmental specialists, in terms of importance towards augmenting SSWRM. This applies to 3rd and 1st worlds. The most significant motivational factors identified, as per figure 19, are economic incentives, value of waste, legislation, corporate leadership and governmental leadership. It is significant that issues such as personal values and social pressure do not rank as important. Chapter 3 contains references to personal belief systems in an effort to identify motivational factors. From the results as per chapter 6, it is clear that belief systems are only important when manifested in corporate and governmental leadership. Apparently the everyday belief systems of citizens do not play much of a role. The driving forces for sustainability seem to be economic attractions and enforcement legislation.

Delbecq (1999: 345) states that "examples of some executives are indicated whose personal spiritual tradition deeply informs and shapes their leadership. Themes include a sense of leadership as a calling, the desire to integrate deeply held personal values with a leadership role, and spirituality as a source of courage when facing daunting challenges". With CSR coming of age, the spiritually motivated leaders will in future be able to apply more of their beliefs in business. In the past, managers had to blindly follow the corporate goal of only creating wealth for the shareholders.

Mintzberg, Simons & Basu (2002) in the MIT Sloan Management Review relate how the approach of business has changed since the 11 September 2001 destruction of the two world trade centre buildings in New York; societies have been driven apart by wedges such as the rising tide of prosperity, lean and mean organisations, heroic leadership, shareholder value and economic (distrustful) man. They indicate that real prosperity combines economic development with social generosity. The insight gained with the strategy-benchmarking-model developed in chapter 6, provides guidelines on how leadership in combination with economic factors and legislation, can facilitate waste reduction management and raise the profile of business towards sustainable development and corporate social responsibility (CSR).

Hatcher (2003) and Kaplan & Norton (2004) pronounce that present business leaders face a daunting array of challenges and need to meet the needs of shareholders, consumers, employees, national and international regulators and NGOs including activists. CSR, corporate governance and producer responsibility are becoming the issues facing leaders in government and private corporate. The **strategy-benchmarking-model,** figure 19, is an aid to the management of contemporary SWRM projects towards sustainability and for the fulfilling of the CSR issues imposed by society on government and corporate.

7.2. Gaps, anomalies and deviations in the data

This research concentrates on the opinions of environmental specialists in terms of SSWRM and factors that would augment such projects. It is based on the education, experience and beliefs of the respondents, of which a large proportion is well educated with many years of experience. The results of this research, based on opinions of experts, create a gap for the comparison between these opinions with actual case studies of, for example, failed SWRM projects. It would be

noteworthy to discover what contribution failed economics actually made to the decline of a SWRM project. This can only be answered once actual case studies have been done.

More research can also be done to compare the opinions of the respondents, who live and work in South Africa, with other countries representing 3rd and 1st world economies. Further distinction can also be made between 2nd, 3rd and least developed countries (LDCs). Why are these countries not dealing successfully with their social capital in terms of sustainable development?

Deviations are found between groups of respondents, for example males versus females or years of experience. The quanta of these differences are not considered to be of great enough importance to influence the final concepts developed. More research can be directed in identifying differences especially between governmental and corporate leaders, and male versus female, in terms of perceptions towards SSWRM.

The 14-motivational factors, as per construct-L, are only ranked in terms of generality and not separated into 3rd and 1st world concepts. This was specifically done as the questionnaire needed to be kept to a limited response time. The target was 20 minutes or less. More research can be done to evaluate the differences between the various economies in terms of the 14-motivational factors.

7.3. Larger significance of results

According to Checkland (1981: 16) "In the methodology, the situation in which the perceived problem lies (rather than the problem itself) is **expressed** and this is done, not in systems terms, but by using the concepts **structure** and **process**, and the relation between the two". The '**hard systems approach'** alone (in strategic planning) is not sufficient because the real world also has **soft and ill-structured problems** (Checkland, 1981; Collis & Montgomery, 1995; Thompson & Strickland, 1999). It is therefore, important to compare the findings of this research with some **unstructured** comments from respondents to the questionnaire. Names of the respondents were withheld as confidentiality was guaranteed. Also, 'first person' quoted was edited to 'third person'.

The first anonymous quotation refers to compulsory legislation, enforcement, poverty and training:

> "Not enough compulsory legislation and people to monitor the waste handling is in place. Prices on recyclable materials are low and people are forced to recycle for food money rather

> than for the importance of the environment. Government should enforce penalties on industries and the public if they do not comply with the law. Respondent would like to see people more involved in waste management programs and seminars. The problem most organisations face is the cost of sending staff members on training and seminars".

The value of waste collected is a major issue in creating the incentive to continue the recovery process. Economic incentives and value of waste are the most important augmenting factors as indicated by the model developed through this research (Figure 19). It is also contrasted by legislation in conjunction with corporate and governmental leadership.

The next anonymous quotation raises sustainability and the important role of government:

> "A successful SWRM requires funding (sound economic incentives), environmentally acceptable and of course social acceptance and support. In all these, government must play a key leadership role such as implementing compliance guidelines".

Here the CSR issues together with governmental responsibilities once again surface.

A further anonymous quotation accentuates the crucial role of financial gain, education and legislation:

> "In summary, a sustainable solid waste reduction management project would need to be driven by what is environmentally and socially responsible of us but cannot succeed without financial gain. Respondent believes the only way to change peoples habits and manners is by financial reward foremost and then through education and understanding of the projects' objectives, can the change be peaceful and prosperous. Behind this would have to be legislative instruments to enforce such a move. Unfortunately, at the end of the day, money talks!"

Poor communities, economics and education are important in the following anonymous quotation:

> "From respondents experience with poor communities there is little long term (or environmental) focus or understanding where the immediate basic need is for food, warmth and shelter. Economics for basic survival is the over-riding driving force of any project. The higher the education and income of the individuals in the poorer communities, the more aware and committed they are to the environment. Waste projects with financial rewards for the individuals are more sustainable".

The last anonymous quotation reflects the need for poor communities to be involved in making a living out of waste. It continues that corporate involvement would hinder the process, which is a surprising comment as corporate leadership and producer responsibility are vital to the development of SWRM projects:

> "Developing countries often have the situation like South Africa that the disadvantaged community makes a living out of waste. This often happens through environmentally unacceptable means. Respondent's belief is this community has to be included into the process and given the opportunity to make money for the project to succeed. Corporate thinking and interests will hinder this process".

The strategic approach to the SSWRM **strategy-benchmarking-model** represented by figure 19 is a summary of the results following statistical testing of the opinions of environmental specialists within South Africa. It confirms many of the typical comments made with regards to the augmentation of these projects. The difference between general comments and the model is the use of scientific multivariate data analysis of the identified augmenting factors that lead to sustainability. This result is then extrapolated to apply to all countries wishing to augment SSWRM projects. The model makes provision for the **hard** issues, such as economics, taxes and responsibilities of companies (producers), versus the **soft** issues such as values, leadership and legislation.

The contribution of this research is inclusive in the approach to the stated problem, objective and goal of the work. The large selection of literature consulted assisted in identifying the augmenting factors, which were then evaluated, by means of the questionnaire, to assess their 'real' perceived contributions. The clusters and multidimensional scaling of the factors contribute to the understanding of the relevant importance of the augmenting factors. It assists greatly with clustering the many variables that arise during such research. The general trend in the literature observed is a matter of dealing with the subject either in too great detail, using singular variables such as, for example, only economics, or considering a vast array of variables. The literature consulted as reported in chapters 2, 3 and 4 did not provide the answer to the actual 'critical' augmenting factors. The three hypotheses formulated and tested for support, focus on idealism, realism and reason for failure. The achievement of the Triple Bottom Line is an example of idealism and is remote from realism. It endeavours to fulfill all three imperatives, whilst reality is different. A further extension of the knowledge base is the identification of the augmenting factors and their ranking and clustering in order to gain insight. The many variables arising make the

statistical analyses complex by nature. Solving this complexity is achieved, mostly through the use of multivariate data analysis, and the critical issues are identified.

The objectives of this research are to determine the augmenting factors towards SSWRM, and to this end the opinions of specialists are analysed. An attempt is also made to research the overall importance of economics in the process and test it using hypotheses. The outcomes only support the equal contribution of all imperatives towards the idealistic approach to sustainable development. Realism, as per figure 9, predicates economic and environmental imperatives whilst failure is ascribed to environmental imperatives in the case of 3rd world and economic and social imperatives within 1st world countries. Another approach to the objectives and goal would be case analyses of actual successful and failed SWRM projects and to relate those outcomes to this research result.

7.4. Policy and other recommendations

Governments, private enterprise and NGOs are typically concerned about using the correct strategic approach to SWRM. The general approach adopted is procrastination, ignorance or the commissioning of studies to recommend an approach.

A systems approach is often the efficient way of analysing a management plan. The **soft systems methodology** (Checkland, 1981; Collis & Montgomery, 1995; Thompson & Strickland, 1999) starts off with an urge to bring about improvement to a social system in which there is felt to be an ill-defined problem situation and then express it by examining elements of structure and process, and their mutual relationship. The root definitions of relative systems must then be formulated and conceptual models of those systems be built. The conceptual models must be compared with **the real situation** and the comparisons used to define desirable, feasible changes in the real world, and finally implement the agreed changes. The use of the strategy-benchmarking-model is based on perceived reality and provides direction to SSWRM.

Hamann (2003) introduces partnerships between companies, governments and civil society as an effective and efficient strategy for corporate social responsibility (CSR). This contemporary leadership style is required to make waste reduction projects sustainable. The outcome of this research provides an answer in a model format that has been created by means of clustering and

multidimensional scaling of the augmenting factors identified. Leaders can use the model to prioritise their efforts in respect of SWRM projects to achieve success, which is measured in terms of as sustainability. In the final analysis policy can be formulated that will apply to the public and private sector to augment solid waste reduction projects. The inference is that for **SWRM projects to succeed** (SSWRM), **leaders** from **government** and the **private sector** are required, through the use of **legislation**, and taking into consideration the **value of waste**, to instil **economic incentives**.

Environmental taxes are rated of less importance than direct economic incentives. Whilst environmental taxes do indirectly influence environmental malpractices they mostly serve as state revenue creation rather than as a vehicle for improved sustainable development. Apart from governmental acts and regulations, legislation includes regulatory instruments such as operating standards (not product standards), permits and licenses. The model as indicated by figure 19 serves as guide to reach the goal of sustainable solid waste reduction management in 3rd and 1st world countries. **By using this strategy-benchmarking-model approach the social capital of a society in terms of solid waste reduction management should be enhanced by increasing its capability to deal with various projects.** Social capital as defined by Hediger (2000) consists of a number of components and this research proves the importance of some in relation to the less significant contributions of others. Human health and life expectancy can only be improved by using socio-cultural values and norms to set the benchmarks for sustainability. The exercise of using human capital and labour force, including knowledge of the environment, will accomplish successful waste projects. According to this research, personal values and belief systems have little to contribute to the process of sustainability. The hard aspects of economic incentives, value of waste and legislation, together with the soft issues such as leadership prove to be the vehicles for sustainability. The underlying issues driving leaders in any economy, irrespective of its development, must be their belief systems. Contemporary leadership within corporate social responsibility (CSR) is faced with greater social environmental responsibilities than ever before.

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APPENDICES

Appendix A:

A. Survey instrument: Questionnaire

Questionnaire

RESEARCH PROJECT
'SOLID WASTE REDUCTION MANAGEMENT' (SWRM)
For Etienne Human (DBL candidate)

To whom it may concern,

Research is being conducted by Mr. Etienne Human a DBL candidate of the Graduate School of Business Leadership (SBL, UNISA), Midrand, into solid waste reduction management (SWRM), with special reference to sustainability and developing countries. It excludes medical, nuclear and hazardous wastes.

Management processes, belief systems and leadership lie at the heart of this work. Your view and belief is very important to this project, as it will provide industry relevant insight. Complete confidentiality is assured. Your name will not be linked to your answer.

I would be extremely grateful if you could find the time to complete the questionnaire. It is not a long questionnaire but requires some thought. Results of this research will be available from the UNISA library or by direct communication with Etienne Human.

Once again I thank you for your valued input and time.

Yours faithfully,

PROF PJ RALL
ACTING EXECUTIVE DIRECTOR

GUIDELINES:

This solid waste reduction management (SWRM) concerns the total management of waste generated by households and industries.

- Please scan through the questions and gain overview before answering them.
- Please choose the item you best associate yourself with. Please answer all questions.
- These questions relate to solid waste reduction management (SWRM) with Developing and then 'First World" (Developed) countries and your belief system and experience regarding the issues.

SECTION 'A':

GENERAL

Please confirm you are in 'print layout view'. (Set by using 'view' in the top menu.)

Please place an 'X' in front of the one best describing your belief and experience.

Question A1:
Solid waste reduction management (SWRM) projects are complex in attaining sustainability

	Strongly Disagree
	Somewhat Disagree
	Neither Agree nor Disagree
	Somewhat Agree
	Strongly Agree

Question A2:
Occupation: Present employed in: Mark one best describing your position with an 'X'

	Waste consulting
	Government
	Waste collection or transport
	Waste equipment suppliers
	Waste recycling or waste use
	Other

Question A3:
Education: Please mark with an 'X' the highest education level you have

	Secondary Schooling
	Technical Diploma
	University Degree

Question A4
How many year general work experience do you have:

	2 to 5
	6 to 10
	11 to 15
	16 to 19
	20 years and more

Question A5
Gender: Are you?

	Female
	Male

SECTION 'B':
DEVELOPING versus DEVELOPED ('First World') COUNTRIES AND SWRM

Question B1a and B1b:

1. Solid waste reduction management (SWRM) projects should be <u>socially</u> acceptable.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B2a and B2b:

2. Solid waste reduction management (SWRM) projects should be <u>economically</u> successful.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B3a and B3b:

3. <u>Environmental</u> issues are important for solid waste reduction management (SWRM) projects.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B4a and B4b:

4. A successful solid waste reduction management (SWRM) project is <u>always socially</u> acceptable.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B5a and B5b:

5. Environmental factors always play a cardinal (key) role in successful solid waste reduction management (SWRM).

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B6a and B6b:

6. Economic factors always play a cardinal (key) role in successful solid waste reduction management (SWRM).

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B7a and B7b:

7. From your experience or knowledge a solid waste reduction management (SWRM) project would fail, or partially fail, because the project was socially unacceptable.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B8a and B8b:

8. A solid waste reduction management (SWRM) projects would fail because it was environmentally un-sound.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

Question B9a and B9b:

9. Sound <u>economics</u> prevent the <u>failure</u> of solid waste reduction management (SWRM) projects.

Please mark with 'X' (One in each column)

	In Developing Countries	***In Developed ('First World') Countries***
Strongly Disagree		
Somewhat Disagree		
Neither Agree nor Disagree		
Somewhat Agree		
Strongly Agree		

SECTION 'C':

SOLID WASTE REDUCTION MANAGEMENT (SWRM) PROJECTS

QUESTION: In any country (developing and developed), <u>realistically</u> speaking, what would <u>instigate (initiate, spark off)</u> a sustainable solid waste reduction management project?

Please rank the following 14 items from 1 to 14.

No two items should have the same ranking.

Please enter the ranking in the column provided.

Your experiences, beliefs and knowledge in answering the questions are important to us.

Rank: **1 = most important to 14 = least important**.

Rank of Importance	Item
	Corporate governance
	Corporate leadership
	Economic incentives
	Education
	Environmental taxes
	Governmental leadership
	Legislation
	Life cycle assessments
	Personal values / belief system
	Producer responsibility
	Risk management
	Social pressure
	Standards, local and international
	Value of waste material as raw material

Important: please check your numbers from 1 to 14

Please provide these optional details if you would like feedback:

Name:	
Organisation:	
E-Mail:	

Any other comments:

Please close and save this word document and then

Forward this e-mail to: info@rubbersa.com

Or fax to 011-791-1310

Thank you, your contribution is valuable!

****

Appendix B:

B. Letter of support for questionnaire

S B L
School of Business Leadership
UNISA

25 January 2005

RESEARCH PROJECT, "SUSTAINABLE SOLID WASTE REDUCTION MANAGEMENT" (SSWRM)

To whom it may concern,

Research is being conducted by Mr Etienne Human a DBL candidate of the Graduate School of Business Leadership (SBL, UNISA), Midrand, into sustainable solid waste reduction management (SSWRM), with special reference to developing countries. It excludes medical, nuclear and hazardous wastes. Management processes, belief systems and leadership lie at the heart of this work. Your view and belief, as a member of the Institute of Waste Management of Southern Africa, is very important to this project, as it will provide insight. Complete confidentiality is assured. Your name will not be linked to your answer. It will only be used to check your name off of the mailing list when your questionnaire is returned.

I would be extremely grateful if you could find the time to complete the questionnaire. It takes about 15 minutes to complete and is mostly done by the click of your mouse button. It is not a long questionnaire but requires some thought. Little additional information needs to be entered. Results of this research will be available from the UNISA library or by direct communication with Etienne Human. The results will also be communicated to the IWMSA and Government. Appreciation for the assistance of the IWMSA will be noted in the doctoral thesis.

There are sections to be completed.

Please link to the questionnaire at: http://www.sbleds.ac.za/eds/surveyhuman.nsf and follow the directions.

Once again I thank you for your valued input and time.

Yours faithfully,

PROF P J RALL
ACTING EXECUTIVE DIRECTOR

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Appendix C:

C. Code book

With the possibility of the survey data being used for secondary data analysis, it is essential (Mouton, 2004) to construct a code book to record every aspect of the survey.

C1. The sample design

The measuring instrument used for this research is a questionnaire as described in paragraph 5.2 and reproduced in appendix A. The sample design, sampling methods and the sampling group, the Institute of Waste Management Southern Africa (IWMSA), are described in paragraph 5.3.

C2. Fieldwork procedure

Descriptions of the data collection methods and field work practice are noted in paragraph 5.4, where it is indicated that the internet instead of posting is used in order to limit costs and to reduce processing times.

C3. Coding protocols

Data capturing and data editing details are described in paragraph 5.5. The coding is done as follows:

A. Identifying responses

A unique ID number is allocated to every response received. The responses were obtained via three routes. The first is the internet response route used by respondents who logged onto the SBL website and answered the questionnaire. The second is the email route where the questionnaire was included as an attachment and the responses were forwarded to the IWMSA offices or directly back to the research control office. The third type of response received was where the questionnaires were faxed to the control office. Responses are therefore traceable to the response received. The identity of the respondent is not reflected as confidentiality of the person is guaranteed. Various checks were carried out to prevent duplication of responses in the databases. Some of the respondents provided contact details and requested feedback of results. Some also

offered additional comments in addition to the structured questionnaire that contained closed ended questions to aid statistical analysis.

B. Coding and value allocation of questions in the questionnaire

The questionnaire as per appendix A contains 5 sections of which the first is a letter of support from the research Promoter.

The second part which is marked section 'A' contains the biographical questions and are marked A1 through to A5. Every question has a number of options each of which is assigned a value; 1 for the first option, 2 for the second and so forth. These numbers are correspondingly named in the SPSS 12.0 programme to keep track of the subheadings of each question.

The third part of the questionnaire is marked section 'B' and explores responses on the importance of the three imperatives in terms of, developed and developing countries, and idealism, reality and failure of SWRM projects. Every question is assigned a number as indicated on the form in appendix A e.g. B1a and B1b etcetera. Values are then assigned to the responses for each question as per the Likert scale of 1 to 5. The scale used (Babbie, 2000) to obtain the direct rating format for the data analysis is as follows: -

'1' = strongly disagree
'2' = disagree
'3' = neither agree nor disagree
'4' = agree
'5' = strongly agree

These numbers are correspondingly named in the SPSS 12.0 programme to keep track of the subheadings of each question.

The fourth part of the questionnaire deals with the ranking of the 14 identified management motivational factors. These questions are coded C14 to C1 and the ranking indicates a value of "1" being the most important factor through to "14" being the least important factor. Again the subheadings in the SPSS are labeled to keep track of the columns.

The fifth and last part of the questionnaire contains space for comments by the respondents.

C. Construction of reply master: SPSS 12.0 data format (Appendix D)

Appendix D contains the reply master data format file of the results obtained for each of the respondents and their corresponding ID number. Triple checks were carried out prevent any transfer mistakes and to ensure that the master data format agrees to the individual responses received.

D. Construction of recoded reply master SPSS 12.0 data format (Appendix G)

The master data of appendix D is recoded, to render the frequency tables and bar charts reflected by appendix H, more meaningful. The recoded data format is represented by appendix G. The recoding is as follows:

All Likert values (questions A1 and all Bs) are reduced from 5 units to three;

- values 1 and 2 becomes 1
- values 3 becomes 2
- values 4 and 5 become 3

Question A2 reflecting occupation or type of company are recoded as:

- 1= company dealing or consulting in waste
- 2= government
- 3= other company
    - values 1, 3, 4 and 5 becomes 1
    - value 2 becomes 2
    - value 6 becomes 3

Question A3 education

- 1 = secondary schooling
- 2 = technical diploma
- 3 = university degree

Question A4 recoded to

- 1 = 2 to 10 years experience
- 2 = 11 to 19 years experience
- 3 = 20 and more years experience

Section ‘C’ of questionnaire is recoded as follows

- 1 = 1 to 5 value as “most important”
- 2 = 6 to 14 value as “least important”

E. Construction of recoded reply master SPSS 12.0 data format (Appendix I)

The master data of appendix D is recoded and reported as appendix I, to render the means and cluster analyses. It is recoded as follows:

- All Likert values and section 'C' are left as is
- Occupation, question A2, Education, question A3 and years experience, question A4 are recoded as per appendix G.
- Columns are created to calculate the means from the Likert values, question section 'B', for ideal, real, fail, social, economic and environmental imperatives and 1st world, 3rd world
- Columns are created to calculate the ranking of the three clusters created and the cluster number, "QCL" as the last column.

The statistical analyses achieved by using the SPSS version 12.0 programme are all contained in the appendices.

* * * * * * * * * * * *

Appendix D:

D. Questionnaire reply master: SPSS 12.0 data format

Refer to next page for complete list of data.

ID	A1_ complex	A2_ occupation	A3_ education	A4_work_ yrs	A5_ gender
1	5	6	3	5	2
2	2	1	3	4	1
3	4	3	2	2	2
4	2	3	2	2	2
5	5	2	3	1	1
6	4	1	3	1	1
7	4	2	3	2	2
8	4	6	3	1	2
9	1	3	3	5	2
10	5	6	2	2	2
11	4	6	2	5	2
12	5	1	3	1	2
13	5	2	3	5	2
14	4	6	2	4	1
15	5	1	3	5	2
16	4	1	1	4	1
17	4	4	3	4	2
18	3	1	2	2	2
19	4	2	3	5	2
20	5	1	3	5	2
21	4	2	3	4	2
22	4	6	3	5	2
23	2	5	3	4	1
24	4	1	3	5	2
25	4	6	3	5	2
26	4	6	3	5	2
27	4	6	2	3	2
28	5	6	3	2	1
29	4	5	3	5	2
30	4	6	3	5	2
31	4	6	1	1	2
32	5	2	3	1	1
33	5	5	3	4	2
34	4	1	3	2	1
35	5	1	3	5	1
36	4	6	3	5	2
37	5	1	3	2	1
38	5	5	3	5	2
39	4	5	3	4	2
40	5	5	3	5	2
41	4	1	3	5	2
42	5	1	3	5	1
43	4	1	3	4	2
44	4	1	3	5	1
45	2	3	3	5	2
46	2	6	3	5	2
47	4	5	3	5	2
48	4	1	2	5	2
49	5	6	2	5	2
50	4	2	2	5	2
51	5	4	3	5	2
52	4	2	2	5	2
53	4	2	2	5	2
54	1	3	1	5	2
55	4	2	3	5	1
56	5	2	1	5	1
57	4	3	3	5	1
58	5	3	3	4	1
59	4	1	2	4	1
60	5	6	2	3	2
61	4	2	3	5	2
62	4	1	3	1	1
63	2	5	3	2	2
64	4	6	3	5	2
65	5	2	3	2	1
66	4	3	3	2	1
67	4	5	3	3	2
68	3	6	1	3	1
69	3	2	3	5	2
70	5	6	3	1	1
71	4	6	3	3	1
72	5	6	3	2	1
73	5	6	3	5	2
74	5	1	2	2	2
75	4	1	3	5	2
76	5	6	3	5	1
77	4	6	3	3	2
78	5	1	1	5	1
79	5	1	1	3	1
80	5	6	2	5	2
81	4	6	3	3	2
82	4	3	3	2	1
83	4	2	3	4	1
84	4	1	1	5	1
85	2	2	3	5	2
86	5	1	3	5	2
87	5	6	2	5	1
88	2	3	3	4	2
89	5	6	3	5	2
90	4	2	3	5	2
91	5	6	3	3	2

ID	B1a_ideal _3rd_soc	B1b_ideal_ 1st_soc	B2a_ideal_ 3rd_econ	B2b_ideal_ 1st_econ	B3a_ideal_ 3rd_env	B3b_ideal_ 1st_env	B4a_real_ 3rd_soc	B4b_real_ 1st_soc	B5a_real_ 3rd_env	B5b_real_ 1st_env	B6a_real_3 rd_econ	B6b_real_ 1st_econ	B7a_fail_ 3rd_soc	B7b_fail_ 1st_soc	B8a_fail_ 3rd_env	B8b_fail_ 1st_env	B9a_fail_ 3rd_econ	B9b_fail_ 1st_econ
1	3	5	5	4	2	5	2	4	2	5	5	3	2	4	2	5	4	3
2	4	4	4	2	5	5	4	4	4	4	5	2	4	2	2	4	4	2
3	4	5	5	1	5	5	2	4	5	5	5	1	2	1	5	5	5	1
4	5	5	5	5	5	5	5	5	5	5	5	4	4	4	5	5	4	4
5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5
6	5	5	5	4	4	5	4	2	2	4	5	4	5	4	4	5	1	4
7	5	5	4	5	5	5	1	2	3	2	4	5	3	4	4	4	4	4
8	5	5	2	5	5	5	1	2	1	1	5	4	2	5	2	4	5	4
9	5	5	4	4	1	5	4	4	1	4	5	2	5	4	3	4	4	4
10	5	4	5	5	5	5	2	4	2	4	5	3	4	1	1	1	1	4
11	5	5	5	5	4	5	5	5	2	2	5	4	4	4	5	3	5	4
12	4	5	5	4	5	5	2	4	5	5	5	5	2	4	4	5	5	5
13	5	5	5	5	5	5	2	3	2	5	4	2	5	5	2	5	4	2
14	5	5	5	5	5	5	5	5	5	5	4	4	4	5	4	4	4	4
15	5	5	5	5	4	4	3	3	2	2	5	5	5	5	3	3	5	5
16	4	5	2	4	5	5	3	4	5	5	5	5	5	5	5	5	4	4
17	5	5	5	3	4	5	2	5	3	5	5	2	3	5	2	5	2	5
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ID	Value_of_waste	Standards	Social_pressure	Risk_management	Producer_responsibility	Personal_values	Life_cycle_assessments	Legislation	Governm_leadership	Corporate_leadership	Environmental_taxes	Education	Economic_incentives	Corporate_governance
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3	1	2	13	3	7	14	12	4	8	10	5	11	6	9
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89	13	5	6	14	9	3	10	4	1	7	12	2	11	8
90	2	5	6	12	1	9	13	3	14	11	10	4	7	8
91	7	6	13	5	1	11	10	12	2	3	14	9	8	4

Appendix E:

E. Frequency statistics of all basic data

Frequency statistics of all basic response data and Friedman ranking on section 'C' of questionnaire. (SPSS Output)

Frequency Table

SWRM is complex

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2
	Somewhat disagree	8	8.8	11.0
	Neither agree nor disagree	3	3.3	14.3
	Somewhat agree	45	49.5	63.7
	Strongly agree	33	36.3	100.0
	Total	91	100.0	

Occupation respondent

		Frequency	Percent
Valid	Waste consulting	24	26.4
	Government	17	18.7
	Waste collection or transport	10	11.0
	Waste equipment supplier	2	2.2
	Waste recycling or waste use	9	9.9
	Other: academic or private company	29	31.9
	Total	91	100.0

Education respondent

		Frequency	Percent	Cumulative Percent
Valid	Secondary schooling	8	8.8	8.8
	Technical diploma	17	18.7	27.5
	University degree	66	72.5	100.0
	Total	91	100.0	

Years work experience

		Frequency	Percent	Cumulative Percent
Valid	2 to 5 years	8	8.8	8.8
	6 to 10 years	14	15.4	24.2
	11 to 15 years	9	9.9	34.1
	16 to 19 years	13	14.3	48.4
	20 years and more	47	51.6	100.0
	Total	91	100.0	

Gender

		Frequency	Percent
Valid	Female	32	35.2
	Male	59	64.8
	Total	91	100.0

B1a ideal: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Somewhat disagree	2	2.2	2.2
	Neither agree nor disagree	5	5.5	7.7
	Somewhat agree	29	31.9	39.6
	Strongly agree	55	60.4	100.0
	Total	91	100.0	

B1b ideal: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Neither agree nor disagree	5	5.5	5.5
	Somewhat agree	18	19.8	25.3
	Strongly agree	68	74.7	100.0
	Total	91	100.0	

B2a ideal: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Somewhat disagree	6	6.6	6.6
	Neither agree nor disagree	6	6.6	13.2
	Somewhat agree	26	28.6	41.8
	Strongly agree	53	58.2	100.0
	Total	91	100.0	

B2b ideal: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	1	1.1	1.1
	Somewhat disagree	4	4.4	5.5
	Neither agree nor disagree	13	14.3	19.8
	Somewhat agree	27	29.7	49.5
	Strongly agree	46	50.5	100.0
	Total	91	100.0	

B3a ideal: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	1	1.1	1.1
	Somewhat disagree	3	3.3	4.4
	Neither agree nor disagree	8	8.8	13.2
	Somewhat agree	19	20.9	34.1
	Strongly agree	60	65.9	100.0
	Total	91	100.0	

B3b ideal: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Somewhat disagree	2	2.2	2.2
	Neither agree nor disagree	1	1.1	3.3
	Somewhat agree	10	11.0	14.3
	Strongly agree	78	85.7	100.0
	Total	91	100.0	

B4a real: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	7	7.7	7.7
	Somewhat disagree	31	34.1	41.8
	Neither agree nor disagree	15	16.5	58.2
	Somewhat agree	20	22.0	80.2
	Strongly agree	18	19.8	100.0
	Total	91	100.0	

B4b real: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	1	1.1	1.1
	Somewhat disagree	18	19.8	20.9
	Neither agree nor disagree	13	14.3	35.2
	Somewhat agree	34	37.4	72.5
	Strongly agree	25	27.5	100.0
	Total	91	100.0	

B5a real: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	3	3.3	3.3
	Somewhat disagree	19	20.9	24.2
	Neither agree nor disagree	8	8.8	33.0
	Somewhat agree	30	33.0	65.9
	Strongly agree	31	34.1	100.0
	Total	91	100.0	

B5b real: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	1	1.1	1.1
	Somewhat disagree	10	11.0	12.1
	Neither agree nor disagree	4	4.4	16.5
	Somewhat agree	25	27.5	44.0
	Strongly agree	51	56.0	100.0
	Total	91	100.0	

B6a real: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2
	Somewhat disagree	8	8.8	11.0
	Neither agree nor disagree	5	5.5	16.5
	Somewhat agree	21	23.1	39.6
	Strongly agree	55	60.4	100.0
	Total	91	100.0	

B6b real: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2
	Somewhat disagree	13	14.3	16.5
	Neither agree nor disagree	10	11.0	27.5
	Somewhat agree	34	37.4	64.8
	Strongly agree	32	35.2	100.0
	Total	91	100.0	

B7a fail: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2
	Somewhat disagree	8	8.8	11.0
	Neither agree nor disagree	11	12.1	23.1
	Somewhat agree	34	37.4	60.4
	Strongly agree	36	39.6	100.0
	Total	91	100.0	

B7b fail: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	6	6.6	6.6
	Somewhat disagree	5	5.5	12.1
	Neither agree nor disagree	16	17.6	29.7
	Somewhat agree	34	37.4	67.0
	Strongly agree	30	33.0	100.0
	Total	91	100.0	

B8a fail: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	3	3.3	3.3
	Somewhat disagree	17	18.7	22.0
	Neither agree nor disagree	21	23.1	45.1
	Somewhat agree	25	27.5	72.5
	Strongly agree	25	27.5	100.0
	Total	91	100.0	

B8b fail: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	3	3.3	3.3
	Somewhat disagree	5	5.5	8.8
	Neither agree nor disagree	5	5.5	14.3
	Somewhat agree	33	36.3	50.5
	Strongly agree	45	49.5	100.0
	Total	91	100.0	

B9a fail: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	6	6.6	6.6
	Somewhat disagree	9	9.9	16.5
	Neither agree nor disagree	10	11.0	27.5
	Somewhat agree	34	37.4	64.8
	Strongly agree	32	35.2	100.0
	Total	91	100.0	

B9b fail: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Strongly disagree	4	4.4	4.4
	Somewhat disagree	11	12.1	16.5
	Neither agree nor disagree	11	12.1	28.6
	Somewhat agree	35	38.5	67.0
	Strongly agree	30	33.0	100.0
	Total	91	100.0	

Value of waste

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	13	14.3	14.3
	2	13	14.3	28.6
	3	13	14.3	42.9
	4	11	12.1	54.9
	5	9	9.9	64.8
	6	4	4.4	69.2
	7	6	6.6	75.8
	8	4	4.4	80.2
	9	4	4.4	84.6
	10	2	2.2	86.8
	11	3	3.3	90.1
	12	2	2.2	92.3
	13	4	4.4	96.7
	14 Least important	3	3.3	100.0
	Total	91	100.0	

Standards environmental

		Frequency	Percent	Cumulative Percent
Valid	2	7	7.7	7.7
	3	8	8.8	16.5
	4	6	6.6	23.1
	5	8	8.8	31.9
	6	9	9.9	41.8
	7	4	4.4	46.2
	8	8	8.8	54.9
	9	8	8.8	63.7
	10	9	9.9	73.6
	11	6	6.6	80.2
	12	8	8.8	89.0
	13	6	6.6	95.6
	14 Least important	4	4.4	100.0
	Total	91	100.0	

Social pressure

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	5	5.5	5.5
	2	5	5.5	11.0
	3	4	4.4	15.4
	4	9	9.9	25.3
	5	6	6.6	31.9
	6	12	13.2	45.1
	7	11	12.1	57.1
	8	3	3.3	60.4
	9	6	6.6	67.0
	10	6	6.6	73.6
	12	8	8.8	82.4
	13	10	11.0	93.4
	14 Least important	6	6.6	100.0
	Total	91	100.0	

Risk management

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	2	2.2	2.2
	2	2	2.2	4.4
	3	2	2.2	6.6
	4	3	3.3	9.9
	5	5	5.5	15.4
	6	2	2.2	17.6
	7	4	4.4	22.0
	8	8	8.8	30.8
	9	9	9.9	40.7
	10	6	6.6	47.3
	11	18	19.8	67.0
	12	11	12.1	79.1
	13	13	14.3	93.4
	14 Least important	6	6.6	100.0
	Total	91	100.0	

Producer responsibility

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	5	5.5	5.5
	2	4	4.4	9.9
	3	6	6.6	16.5
	4	9	9.9	26.4
	5	7	7.7	34.1
	6	5	5.5	39.6
	7	6	6.6	46.2
	8	6	6.6	52.7
	9	9	9.9	62.6
	10	15	16.5	79.1
	11	4	4.4	83.5
	12	8	8.8	92.3
	13	5	5.5	97.8
	14 Least important	2	2.2	100.0
	Total	91	100.0	

Personal values

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	6	6.6	6.6
	2	3	3.3	9.9
	3	6	6.6	16.5
	4	3	3.3	19.8
	5	5	5.5	25.3
	6	8	8.8	34.1
	7	4	4.4	38.5
	8	7	7.7	46.2
	9	8	8.8	54.9
	10	4	4.4	59.3
	11	10	11.0	70.3
	12	9	9.9	80.2
	13	3	3.3	83.5
	14 Least important	15	16.5	100.0
	Total	91	100.0	

Life cycle assessments

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	1	1.1	1.1
	2	1	1.1	2.2
	3	1	1.1	3.3
	4	4	4.4	7.7
	5	2	2.2	9.9
	6	7	7.7	17.6
	7	5	5.5	23.1
	8	4	4.4	27.5
	9	2	2.2	29.7
	10	10	11.0	40.7
	11	9	9.9	50.5
	12	11	12.1	62.6
	13	9	9.9	72.5
	14 Least important	25	27.5	100.0
	Total	91	100.0	

Legislation

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	16	17.6	17.6
	2	12	13.2	30.8
	3	15	16.5	47.3
	4	9	9.9	57.1
	5	7	7.7	64.8
	6	5	5.5	70.3
	7	9	9.9	80.2
	8	6	6.6	86.8
	9	3	3.3	90.1
	10	3	3.3	93.4
	12	3	3.3	96.7
	13	2	2.2	98.9
	14 Least important	1	1.1	100.0
	Total	91	100.0	

Government leadership

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	14	15.4	15.4
	2	9	9.9	25.3
	3	3	3.3	28.6
	4	4	4.4	33.0
	5	9	9.9	42.9
	6	7	7.7	50.5
	7	6	6.6	57.1
	8	6	6.6	63.7
	9	11	12.1	75.8
	10	2	2.2	78.0
	11	3	3.3	81.3
	12	8	8.8	90.1
	13	2	2.2	92.3
	14 Least important	7	7.7	100.0
	Total	91	100.0	

Corporate leadership

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	5	5.5	5.5
	2	4	4.4	9.9
	3	5	5.5	15.4
	4	2	2.2	17.6
	5	9	9.9	27.5
	6	6	6.6	34.1
	7	8	8.8	42.9
	8	7	7.7	50.5
	9	9	9.9	60.4
	10	8	8.8	69.2
	11	12	13.2	82.4
	12	3	3.3	85.7
	13	8	8.8	94.5
	14 Least important	5	5.5	100.0
	Total	91	100.0	

Environmental taxes

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	3	3.3	3.3
	2	9	9.9	13.2
	3	8	8.8	22.0
	4	7	7.7	29.7
	5	8	8.8	38.5
	6	5	5.5	44.0
	7	4	4.4	48.4
	8	10	11.0	59.3
	9	6	6.6	65.9
	10	11	12.1	78.0
	11	4	4.4	82.4
	12	5	5.5	87.9
	13	4	4.4	92.3
	14 Least important	7	7.7	100.0
	Total	91	100.0	

Education

		Frequency	Percent	Cumulative Percent
Valid	1 Most important	6	6.6	6.6
	2	4	4.4	11.0
	3	8	8.8	19.8
	4	9	9.9	29.7
	5	11	12.1	41.8
	6	10	11.0	52.7
	7	10	11.0	63.7
	8	7	7.7	71.4
	9	5	5.5	76.9
	10	3	3.3	80.2
	11	7	7.7	87.9
	13	10	11.0	98.9
	14 Least important	1	1.1	100.0
	Total	91	100.0	

Economic incentives

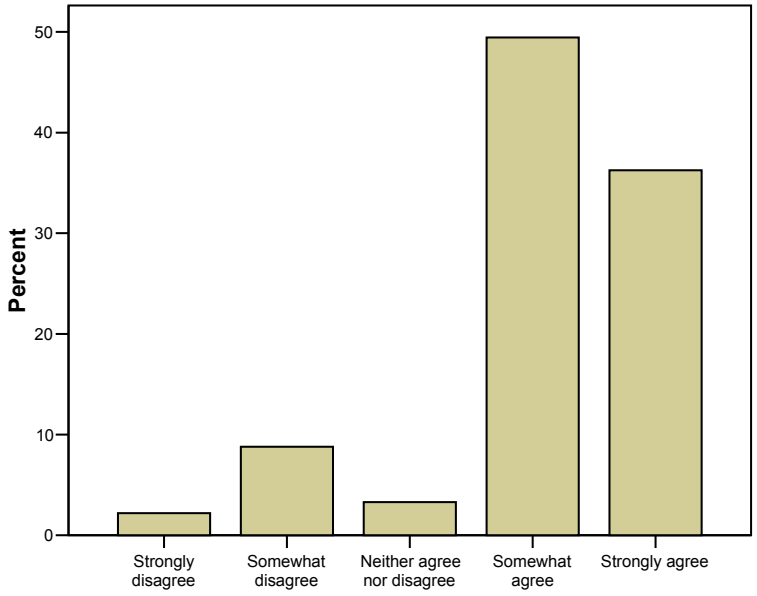
		Frequency	Percent	Cumulative Percent
Valid	1 Most important	21	23.1	23.1
	2	15	16.5	39.6
	3	10	11.0	50.5
	4	10	11.0	61.5
	5	7	7.7	69.2
	6	4	4.4	73.6
	7	7	7.7	81.3
	8	5	5.5	86.8
	9	2	2.2	89.0
	10	3	3.3	92.3
	11	3	3.3	95.6
	12	1	1.1	96.7
	13	2	2.2	98.9
	14 Least important	1	1.1	100.0
	Total	91	100.0	

Corporate governance

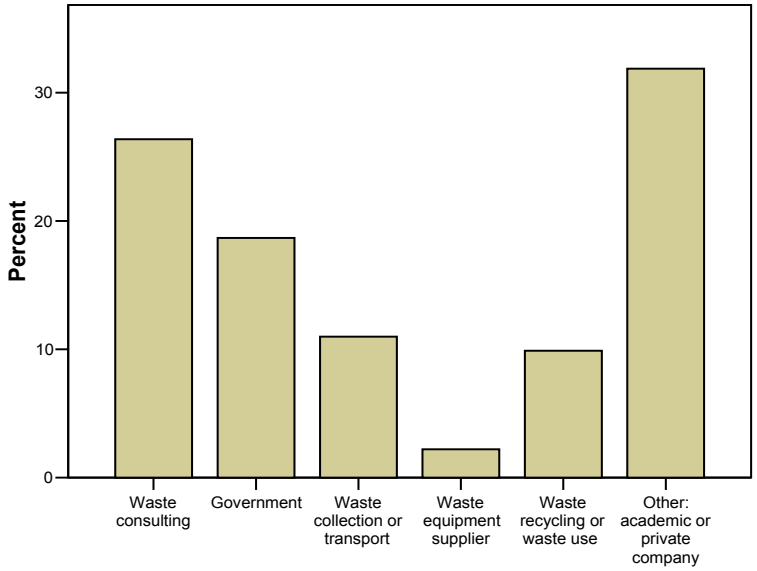
		Frequency	Percent	Cumulative Percent
Valid	1 Most important	4	4.4	4.4
	2	5	5.5	9.9
	3	5	5.5	15.4
	4	3	3.3	18.7
	5	3	3.3	22.0
	6	3	3.3	25.3
	7	7	7.7	33.0
	8	8	8.8	41.8
	9	9	9.9	51.6
	10	8	8.8	60.4
	11	10	11.0	71.4
	12	10	11.0	82.4
	13	11	12.1	94.5
	14 Least important	5	5.5	100.0
	Total	91	100.0	

Bar Chart

SWRM is complex



Occupation respondent



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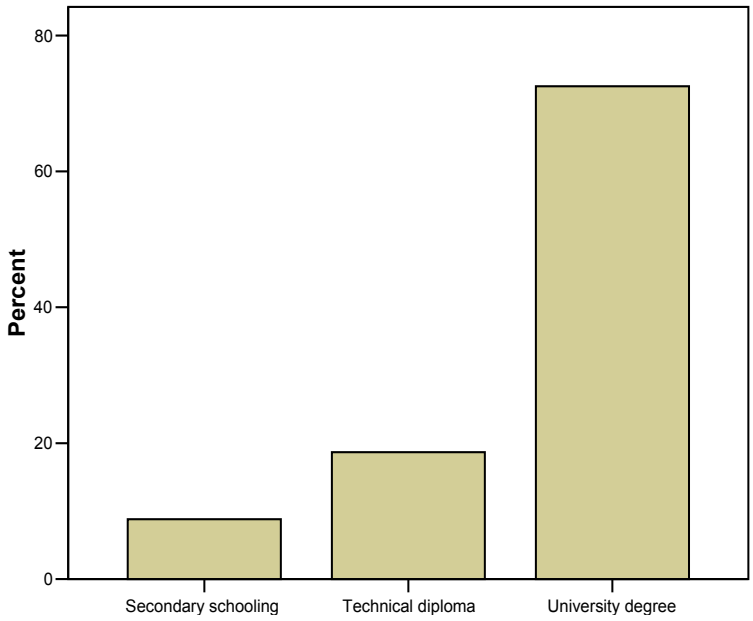
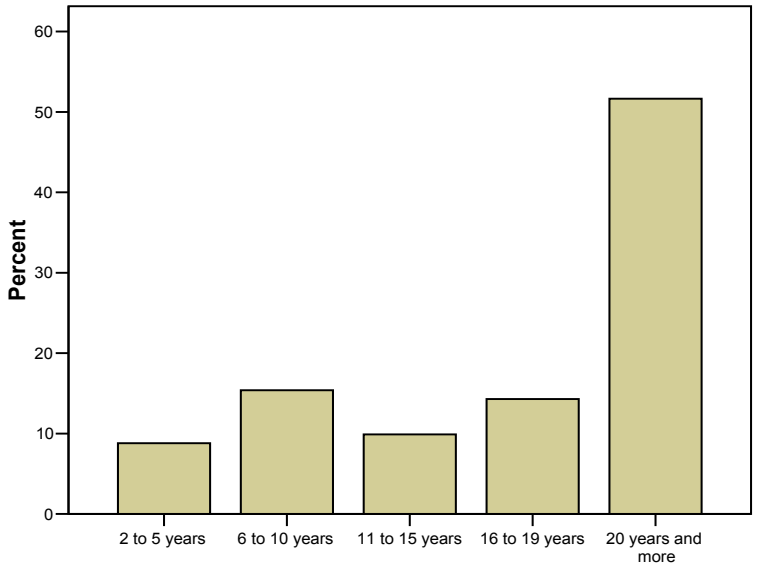
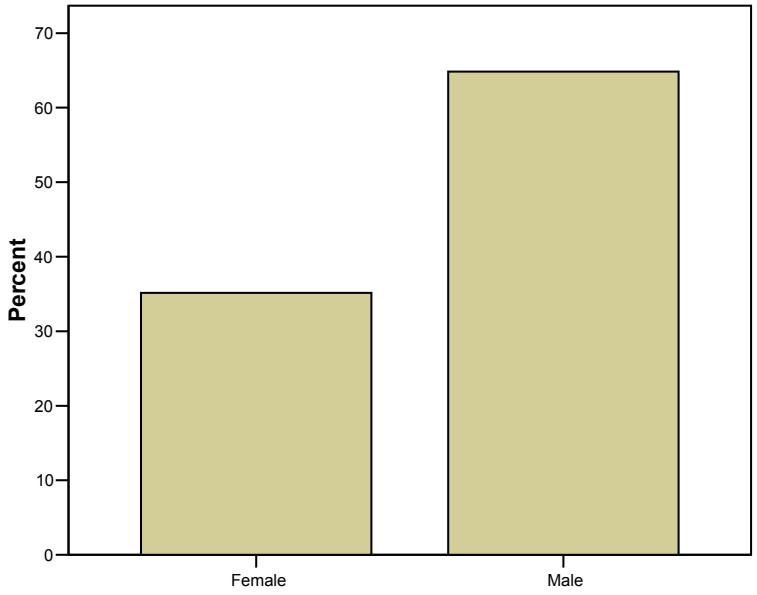


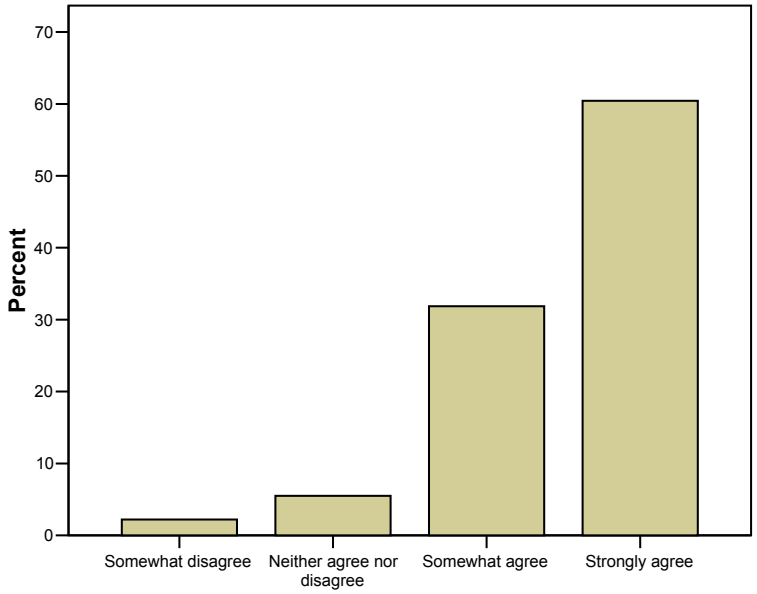
Years work experience



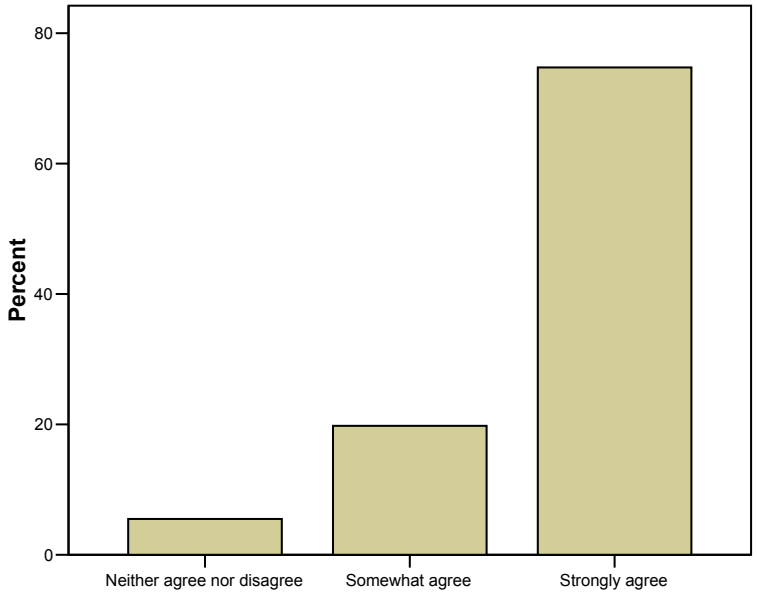
Gender



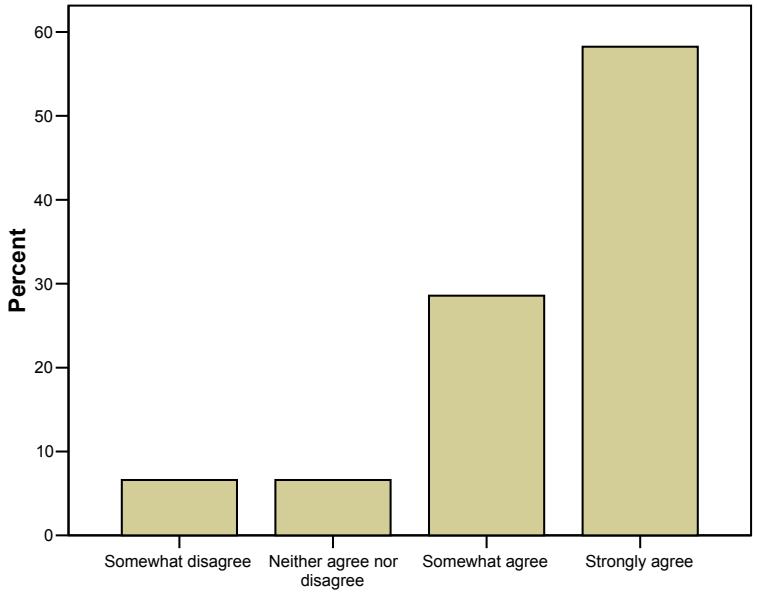
B1a ideal: 3rd social



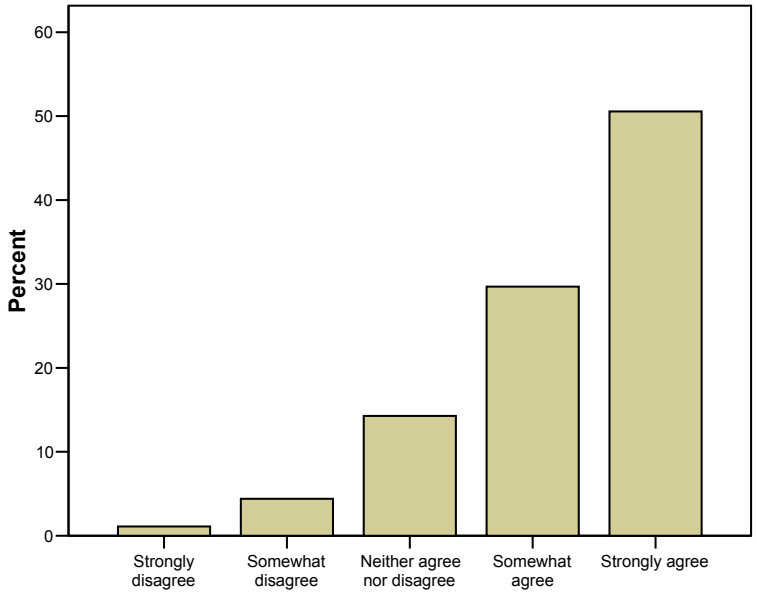
B1b ideal: 1st social



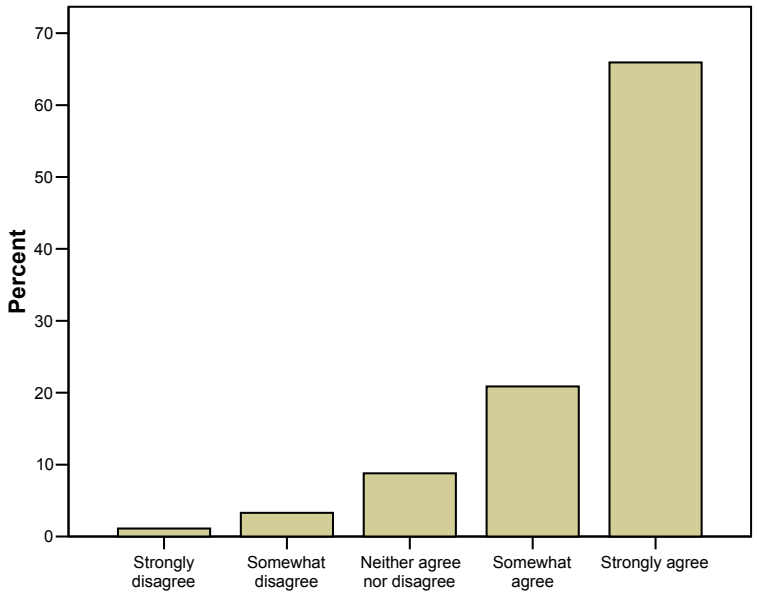
B2a ideal: 3rd economic



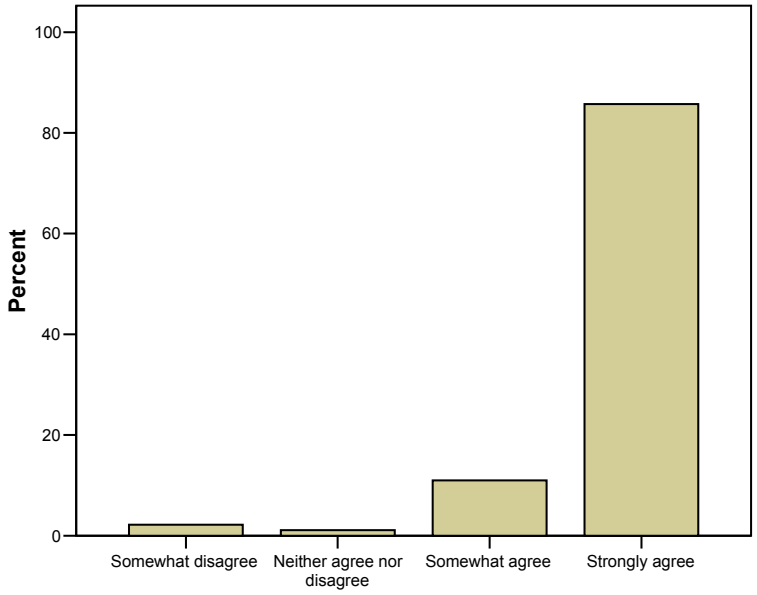
B2b ideal: 1st economic



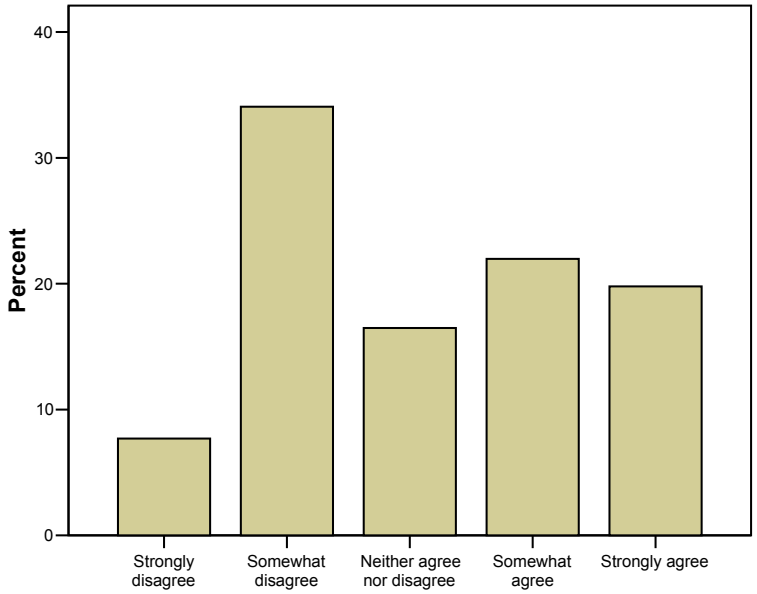
B3a ideal: 3rd environment



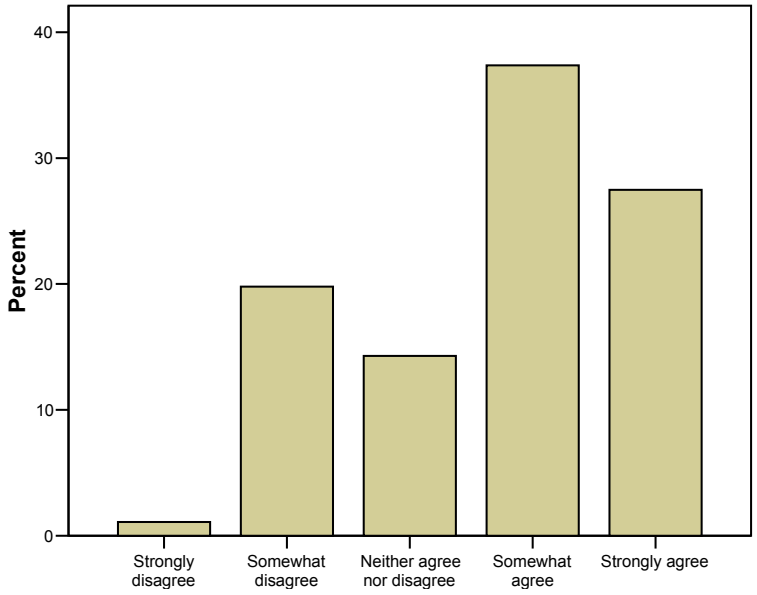
B3b ideal: 1st environment



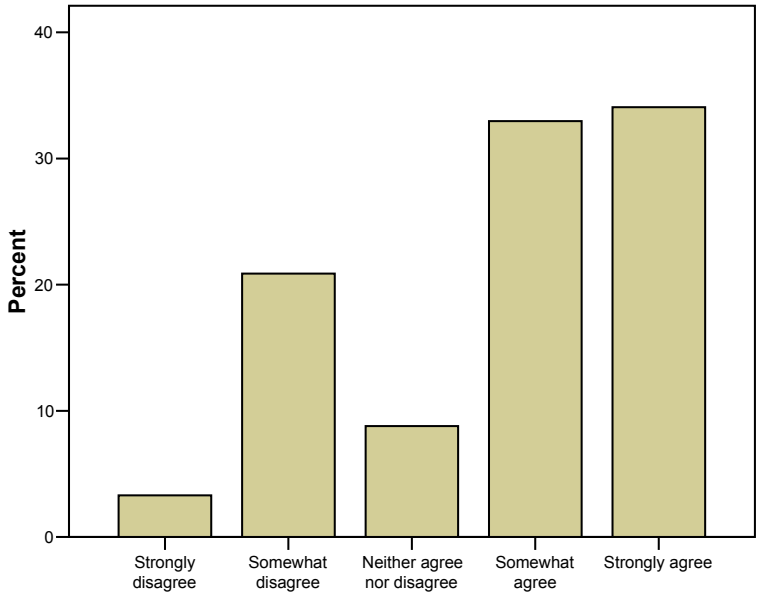
B4a real: 3rd social



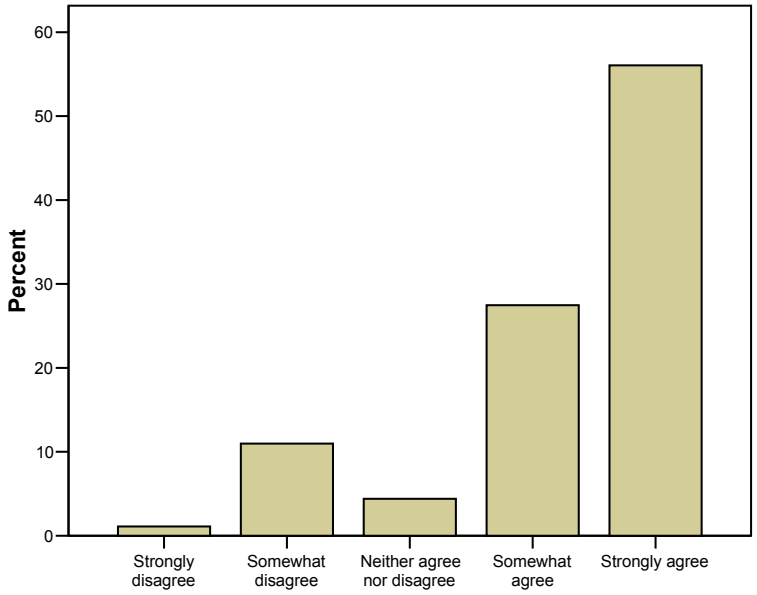
B4b real: 1st social



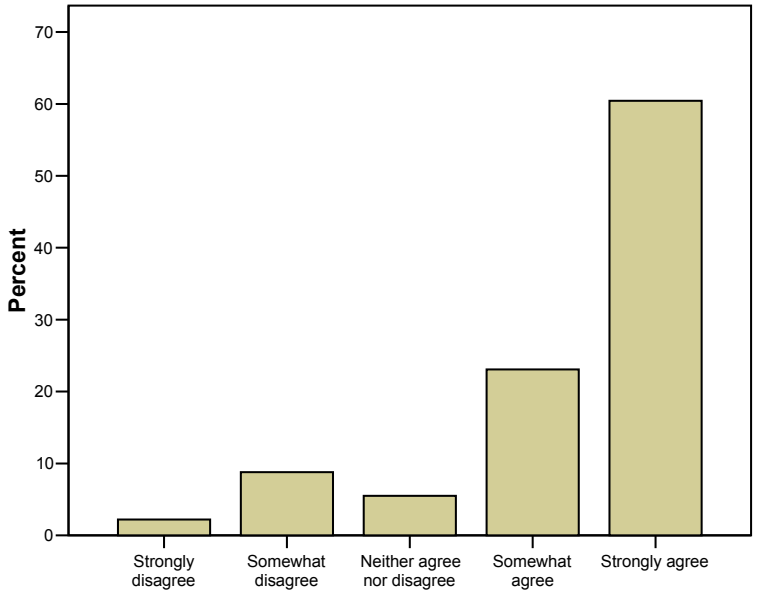
B5a real: 3rd environment



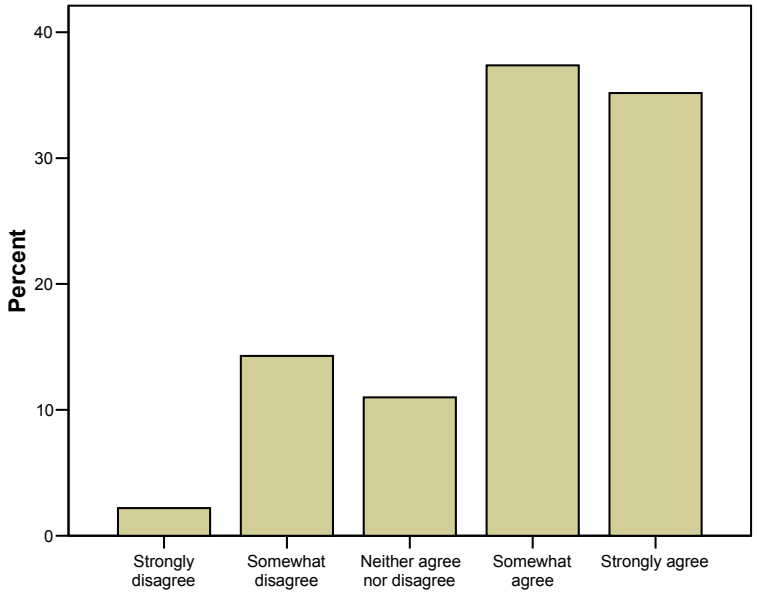
B5b real: 1st environment



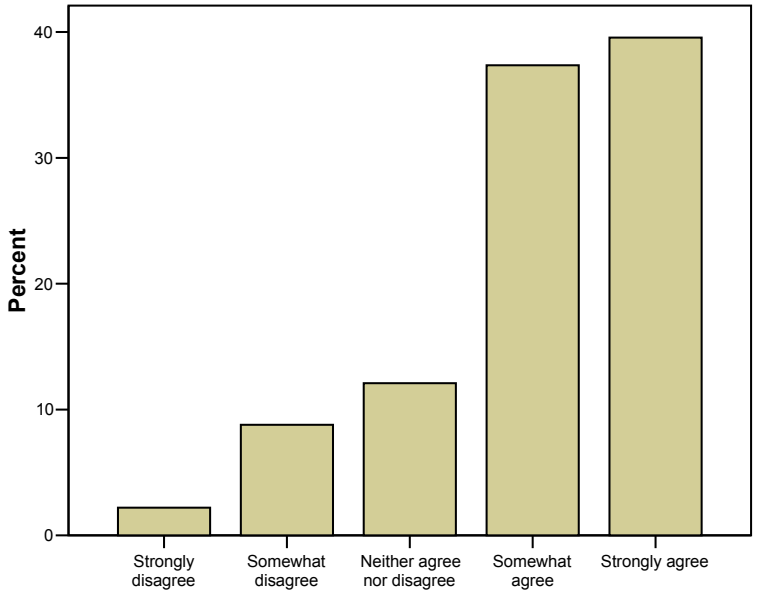
B6a real: 3rd economic



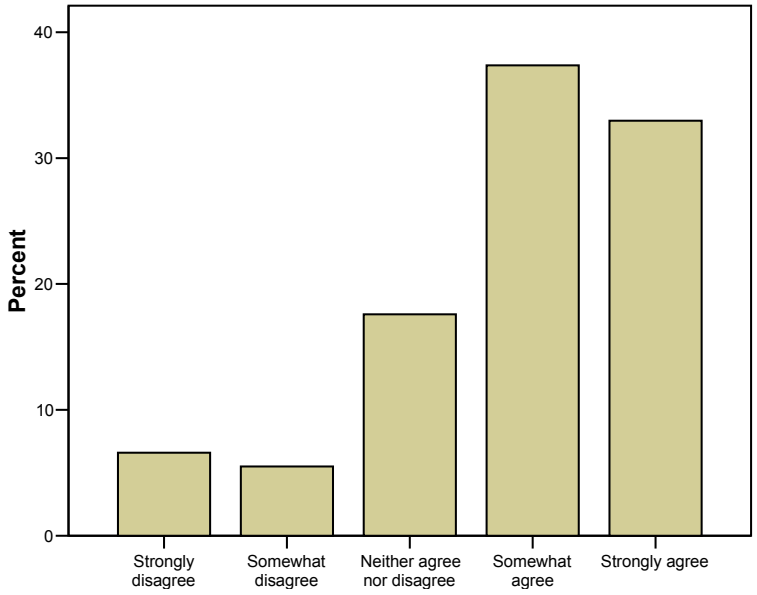
B6b real: 1st economic



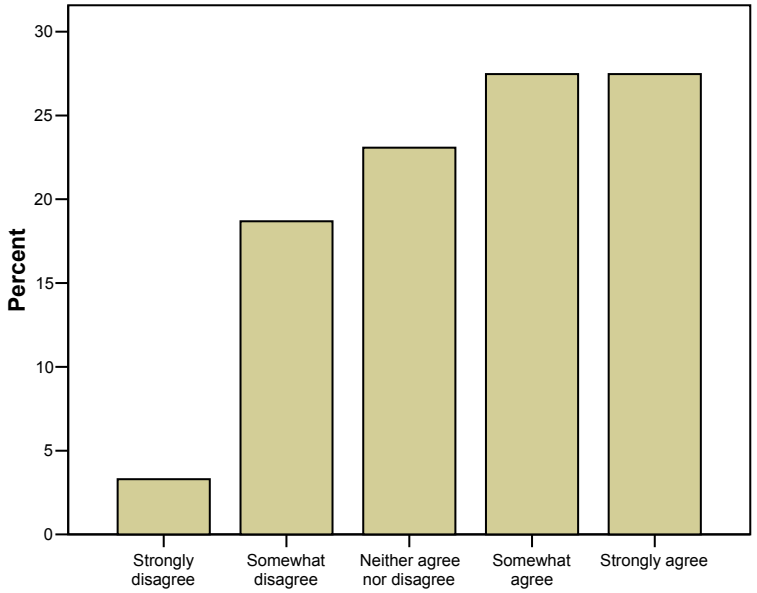
B7a fail: 3rd social



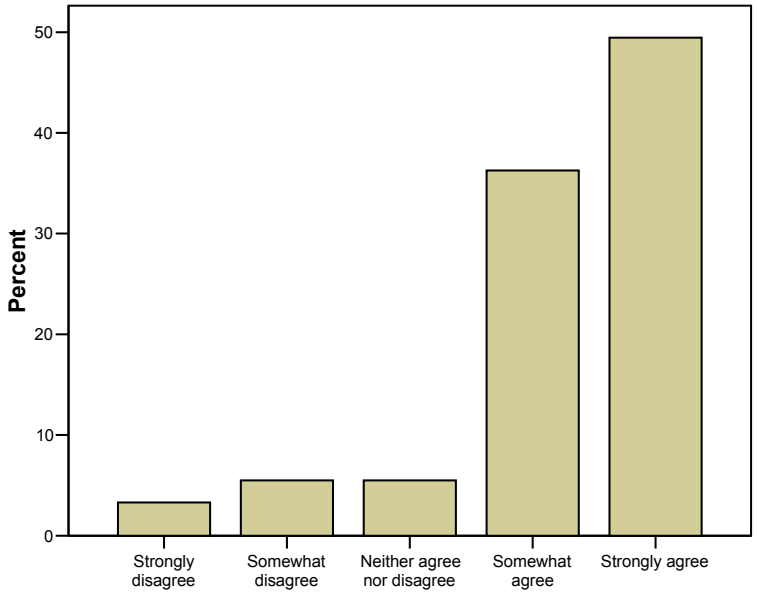
B7b fail: 1st social



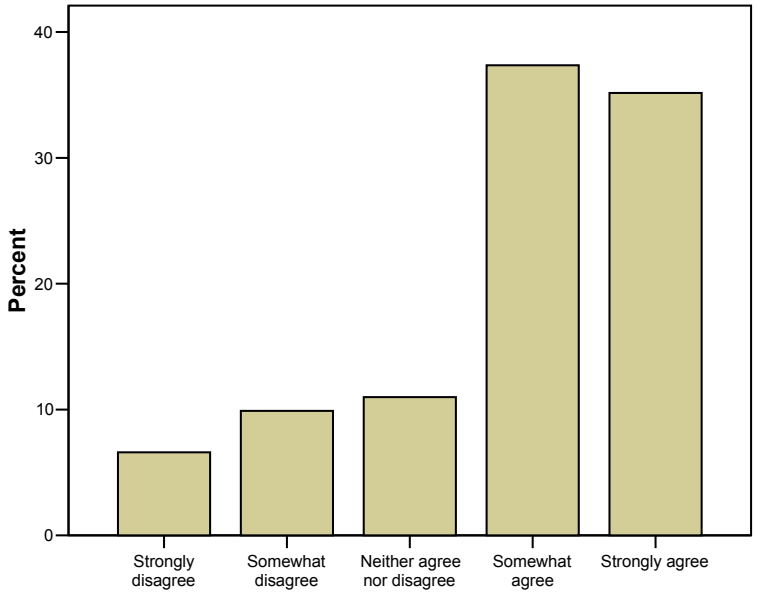
B8a fail: 3rd environment



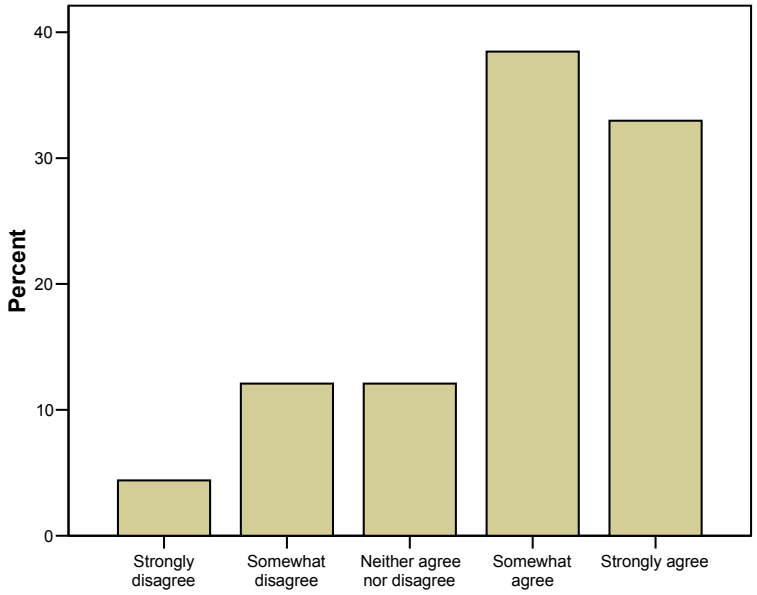
B8b fail: 1st environment



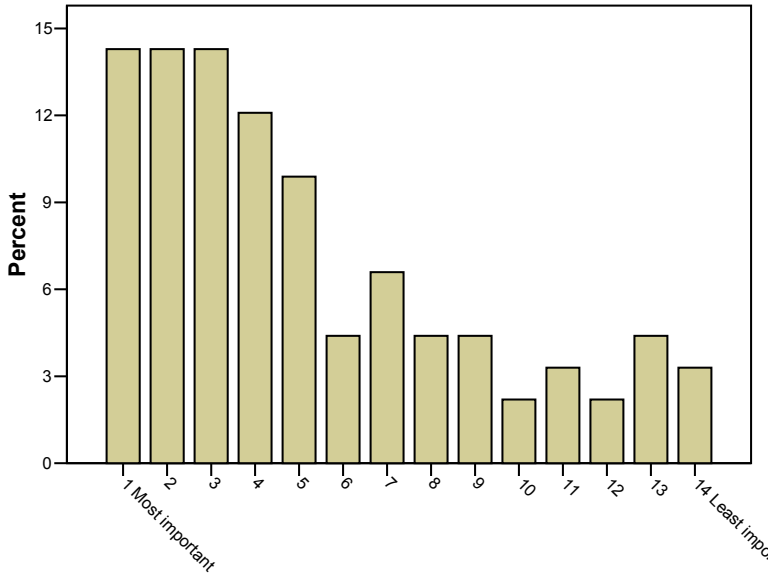
B9a fail: 3rd economic



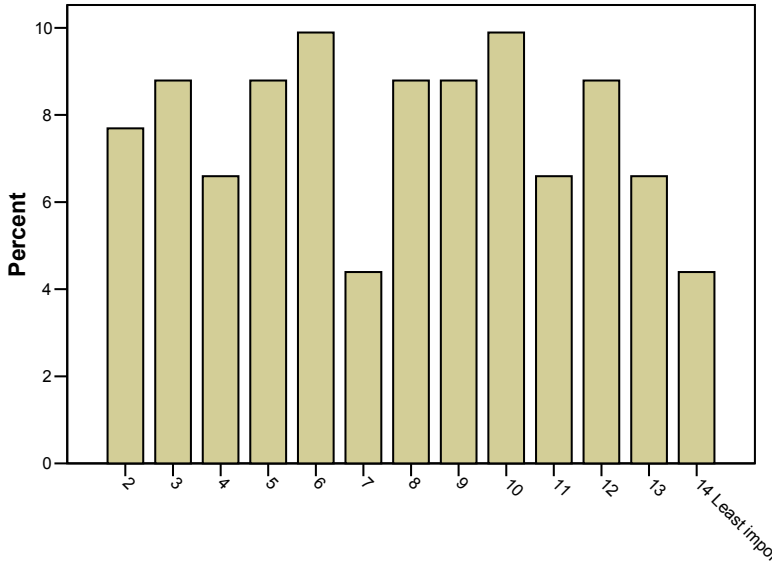
B9b fail: 1st economic



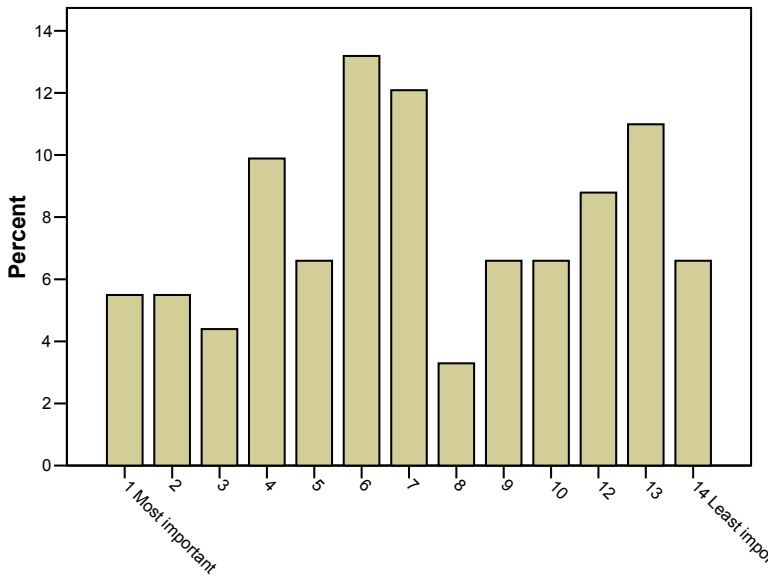
Value of waste



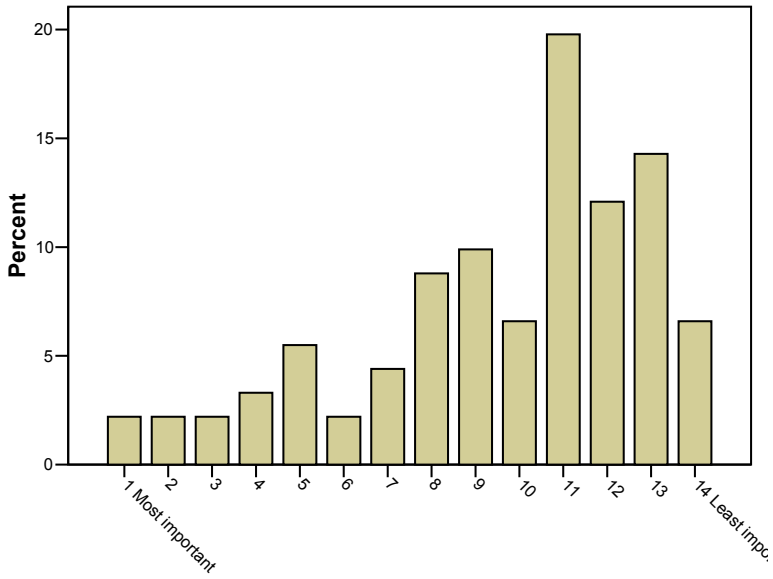
Standards environmental



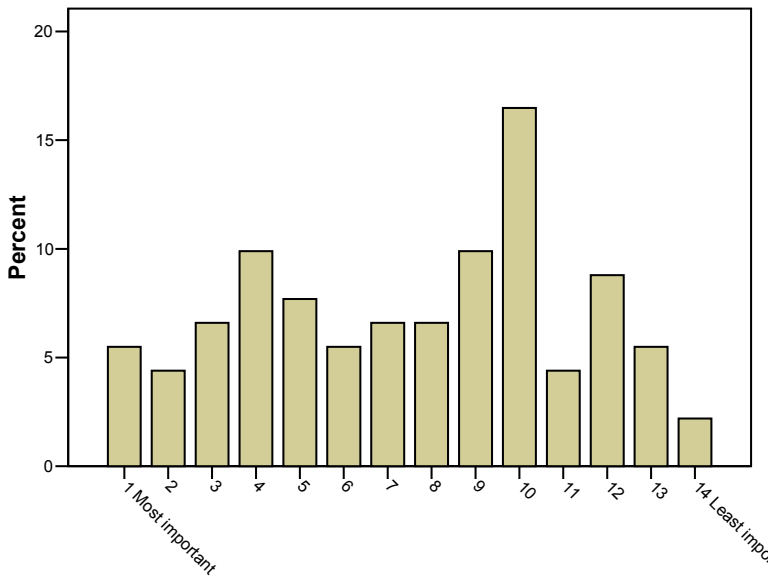
Social pressure



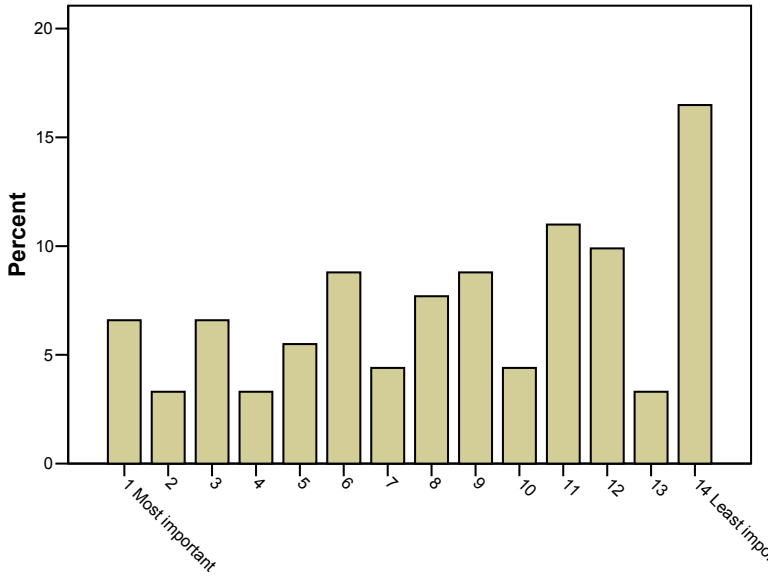
Risk management



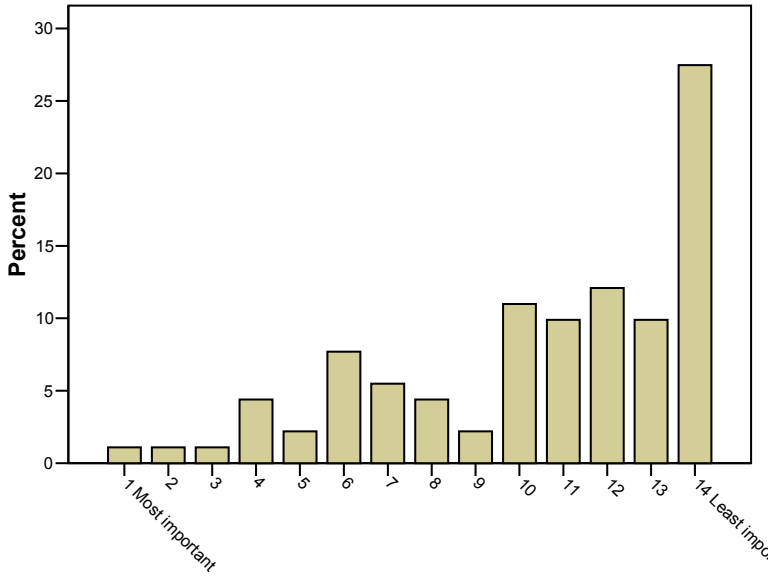
Producer responsibility



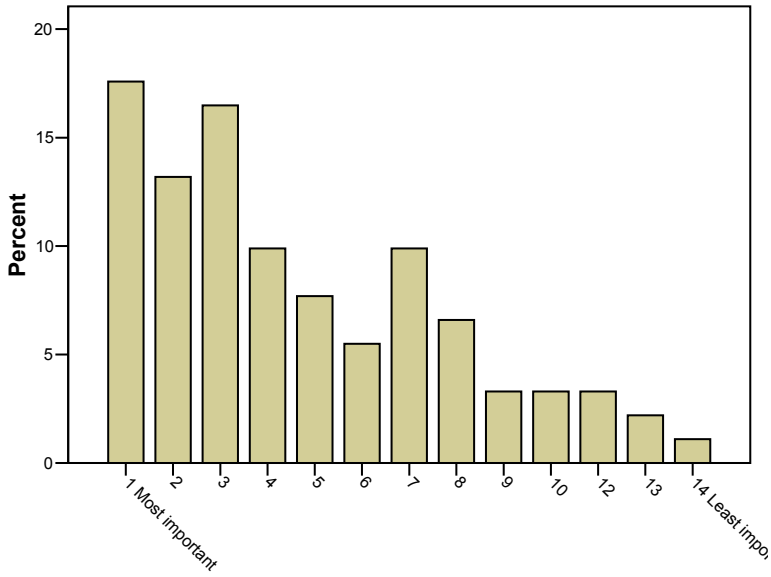
Personal values



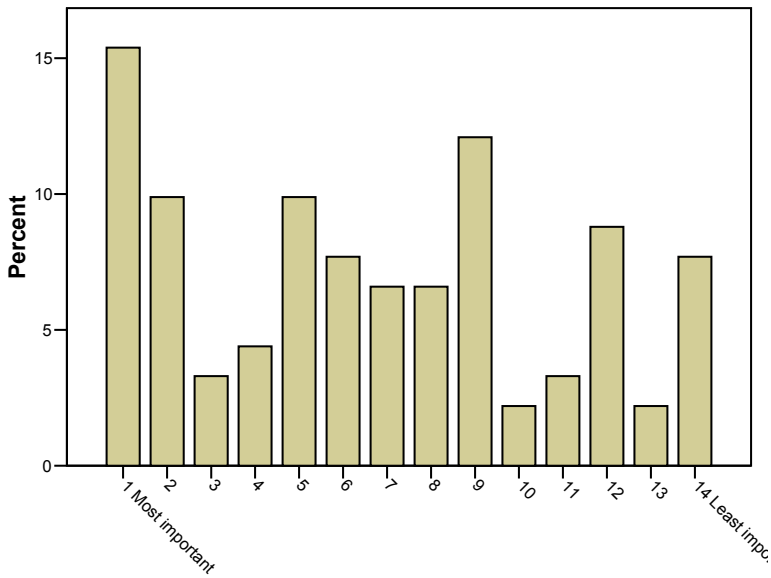
Life cycle assessments



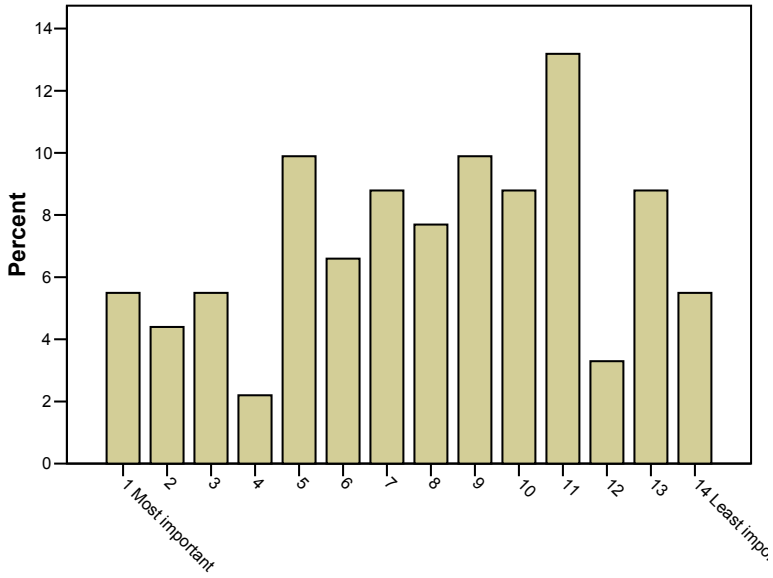
Legislation



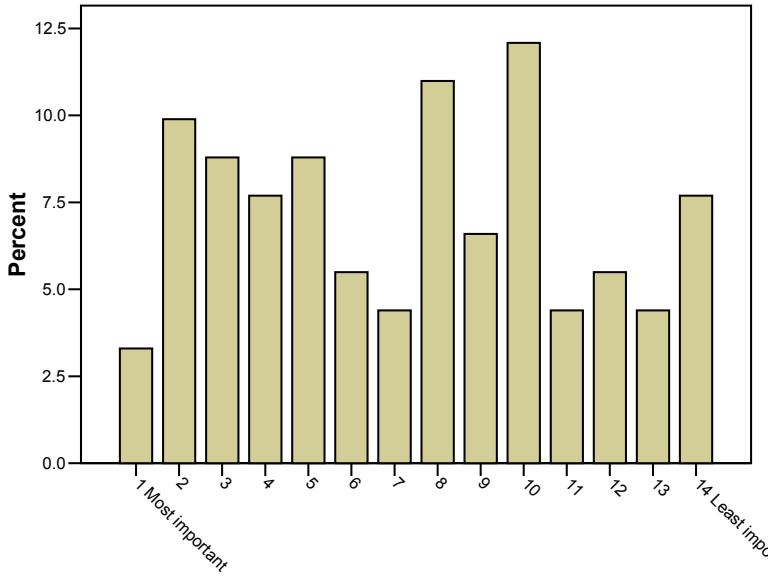
Government leadership



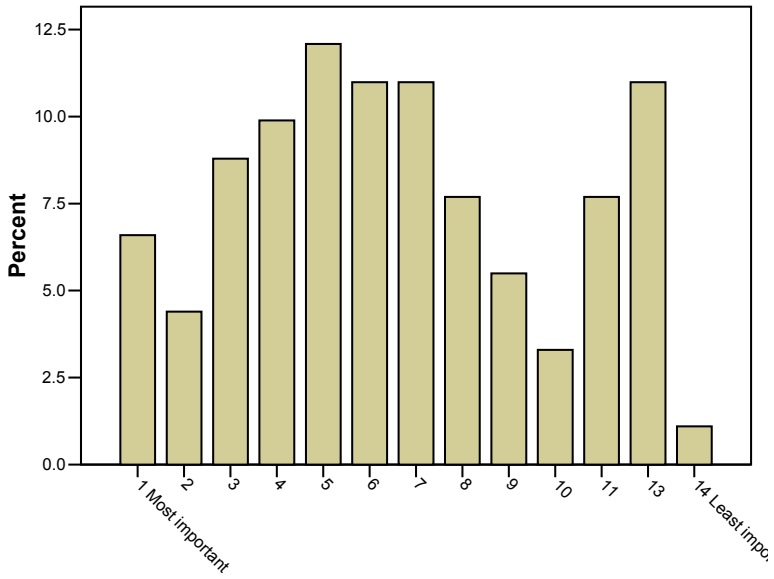
Corporate leadership



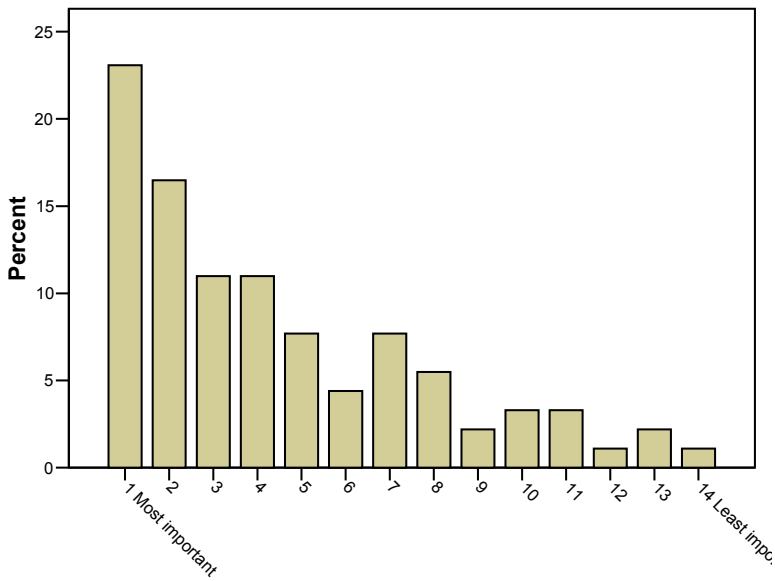
Environmental taxes

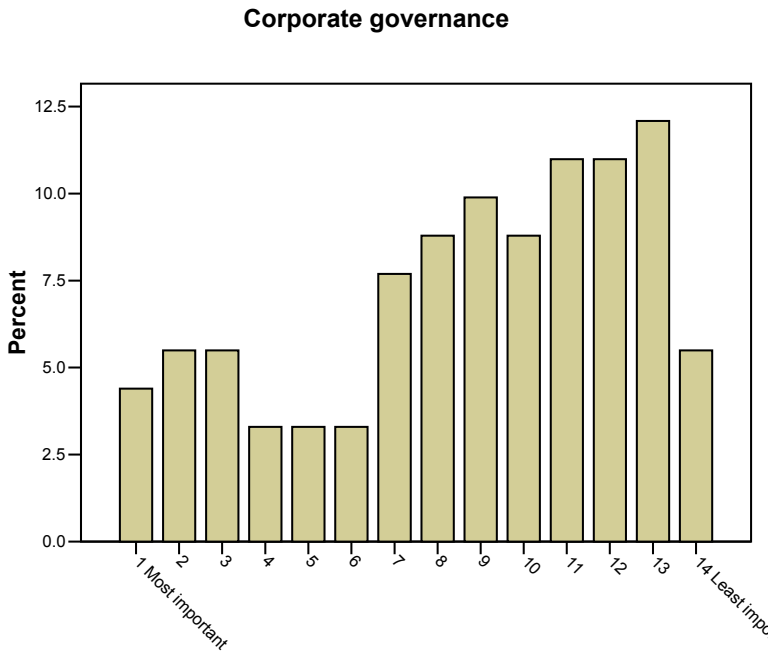


Education



Economic incentives




Corporate governance
Percent
12.5
10.0
7.5
5.0
2.5
0.0
1 Most important
2
3
4
5
6
7
8
9
10
11
12
13
14 Least impo

Non Parametric Tests

Friedman Test on base data

Ranks

	Mean Rank
Value of waste	5.29
Standards environmental	7.93
Social pressure	7.75
Risk management	9.74
Producer responsibility	7.63
Personal values	8.68
Life cycle assessments	10.65
Legislation	4.86
Government leadership	6.73
Corporate leadership	8.10
Environmental taxes	7.46
Education	6.87
Economic incentives	4.55
Corporate governance	8.76

Test Statistics (a)

N	91
Chi-Square	208.993
df	13
Asymp. Sig.	.000

a Friedman Test

	Mean Rank
Economic incentives	4.55
Legislation	4.86
Value of waste	5.29
Government leadership	6.73
Education	6.87
Environmental taxes	7.46
Producer responsibility	7.63
Social pressure	7.75
Standards environmental	7.93
Corporate leadership	8.1
Personal values	8.68
Corporate governance	8.76
Risk management	9.74
Life cycle assessments	10.65

Appendix F:

F. Cronbach's Alpha reliability test: SPSS output

Cronbach's Alpha reliability test: All variables questions

		B1a ideal: 3rd social	B1b ideal: 1st social	B2a ideal: 3rd econ	B2b ideal: 1st econ	B3a ideal: 3rd environ	B3b ideal: 1st environ	B4a real: 3rd social	B4b real: 1st social	B5a real: 3rd environ	B5b real: 1st environ	B6a real: 3rd econ	B6b real: 1st econ	B7a fail: 3rd social	B7b fail: 1st social	B8a fail: 3rd environ	B8b fail: 1st environ	B9a fail: 3rd econ	B9b fail: 1st econ
B1a ideal: 3rd social	Pearson Correlation	1	.225(*)	.041	.183	.221(*)	-.137	.299(**)	.038	.002	-.063	-.136	-.013	.266(*)	.194	.036	-.165	-.025	.118
	Sig. (2-tailed)	.	.032	.697	.082	.035	.194	.004	.724	.987	.556	.199	.900	.011	.066	.732	.117	.812	.266
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B1b ideal: 1st social	Pearson Correlation	.225(*)	1	-.049	.307(**)	-.151	.051	.081	.327(**)	.026	.026	-.025	.174	.148	.301(**)	.165	.086	.125	.108
	Sig. (2-tailed)	.032	.	.642	.003	.154	.634	.444	.002	.810	.808	.811	.099	.160	.004	.117	.419	.240	.307
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B2a ideal: 3rd economic	Pearson Correlation	.041	-.049	1	.278(**)	.021	-.002	.086	.084	-.018	.155	.408(**)	.158	.083	.115	.032	.037	-.017	-.080
	Sig. (2-tailed)	.697	.642	.	.008	.842	.987	.418	.428	.864	.143	.000	.136	.432	.279	.761	.731	.873	.453
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B2b ideal: 1st economic	Pearson Correlation	.183	.307(**)	.278(**)	1	.008	-.119	-.043	.016	-.041	-.100	.103	.540(**)	.175	.305(**)	.126	-.107	-.056	.151
	Sig. (2-tailed)	.082	.003	.008	.	.938	.260	.686	.878	.702	.344	.330	.000	.097	.003	.235	.315	.601	.152
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B3a ideal: 3rd environ-ment	Pearson Correlation	.221(*)	-.151	.021	.008	1	.328(**)	-.051	-.140	.397(**)	.216(*)	-.195	.043	-.054	.107	.145	-.024	-.121	-.121
	Sig. (2-tailed)	.035	.154	.842	.938	.	.001	.629	.185	.000	.040	.065	.688	.610	.313	.169	.820	.255	.253
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B3b ideal: 1st environ-ment	Pearson Correlation	-.137	.051	-.002	-.119	.328(**)	1	-.059	.065	.149	.394(**)	-.009	-.071	.030	.125	.055	.218(*)	-.046	-.051
	Sig. (2-tailed)	.194	.634	.987	.260	.001	.	.581	.540	.159	.000	.936	.505	.775	.238	.603	.038	.668	.630
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B4a real: 3rd social	Pearson Correlation	.299(**)	.081	.086	-.043	-.051	-.059	1	.530(**)	.308(**)	.183	.143	.048	.221(*)	.163	.145	.021	.335(**)	.261(*)
	Sig. (2-tailed)	.004	.444	.418	.686	.629	.581	.	.000	.003	.083	.176	.650	.035	.122	.172	.844	.001	.012
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B4b real: 1st social	Pearson Correlation	.038	.327(**)	.084	.016	-.140	.065	.530(**)	1	.138	.318(**)	.003	.027	.115	.095	.038	.042	.257(*)	.214(*)
	Sig. (2-tailed)	.724	.002	.428	.878	.185	.540	.000	.	.194	.002	.978	.797	.279	.371	.723	.694	.014	.042

	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B5a real: 3rd environ-ment	Pearson Correla-tion	.002	.026	-.018	-.041	.397 (**)	.149	.308 (**)	.138	1	.620 (**)	.046	.264 (*)	.129	-.037	.367 (**)	.130	.048	-.008
	Sig. (2-tailed)	.987	.810	.864	.702	.000	.159	.003	.194	.	.000	.666	.012	.223	.727	.000	.219	.655	.943
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B5b real: 1st environ-ment	Pearson Correla-tion	-.063	.026	.155	-.100	.216 (*)	.394 (**)	.183	.318 (**)	.620 (**)	1	.006	-.013	.187	.053	.121	.289 (**)	.042	.009
	Sig. (2-tailed)	.556	.808	.143	.344	.040	.000	.083	.002	.000	.	.954	.902	.076	.617	.255	.005	.695	.933
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B6a real: 3rd eco-nomic	Pearson Correla-tion	-.136	-.025	.408 (**)	.103	-.195	-.009	.143	.003	.046	.006	1	.312 (**)	-.070	-.006	.098	.130	.090	.042
	Sig. (2-tailed)	.199	.811	.000	.330	.065	.936	.176	.978	.666	.954	.	.003	.511	.952	.355	.220	.397	.692
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B6b real: 1st econ-omic	Pearson Correla-tion	-.013	.174	.158	.540 (**)	.043	-.071	.048	.027	.264 (*)	-.013	.312 (**)	1	.080	.135	.219 (*)	.053	.079	.256 (*)
	Sig. (2-tailed)	.900	.099	.136	.000	.688	.505	.650	.797	.012	.902	.003	.	.449	.201	.037	.621	.458	.014
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B7a fail: 3rd social	Pearson Correlation	.266 (*)	.148	.083	.175	-.054	.030	.221 (*)	.115	.129	.187	-.070	.080	1	.463 (**)	.285 (**)	.257 (*)	.093	.107
	Sig. (2-tailed)	.011	.160	.432	.097	.610	.775	.035	.279	.223	.076	.511	.449	.	.000	.006	.014	.379	.312
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B7b fail: 1st social	Pearson Correla-tion	.194	.301 (**)	.115	.305 (**)	.107	.125	.163	.095	-.037	.053	-.006	.135	.463 (**)	1	.182	.434 (**)	.160	.167
	Sig. (2-tailed)	.066	.004	.279	.003	.313	.238	.122	.371	.727	.617	.952	.201	.000	.	.085	.000	.129	.114
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B8a fail: 3rd environ-ment	Pearson Correla-tion	.036	.165	.032	.126	.145	.055	.145	.038	.367 (**)	.121	.098	.219 (*)	.285 (**)	.182	1	.467 (**)	.268 (*)	.252 (*)
	Sig. (2-tailed)	.732	.117	.761	.235	.169	.603	.172	.723	.000	.255	.355	.037	.006	.085	.	.000	.010	.016
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B8b fail: 1st environ-ment	Pearson Correla-tion	-.165	.086	.037	-.107	-.024	.218 (*)	.021	.042	.130	.289 (**)	.130	.053	.257 (*)	.434 (**)	.467 (**)	1	.258 (*)	.100
	Sig. (2-tailed)	.117	.419	.731	.315	.820	.038	.844	.694	.219	.005	.220	.621	.014	.000	.000	.	.014	.345
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B9a fail: 3rd eco-nomic	Pearson Correla-tion	-.025	.125	-.017	-.056	-.121	-.046	.335 (**)	.257 (*)	.048	.042	.090	.079	.093	.160	.268 (*)	.258 (*)	1	.610 (**)

	Sig. (2-tailed)	.812	.240	.873	.601	.255	.668	.001	.014	.655	.695	.397	.458	.379	.129	.010	.014	.	.000
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
B9b fail: 1st economic	Pearson Correlation	.118	.108	-.080	.151	-.121	-.051	.261(*)	.214(*)	-.008	.009	.042	.256(*)	.107	.167	.252(*)	.100	.610(**)	1
	Sig. (2-tailed)	.266	.307	.453	.152	.253	.630	.012	.042	.943	.933	.692	.014	.312	.114	.016	.345	.000	.
	N	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Case Processing Summary

		N	%
Cases	Valid	91	100.0
	Excluded (a)	0	.0
	Total	91	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.716	18

Correlations: Social imperative variable

Correlations

		B1a ideal: 3rd social	B1b ideal: 1st social	B4a real: 3rd social	B4b real: 1st social	B7a fail: 3rd social	B7b fail: 1st social
B1a ideal: 3rd social	Pearson Correlation	1	.225(*)	.299(**)	.038	.266(*)	.194
	Sig. (2-tailed)	.	.032	.004	.724	.011	.066
	N	91	91	91	91	91	91
B1b ideal: 1st social	Pearson Correlation	.225(*)	1	.081	.327(**)	.148	.301(**)
	Sig. (2-tailed)	.032	.	.444	.002	.160	.004
	N	91	91	91	91	91	91
B4a real: 3rd social	Pearson Correlation	.299(**)	.081	1	.530(**)	.221(*)	.163
	Sig. (2-tailed)	.004	.444	.	.000	.035	.122
	N	91	91	91	91	91	91
B4b real: 1st social	Pearson Correlation	.038	.327(**)	.530(**)	1	.115	.095
	Sig. (2-tailed)	.724	.002	.000	.	.279	.371
	N	91	91	91	91	91	91
B7a fail: 3rd social	Pearson Correlation	.266(*)	.148	.221(*)	.115	1	.463(**)
	Sig. (2-tailed)	.011	.160	.035	.279	.	.000
	N	91	91	91	91	91	91
B7b fail: 1st social	Pearson Correlation	.194	.301(**)	.163	.095	.463(**)	1
	Sig. (2-tailed)	.066	.004	.122	.371	.000	.
	N	91	91	91	91	91	91

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Cronbach's Alpha reliability test: Social variable questions

Case Processing Summary

		N	%
Cases	Valid	91	100.0
	Excluded (a)	0	.0
	Total	91	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.632	6

Correlations: Environmental imperative variable

Correlations

		B3a ideal: 3rd environment	B3b ideal: 1st environment	B5a real: 3rd environment	B5b real: 1st environment	B8a fail: 3rd environment	B8b fail: 1st environment
B3a ideal: 3rd environment	Pearson Correlation	1	.328(**)	.397(**)	.216(*)	.145	-.024
	Sig. (2-tailed)	.	.001	.000	.040	.169	.820
	N	91	91	91	91	91	91
B3b ideal: 1st environment	Pearson Correlation	.328(**)	1	.149	.394(**)	.055	.218(*)
	Sig. (2-tailed)	.001	.	.159	.000	.603	.038
	N	91	91	91	91	91	91
B5a real: 3rd environment	Pearson Correlation	.397(**)	.149	1	.620(**)	.367(**)	.130
	Sig. (2-tailed)	.000	.159	.	.000	.000	.219
	N	91	91	91	91	91	91
B5b real: 1st environment	Pearson Correlation	.216(*)	.394(**)	.620(**)	1	.121	.289(**)
	Sig. (2-tailed)	.040	.000	.000	.	.255	.005
	N	91	91	91	91	91	91
B8a fail: 3rd environment	Pearson Correlation	.145	.055	.367(**)	.121	1	.467(**)
	Sig. (2-tailed)	.169	.603	.000	.255	.	.000
	N	91	91	91	91	91	91
B8b fail: 1st environment	Pearson Correlation	-.024	.218(*)	.130	.289(**)	.467(**)	1
	Sig. (2-tailed)	.820	.038	.219	.005	.000	.
	N	91	91	91	91	91	91

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Cronbach's Alpha reliability test: Environmental variable questions

Case Processing Summary

		N	%
Cases	Valid	91	100.0
	Excluded (a)	0	.0
	Total	91	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.674	6

Correlations: Economic imperative variable

Correlations

		B2a ideal: 3rd economic	B2b ideal: 1st economic	B6a real: 3rd economic	B6b real: 1st economic	B9a fail: 3rd economic	B9b fail: 1st economic
B2a ideal: 3rd economic	Pearson Correlation	1	.278(**)	.408(**)	.158	-.017	-.080
	Sig. (2-tailed)	.	.008	.000	.136	.873	.453
	N	91	91	91	91	91	91
B2b ideal: 1st economic	Pearson Correlation	.278(**)	1	.103	.540(**)	-.056	.151
	Sig. (2-tailed)	.008	.	.330	.000	.601	.152
	N	91	91	91	91	91	91
B6a real: 3rd economic	Pearson Correlation	.408(**)	.103	1	.312(**)	.090	.042
	Sig. (2-tailed)	.000	.330	.	.003	.397	.692
	N	91	91	91	91	91	91
B6b real: 1st economic	Pearson Correlation	.158	.540(**)	.312(**)	1	.079	.256(*)
	Sig. (2-tailed)	.136	.000	.003	.	.458	.014
	N	91	91	91	91	91	91
B9a fail: 3rd economic	Pearson Correlation	-.017	-.056	.090	.079	1	.610(**)
	Sig. (2-tailed)	.873	.601	.397	.458	.	.000
	N	91	91	91	91	91	91
B9b fail: 1st economic	Pearson Correlation	-.080	.151	.042	.256(*)	.610(**)	1
	Sig. (2-tailed)	.453	.152	.692	.014	.000	.
	N	91	91	91	91	91	91

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Cronbach's Alpha reliability tests: Economic variable questions

Case Processing Summary

		N	%
Cases	Valid	91	100.0
	Excluded (a)	0	.0
	Total	91	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.586	6

Appendix G:

G. Recoded reply data, SPSS data

Refer to next page for complete list of data.

ID	A1_complex	A2_occupation	A3_education	A4_work_yrs	A5_gender
1	3	3	3	3	2
2	1	1	3	2	1
3	3	1	2	1	2
4	1	1	2	1	2
5	3	2	3	1	1
6	3	1	3	1	1
7	3	2	3	1	2
8	3	3	3	1	2
9	1	1	3	3	2
10	3	3	2	1	2
11	3	3	2	3	2
12	3	1	3	1	2
13	3	2	3	3	2
14	3	3	2	2	1
15	3	1	3	3	2
16	3	1	1	2	1
17	3	1	3	2	2
18	2	1	2	1	2
19	3	2	3	3	2
20	3	1	3	3	2
21	3	2	3	2	2
22	3	3	3	3	2
23	1	1	3	2	1
24	3	1	3	3	2
25	3	3	3	3	2
26	3	3	3	3	2
27	3	3	2	2	2
28	3	3	3	1	1
29	3	1	3	3	2
30	3	3	3	3	2
31	3	3	1	1	2
32	3	2	3	1	1
33	3	1	3	2	2
34	3	1	3	1	1
35	3	1	3	3	1
36	3	3	3	3	2
37	3	1	3	1	1
38	3	1	3	3	2
39	3	1	3	2	2
40	3	1	3	3	2
41	3	1	3	3	2
42	3	1	3	3	1
43	3	1	3	2	2
44	3	1	3	3	1
45	1	1	3	3	2
46	1	3	3	3	2
47	3	1	3	3	2
48	3	1	2	3	2
49	3	3	2	3	2
50	3	2	2	3	2
51	3	1	3	3	2
52	3	2	2	3	2
53	3	2	2	3	2
54	1	1	1	3	2
55	3	2	3	3	1
56	3	2	1	3	1
57	3	1	3	3	1
58	3	1	3	2	1
59	3	1	2	2	1
60	3	3	2	2	2
61	3	2	3	3	2
62	3	1	3	1	1
63	1	1	3	1	2
64	3	3	3	3	2
65	3	2	3	1	1
66	3	1	3	1	1
67	3	1	3	2	2
68	2	3	1	2	1
69	2	2	3	3	2
70	3	3	3	1	1
71	3	3	3	2	1
72	3	3	3	1	1
73	3	3	3	3	2
74	3	1	2	1	2
75	3	1	3	3	2
76	3	3	3	3	1
77	3	3	3	2	2
78	3	1	1	3	1
79	3	1	1	2	1
80	3	3	2	3	2
81	3	3	3	2	2
82	3	1	3	1	1
83	3	2	3	2	1
84	3	1	1	3	1
85	1	2	3	3	2
86	3	1	3	3	2
87	3	3	2	3	1
88	1	1	3	2	2
89	3	3	3	3	2
90	3	2	3	3	2
91	3	3	3	2	2

ID	B1a_ideal_3rd_soc	B1b_ideal_1st_soc	B2a_ideal_3rd_econ	B2b_ideal_1st_econ	B3a_ideal_3rd_env	B3b_ideal_1st_env	B4a_real_3rd_soc	B4b_real_1st_soc	B5a_real_3rd_env	B5b_real_1st_env	B6a_real_3rd_econ	B6b_real_1st_econ	B7a_fail_3rd_soc	B7b_fail_1st_soc	B8a_fail_3rd_env	B8b_fail_1st_env	B9a_fail_3rd_econ	B9b_fail_1st_econ
1	2	3	3	3	1	3	1	3	1	3	3	2	1	3	1	3	3	2
2	3	3	3	1	3	3	3	3	3	3	3	1	3	1	1	3	3	1
3	3	3	3	1	3	3	1	3	3	3	3	1	1	1	3	3	3	1
4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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ID	Value_of_ waste	Standards	Social_ pressure	Risk_ management	Producer_ responsibility	Personal_ values	Life_cycle_ assessments	Legislation	Government leadership	Corporate leadership	Environmental _ taxes	Education	Economic_ incentives	Corp_ governance
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Appendix H:

H. Frequency tables and bar charts of recoded data, SPSS output

Frequency Table

SWRM is complex

		Frequency	Percent	Cumulative Percent
Valid	Disagree	10	11.0	11.0
	Neutral	3	3.3	14.3
	Agree	78	85.7	100.0
	Total	91	100.0	

Occupation respondent

		Frequency	Percent
Valid	Waste companies	45	49.5
	Government	17	18.7
	Other companies	29	31.9
	Total	91	100.0

Education respondent

		Frequency	Percent	Cumulative Percent
Valid	Secondary schooling	8	8.8	8.8
	Technical diploma	17	18.7	27.5
	University degree	66	72.5	100.0
	Total	91	100.0	

Years work experience

		Frequency	Percent	Cumulative Percent
Valid	2 to 10 years	22	24.2	24.2
	11 to 19 years	22	24.2	48.4
	20 years and more	47	51.6	100.0
	Total	91	100.0	

Gender

		Frequency	Percent
Valid	Female	32	35.2
	Male	59	64.8
	Total	91	100.0

B1a ideal: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Disagree	2	2.2	2.2
	Neutral	5	5.5	7.7
	Agree	84	92.3	100.0
	Total	91	100.0	

B1b ideal: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Neutral	5	5.5	5.5
	Agree	86	94.5	100.0
	Total	91	100.0	

B2a ideal: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	6	6.6	6.6
	Neutral	6	6.6	13.2
	Agree	79	86.8	100.0
	Total	91	100.0	

B2b ideal: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	5	5.5	5.5
	Neutral	13	14.3	19.8
	Agree	73	80.2	100.0
	Total	91	100.0	

B3a ideal: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	4	4.4	4.4
	Neutral	8	8.8	13.2
	Agree	79	86.8	100.0
	Total	91	100.0	

B3b ideal: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	2	2.2	2.2
	Neutral	1	1.1	3.3
	Agree	88	96.7	100.0
	Total	91	100.0	

B4a real: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Disagree	38	41.8	41.8
	Neutral	15	16.5	58.2
	Agree	38	41.8	100.0
	Total	91	100.0	

B4b real: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Disagree	19	20.9	20.9
	Neutral	13	14.3	35.2
	Agree	59	64.8	100.0
	Total	91	100.0	

B5a real: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	22	24.2	24.2
	Neutral	8	8.8	33.0
	Agree	61	67.0	100.0
	Total	91	100.0	

B5b real: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	11	12.1	12.1
	Neutral	4	4.4	16.5
	Agree	76	83.5	100.0
	Total	91	100.0	

B6a real: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	10	11.0	11.0
	Neutral	5	5.5	16.5
	Agree	76	83.5	100.0
	Total	91	100.0	

B6b real: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	15	16.5	16.5
	Neutral	10	11.0	27.5
	Agree	66	72.5	100.0
	Total	91	100.0	

B7a fail: 3rd social

		Frequency	Percent	Cumulative Percent
Valid	Disagree	10	11.0	11.0
	Neutral	11	12.1	23.1
	Agree	70	76.9	100.0
	Total	91	100.0	

B7b fail: 1st social

		Frequency	Percent	Cumulative Percent
Valid	Disagree	11	12.1	12.1
	Neutral	16	17.6	29.7
	Agree	64	70.3	100.0
	Total	91	100.0	

B8a fail: 3rd environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	20	22.0	22.0
	Neutral	21	23.1	45.1
	Agree	50	54.9	100.0
	Total	91	100.0	

B8b fail: 1st environment

		Frequency	Percent	Cumulative Percent
Valid	Disagree	8	8.8	8.8
	Neutral	5	5.5	14.3
	Agree	78	85.7	100.0
	Total	91	100.0	

B9a fail: 3rd economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	15	16.5	16.5
	Neutral	10	11.0	27.5
	Agree	66	72.5	100.0
	Total	91	100.0	

B9b fail: 1st economic

		Frequency	Percent	Cumulative Percent
Valid	Disagree	15	16.5	16.5
	Neutral	11	12.1	28.6
	Agree	65	71.4	100.0
	Total	91	100.0	

Value of waste

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	59	64.8	64.8
	2: Least important	32	35.2	100.0
	Total	91	100.0	

Standards environmental

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	29	31.9	31.9
	2: Least important	62	68.1	100.0
	Total	91	100.0	

Social pressure

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	29	31.9	31.9
	2: Least important	62	68.1	100.0
	Total	91	100.0	

Risk management

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	14	15.4	15.4
	2: Least important	77	84.6	100.0
	Total	91	100.0	

Producer responsibility

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	31	34.1	34.1
	2: Least important	60	65.9	100.0
	Total	91	100.0	

Personal values

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	23	25.3	25.3
	2: Least important	68	74.7	100.0
	Total	91	100.0	

Life cycle assessments

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	9	9.9	9.9
	2: Least important	82	90.1	100.0
	Total	91	100.0	

Legislation

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	59	64.8	64.8
	2: Least important	32	35.2	100.0
	Total	91	100.0	

Government leadership

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	39	42.9	42.9
	2: Least important	52	57.1	100.0
	Total	91	100.0	

Corporate leadership

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	25	27.5	27.5
	2: Least important	66	72.5	100.0
	Total	91	100.0	

Environmental taxes

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	35	38.5	38.5
	2: Least important	56	61.5	100.0
	Total	91	100.0	

Education

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	38	41.8	41.8
	2: Least important	53	58.2	100.0
	Total	91	100.0	

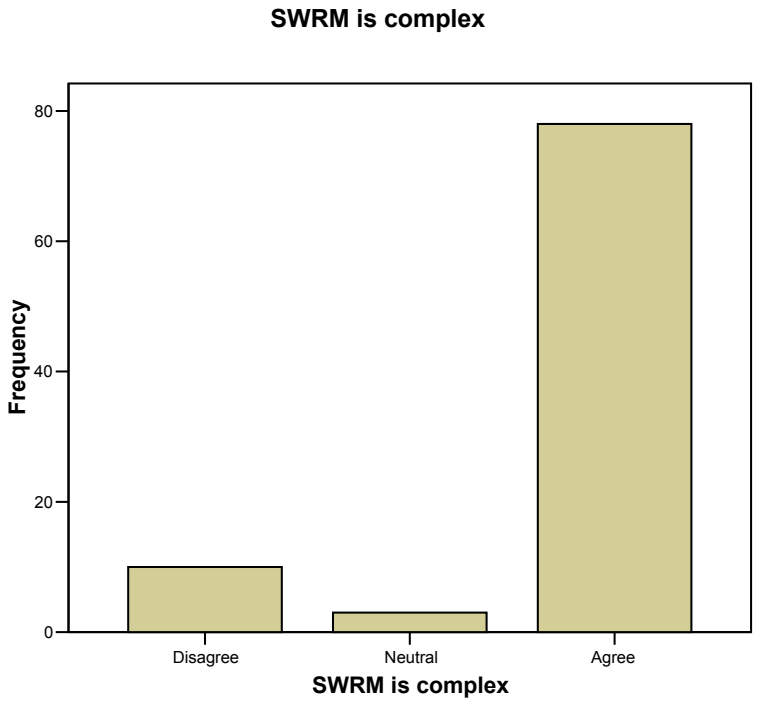
Economic incentives

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	63	69.2	69.2
	2: Least important	28	30.8	100.0
	Total	91	100.0	

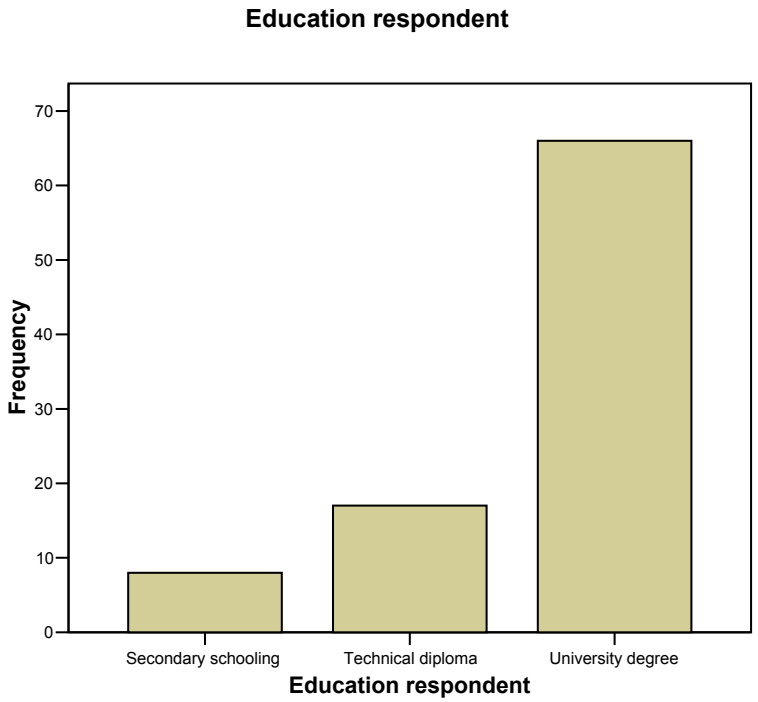
Corporate governance

		Frequency	Percent	Cumulative Percent
Valid	1: Most important	20	22.0	22.0
	2: Least important	71	78.0	100.0
	Total	91	100.0	

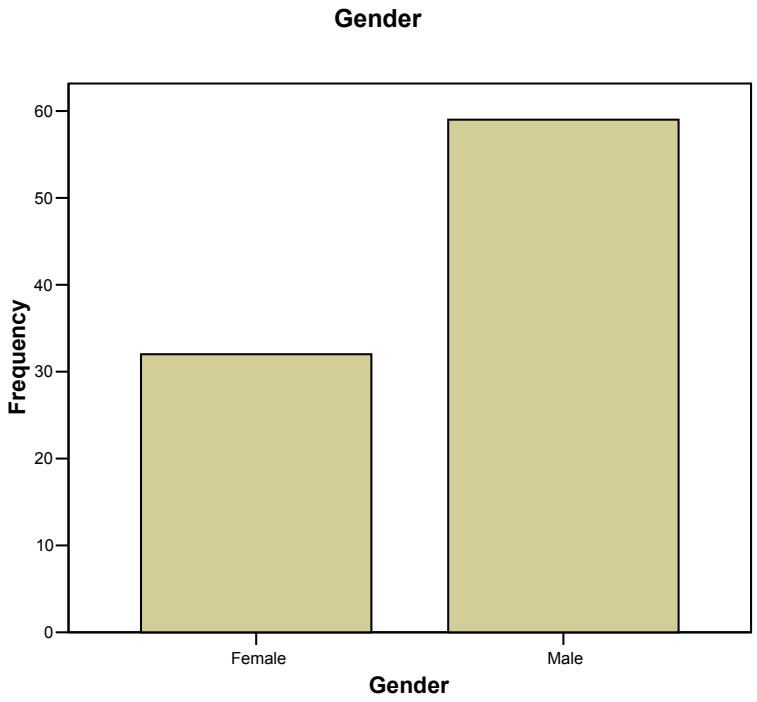
Bar Chart

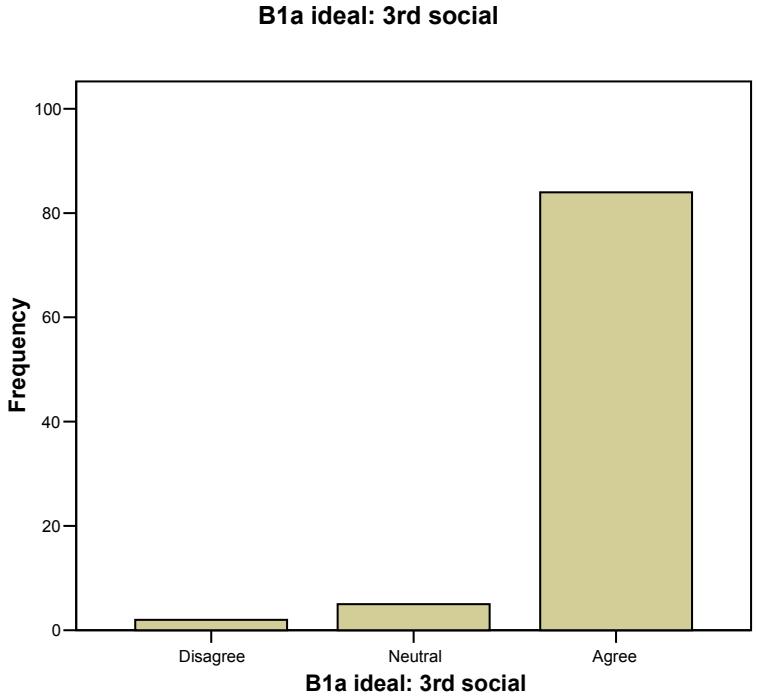

SWRM is complex
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
SWRM is complex

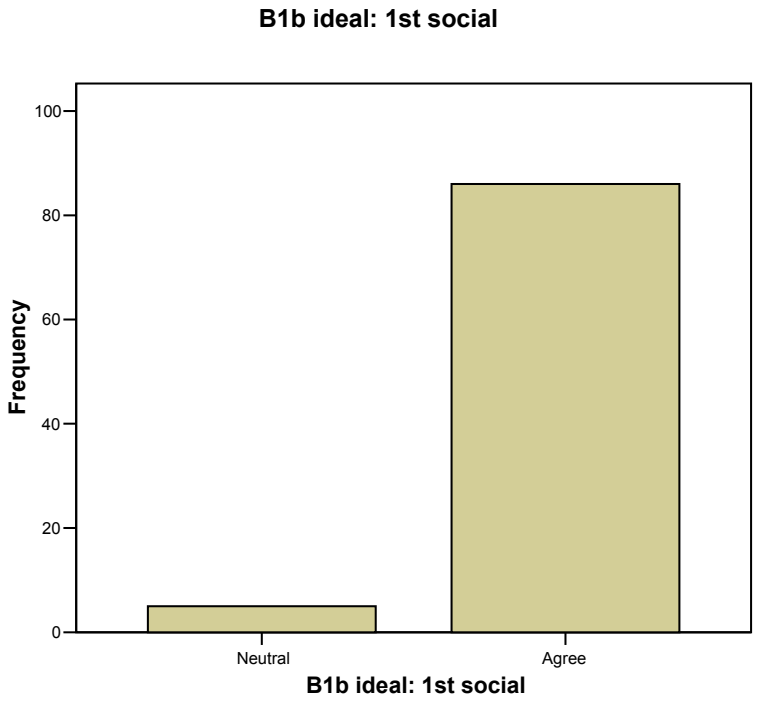

Occupation respondent
50
40
30
20
10
0
Frequency
Waste companies
Government
Other companies
Occupation respondent

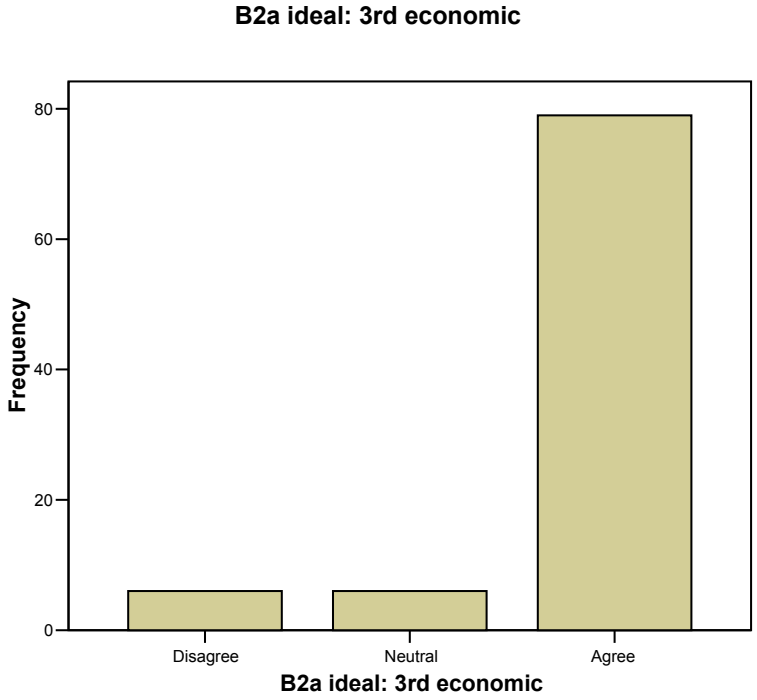

Education respondent
70
60
50
40
30
20
10
0
Frequency
Secondary schooling
Technical diploma
University degree
Education respondent

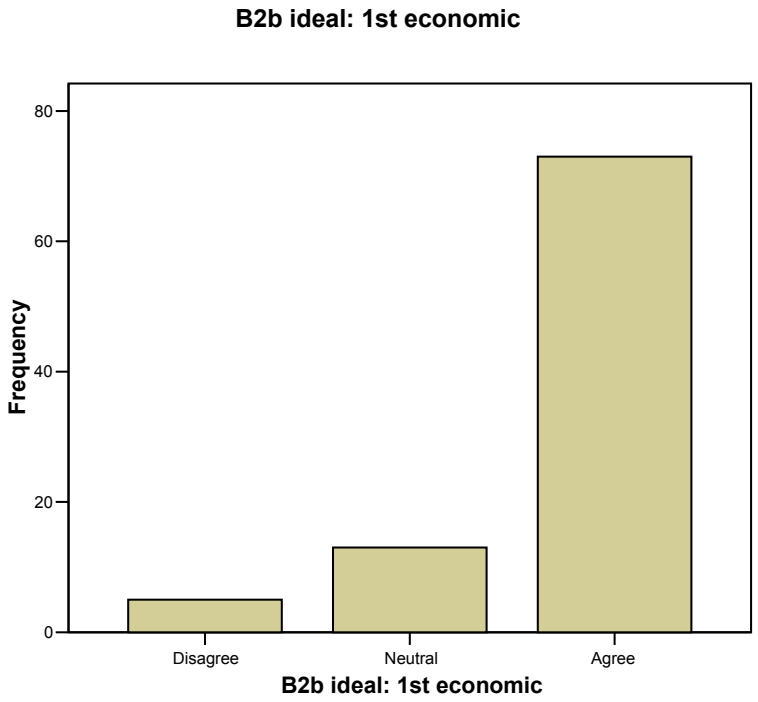

Years work experience
50
40
30
20
10
0
Frequency
2 to 10 years
11 to 19 years
20 years and more
Years work experience

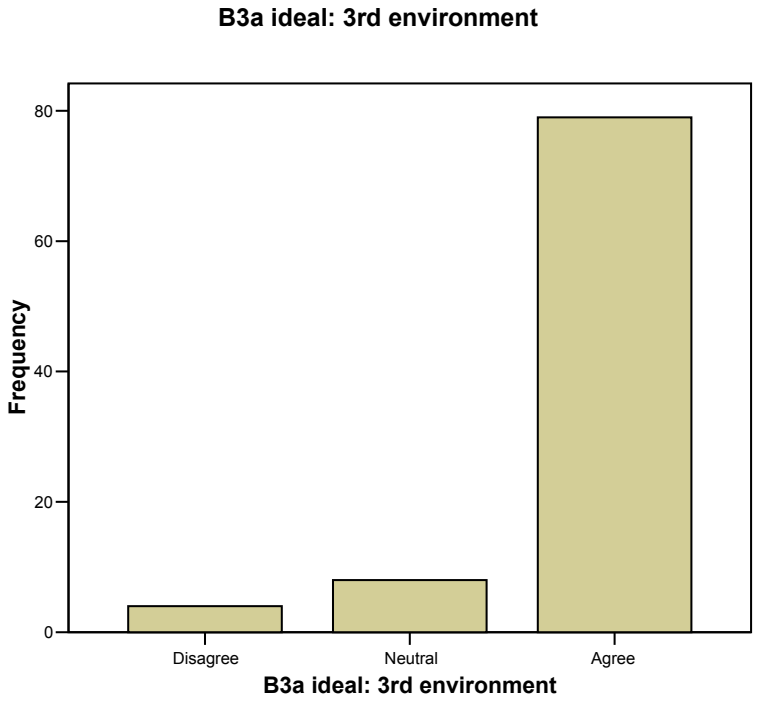

Gender
60
50
40
30
20
10
0
Frequency
Female
Male
Gender

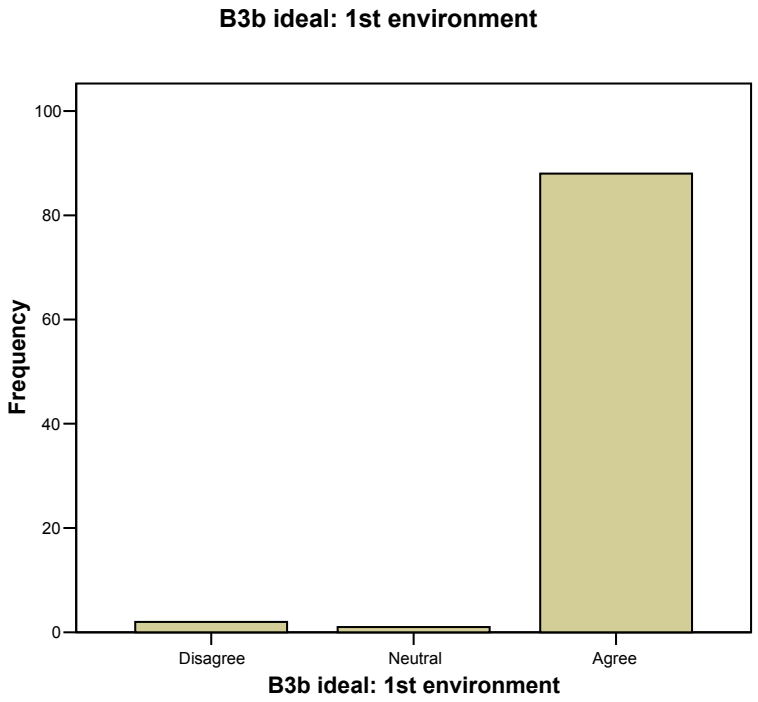

B1a ideal: 3rd social
100
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B1a ideal: 3rd social

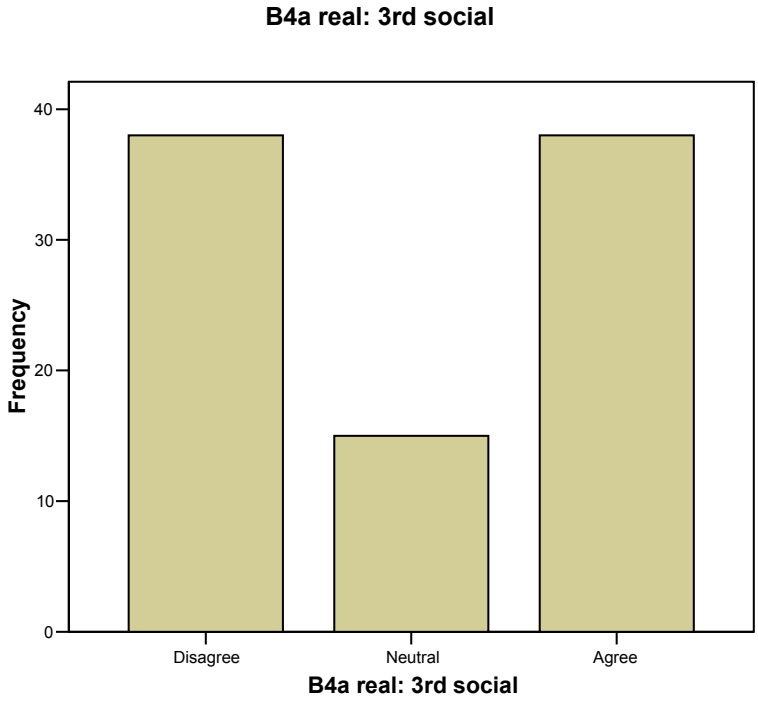

B1b ideal: 1st social
100
80
60
40
20
0
Frequency
Neutral
Agree
B1b ideal: 1st social

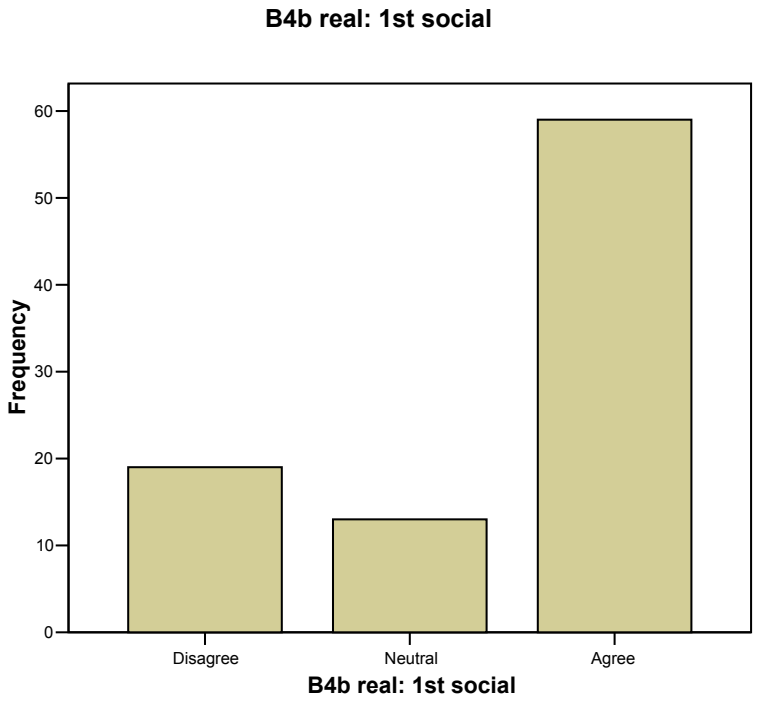

B2a ideal: 3rd economic
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B2a ideal: 3rd economic

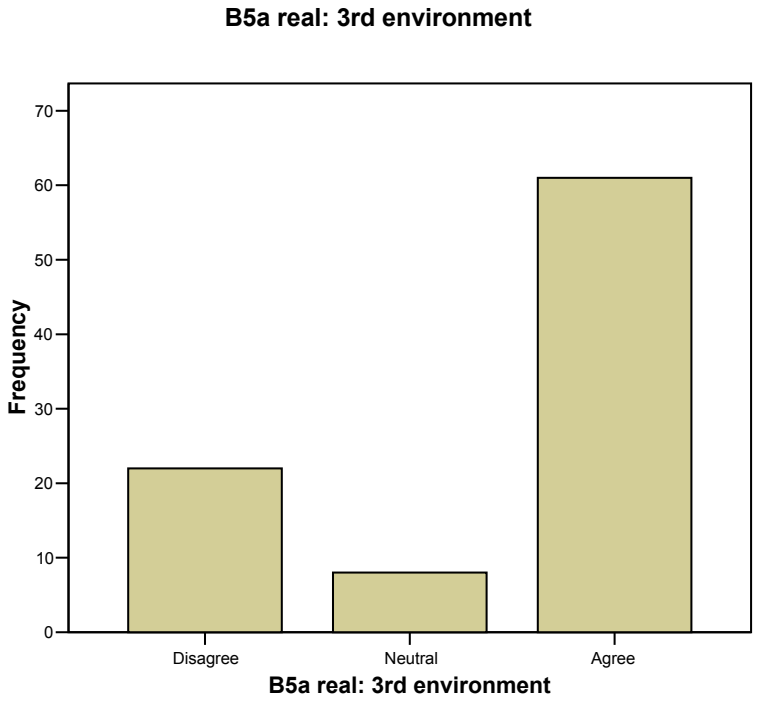

B2b ideal: 1st economic
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B2b ideal: 1st economic

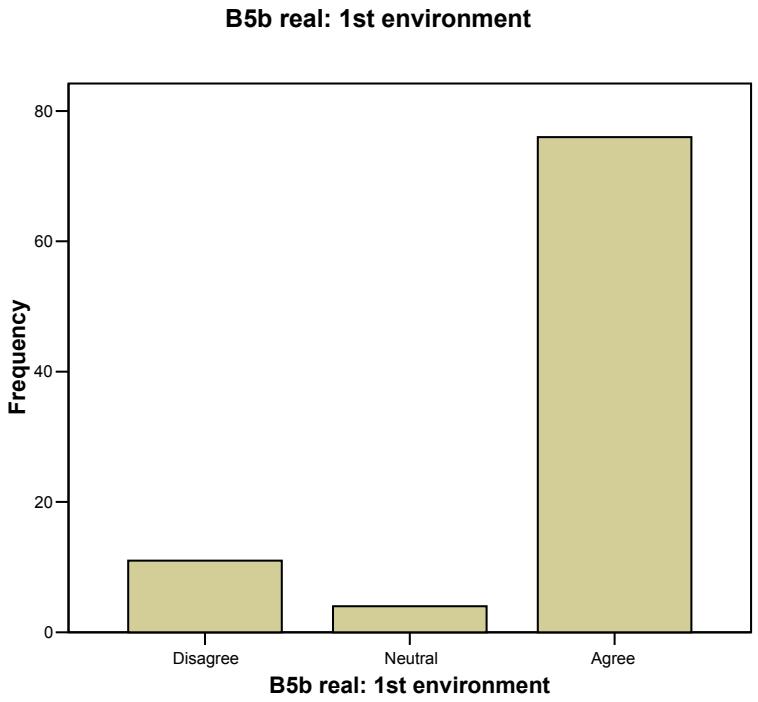

B3a ideal: 3rd environment
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B3a ideal: 3rd environment

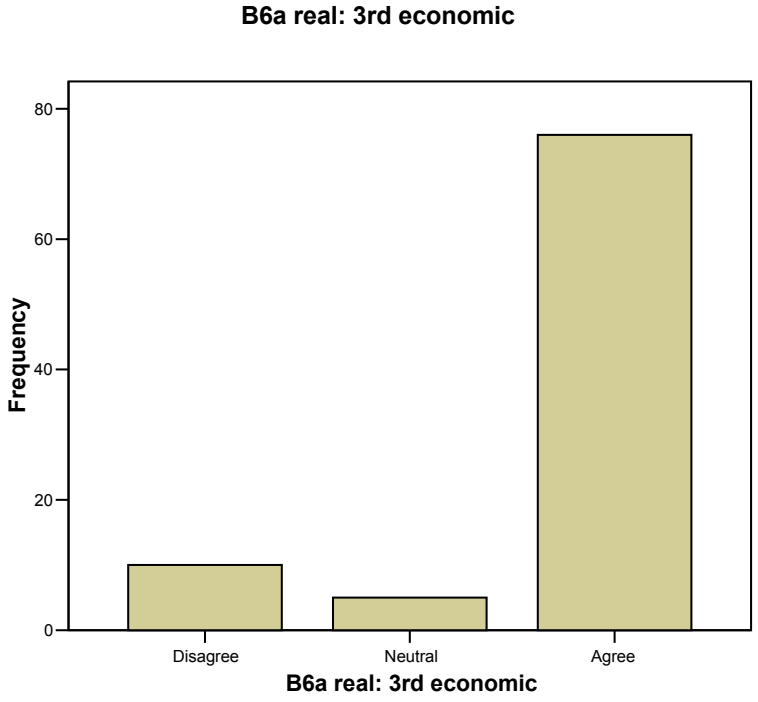

B3b ideal: 1st environment
100
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B3b ideal: 1st environment

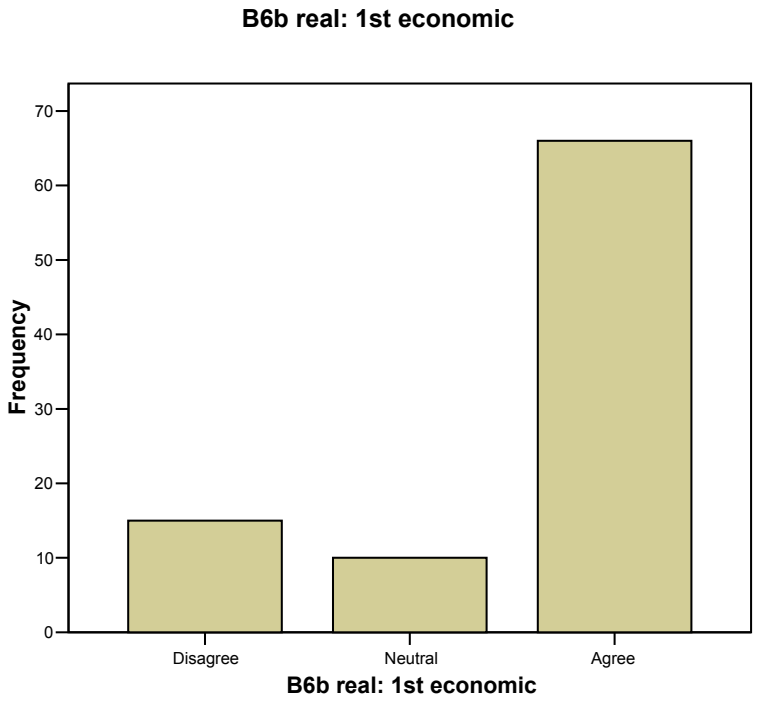

B4a real: 3rd social
40
30
20
10
0
Frequency
Disagree
Neutral
Agree
B4a real: 3rd social

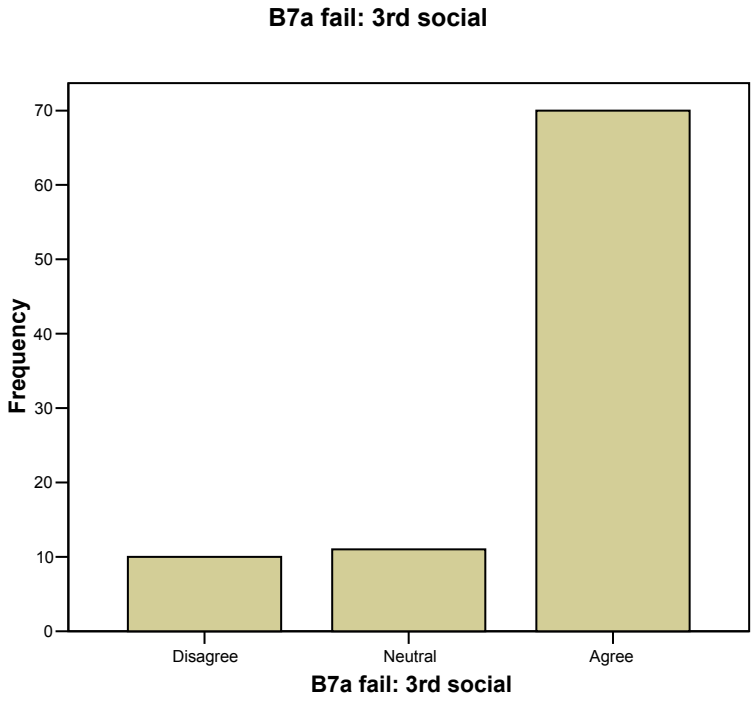

B4b real: 1st social
Frequency
60
50
40
30
20
10
0
Disagree
Neutral
Agree
B4b real: 1st social

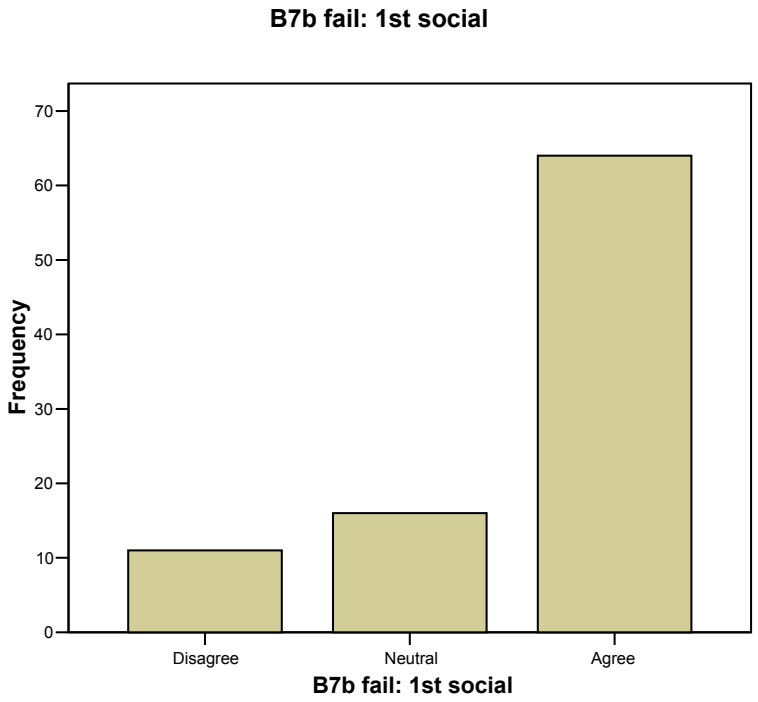

B5a real: 3rd environment
Frequency
70
60
50
40
30
20
10
0
Disagree
Neutral
Agree
B5a real: 3rd environment

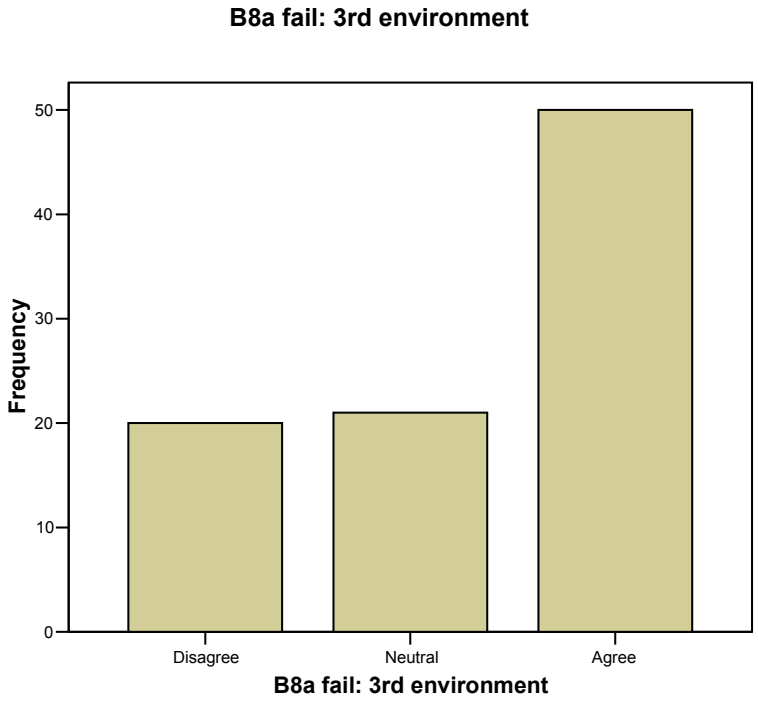

B5b real: 1st environment
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B5b real: 1st environment

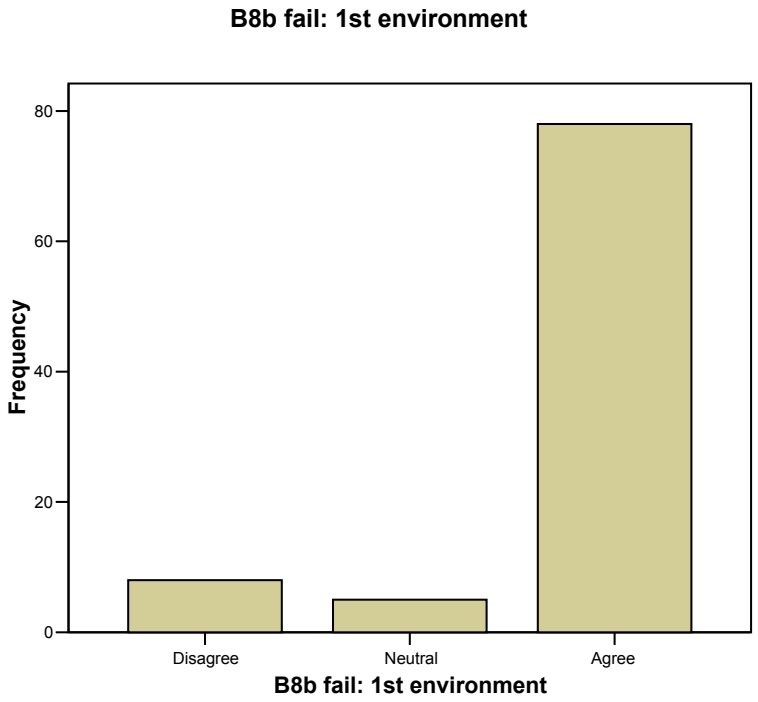

B6a real: 3rd economic
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B6a real: 3rd economic

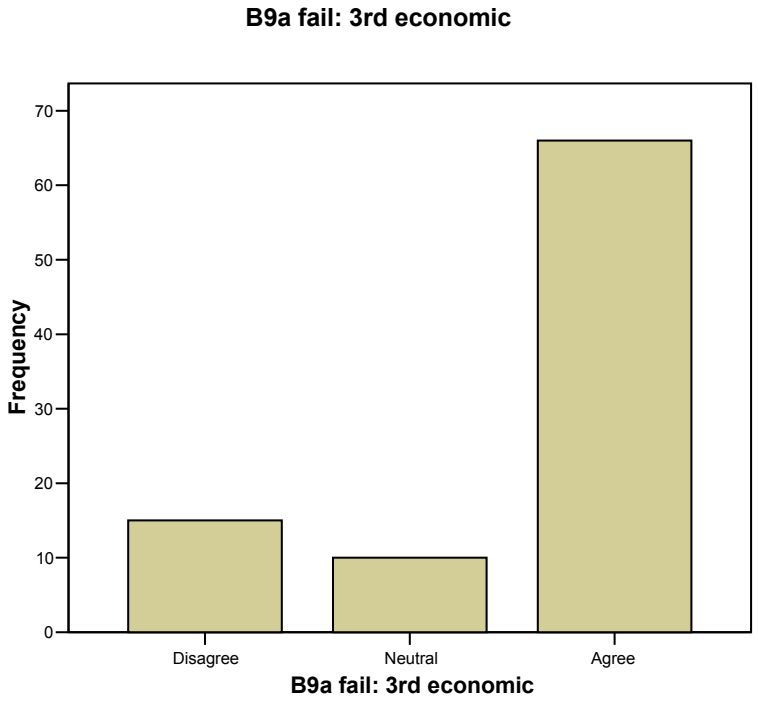

B6b real: 1st economic
Frequency
70
60
50
40
30
20
10
0
Disagree
Neutral
Agree
B6b real: 1st economic

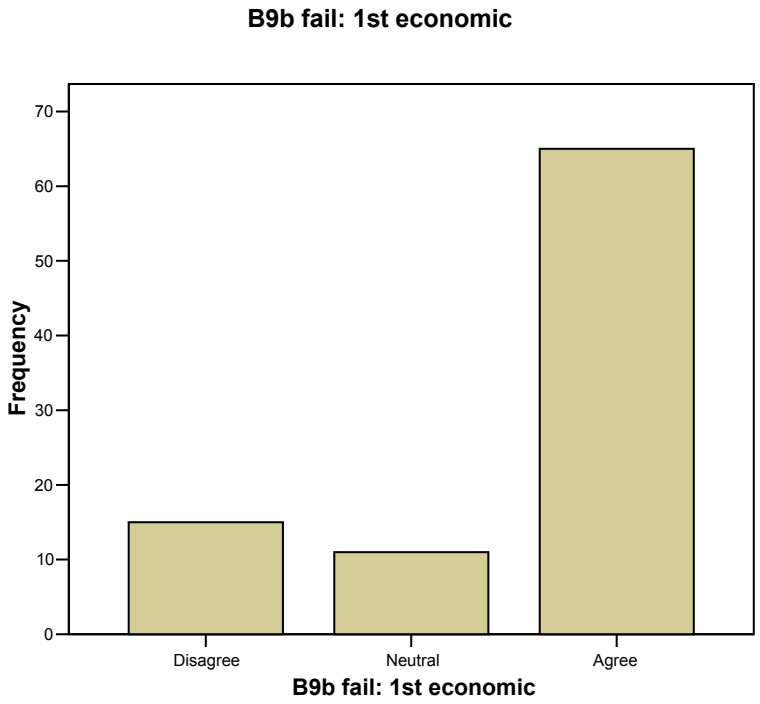

B7a fail: 3rd social
Frequency
70
60
50
40
30
20
10
0
Disagree
Neutral
Agree
B7a fail: 3rd social


B7b fail: 1st social
70
60
50
40
30
20
10
0
Frequency
Disagree
Neutral
Agree
B7b fail: 1st social

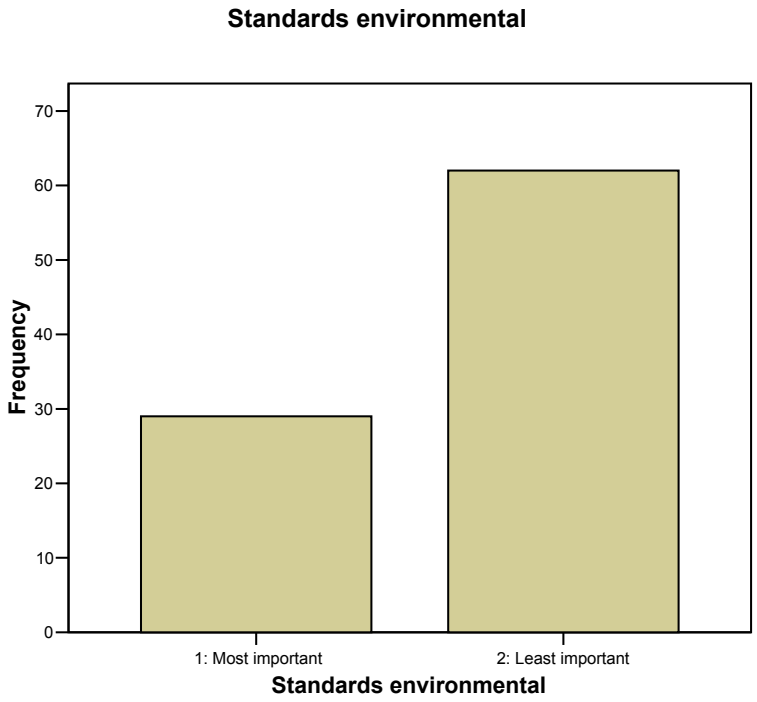

B8a fail: 3rd environment
50
40
30
20
10
0
Frequency
Disagree
Neutral
Agree
B8a fail: 3rd environment

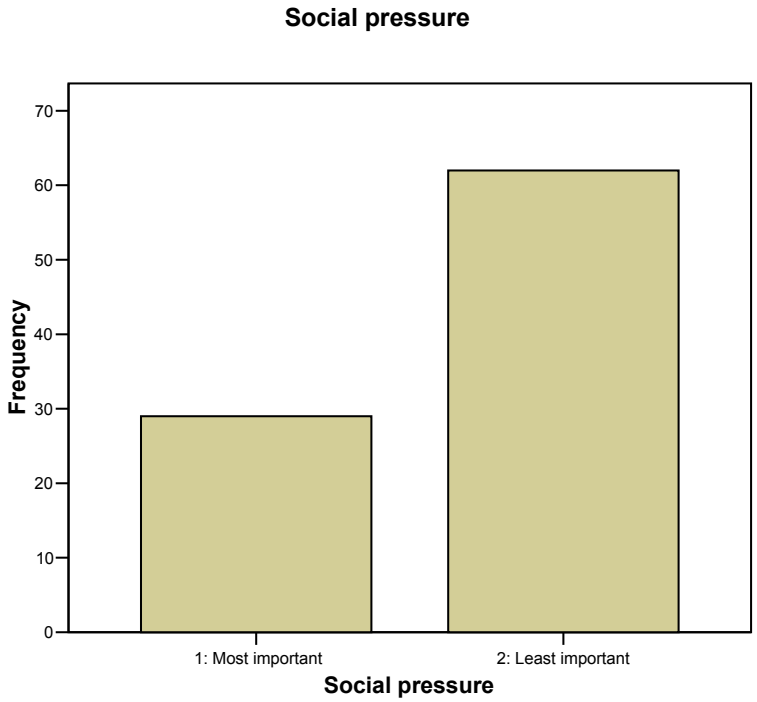

B8b fail: 1st environment
80
60
40
20
0
Frequency
Disagree
Neutral
Agree
B8b fail: 1st environment

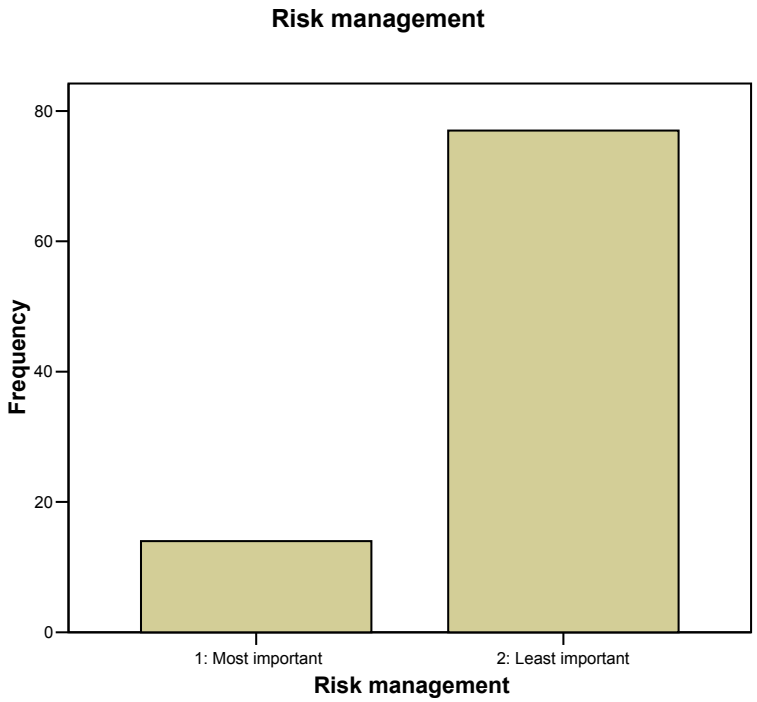

B9a fail: 3rd economic
70
60
50
40
30
20
10
0
Frequency
Disagree
Neutral
Agree
B9a fail: 3rd economic

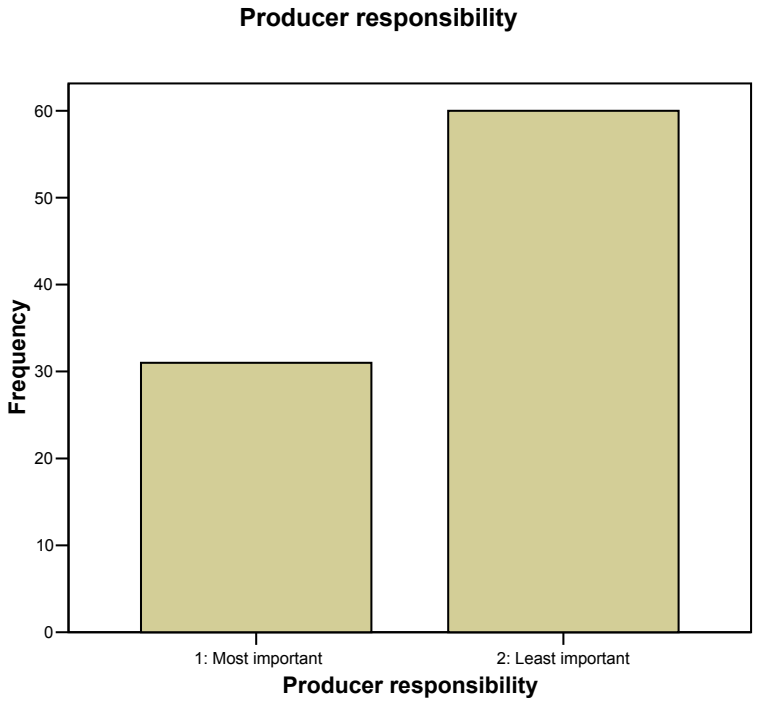

B9b fail: 1st economic
70
60
50
40
30
20
10
0
Frequency
Disagree
Neutral
Agree
B9b fail: 1st economic

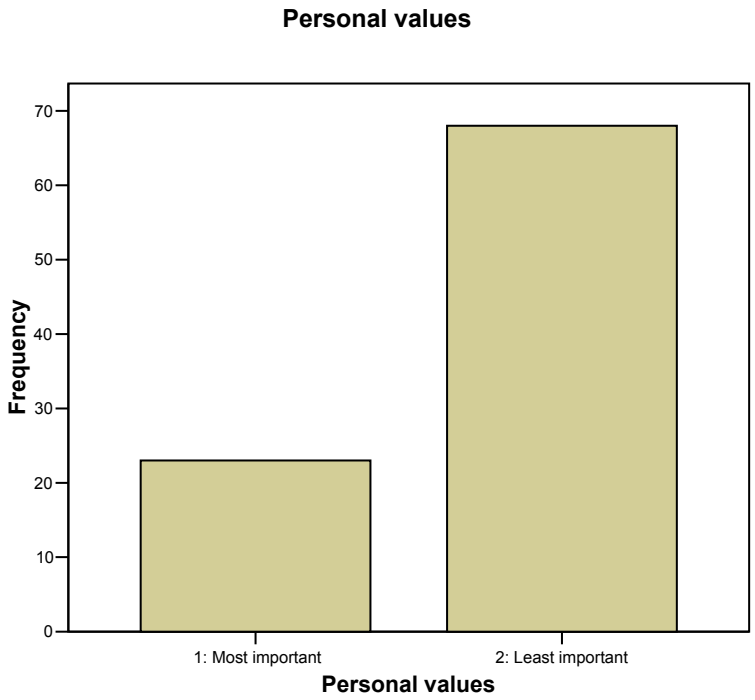

Value of waste
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Value of waste

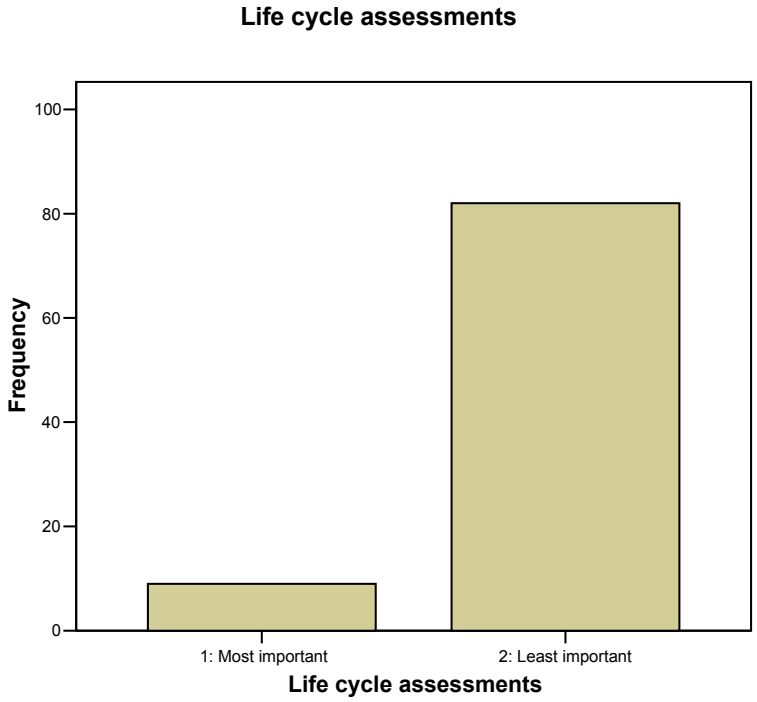

Standards environmental
Frequency
70
60
50
40
30
20
10
0
1: Most important
2: Least important
Standards environmental

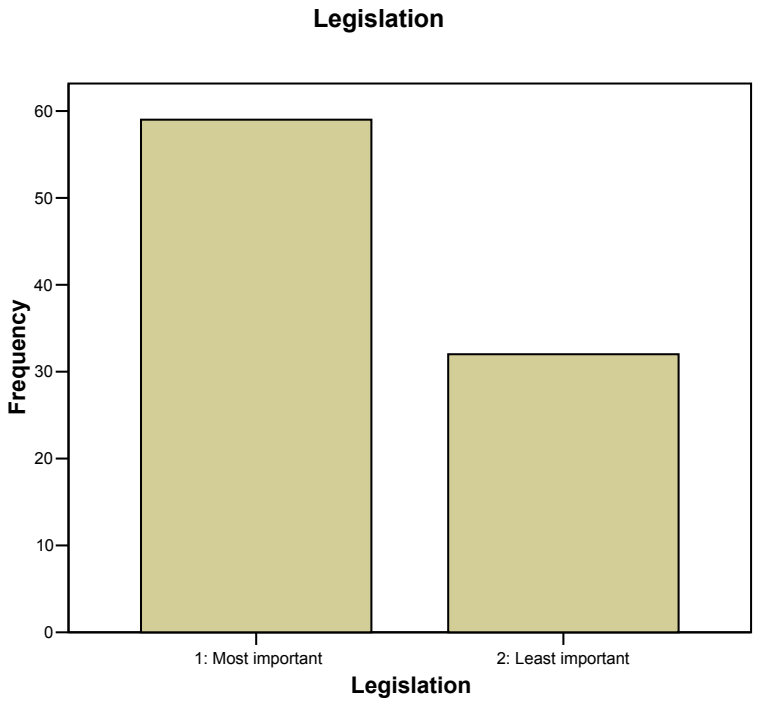

Social pressure
Frequency
70
60
50
40
30
20
10
0
1: Most important
2: Least important
Social pressure

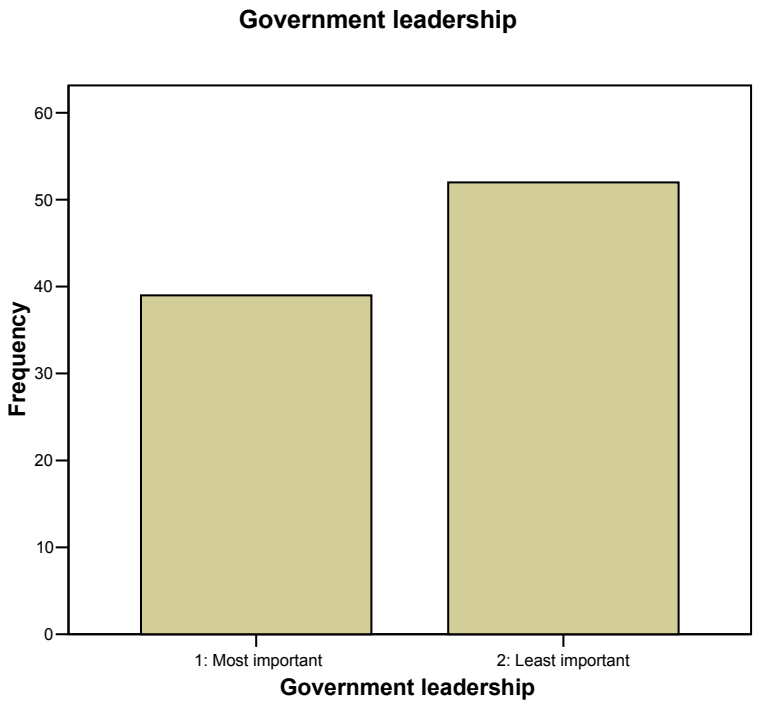

Risk management
80
60
40
20
0
Frequency
1: Most important
2: Least important
Risk management

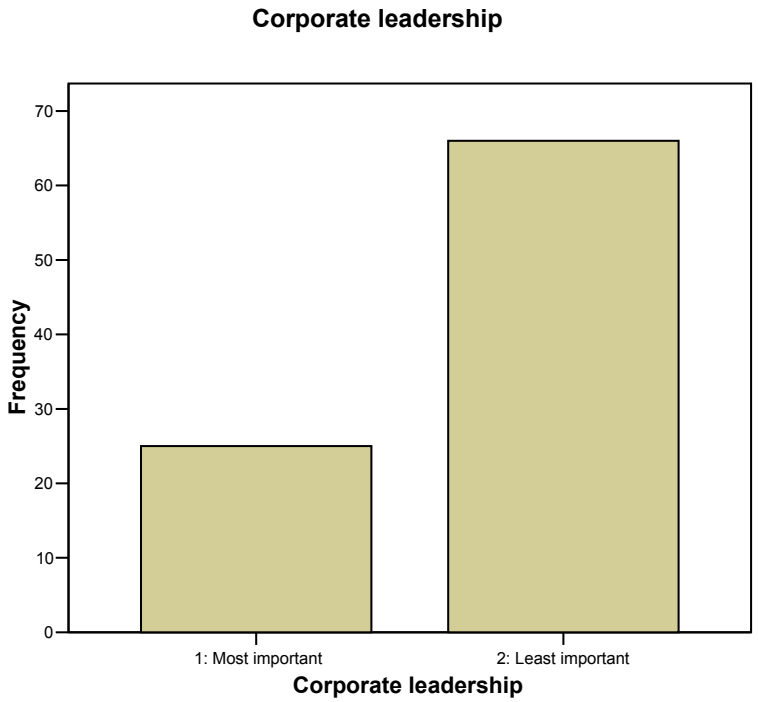

Producer responsibility
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Producer responsibility

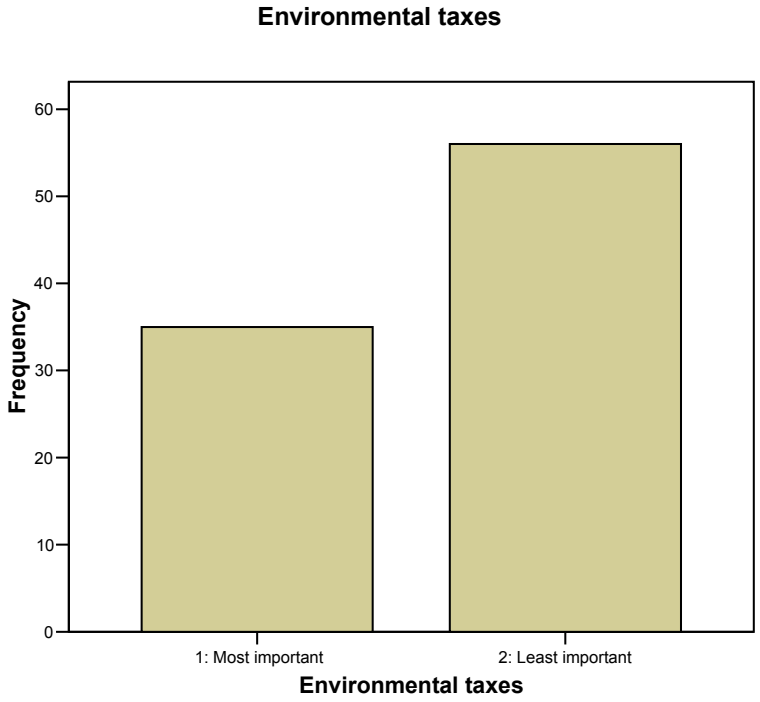

Personal values
70
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Personal values

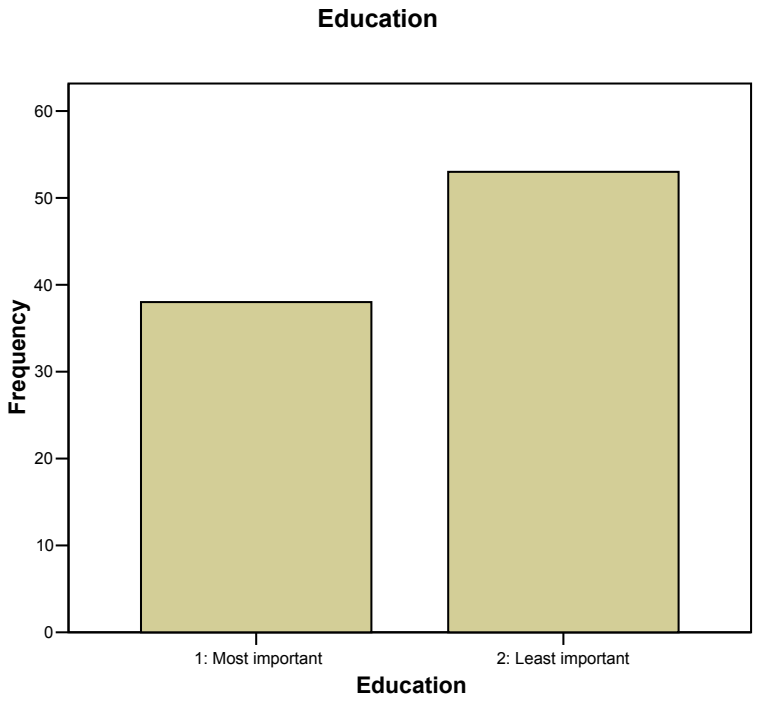

Life cycle assessments
100
80
60
40
20
0
Frequency
1: Most important
2: Least important
Life cycle assessments

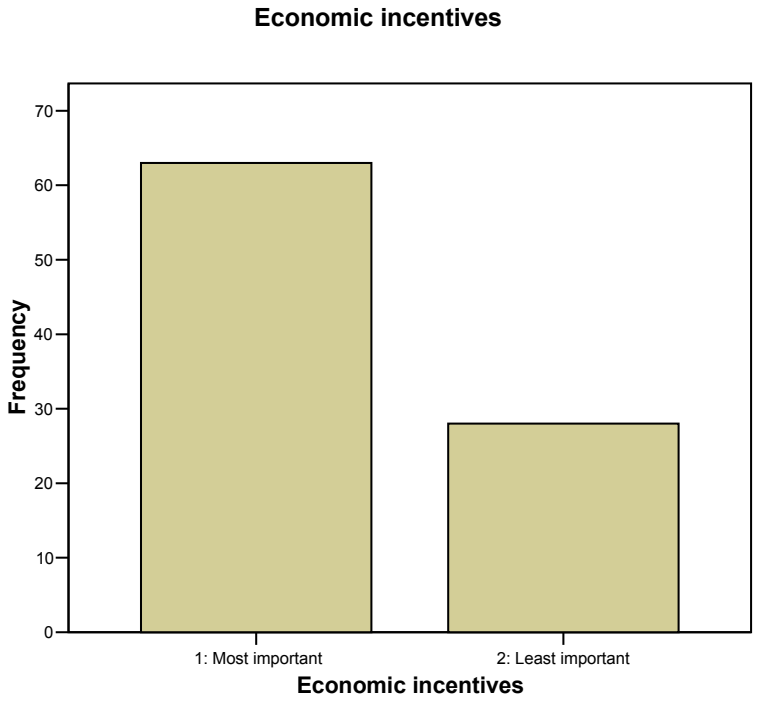

Legislation
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Legislation

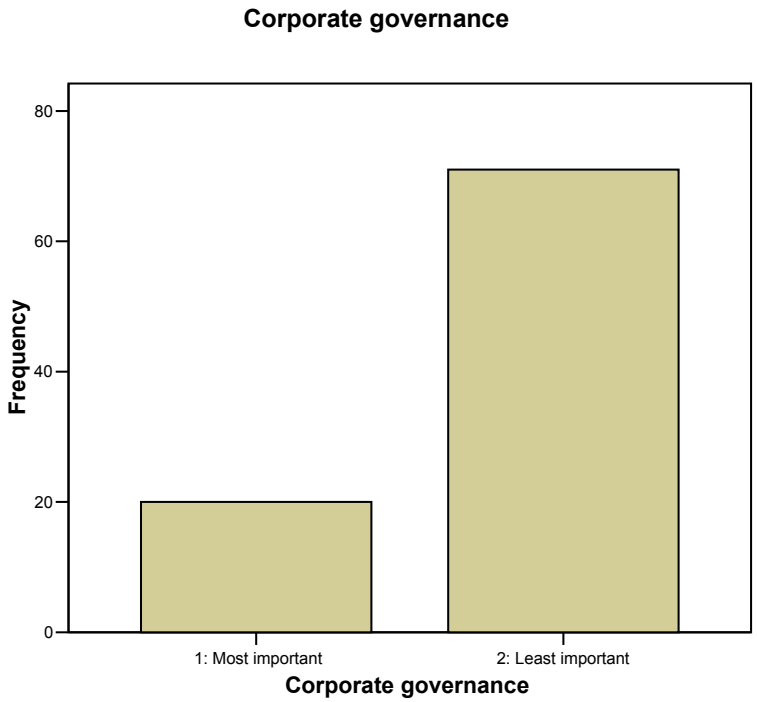

Government leadership
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Government leadership


Corporate leadership
70
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Corporate leadership


Environmental taxes
60
50
40
30
20
10
0
Frequency
1: Most important
2: Least important
Environmental taxes


Education
Frequency
60
50
40
30
20
10
0
1: Most important
2: Least important
Education


Economic incentives
Frequency
70
60
50
40
30
20
10
0
1: Most important
2: Least important
Economic incentives



Appendix I:

I. Data table: means and cluster calculations on un-recoded data

Refer to next page for complete list of data.

ID	A1_ complex	A2_ occupation	A3_ education	A4_ work_yrs	A5_ gender	B1a_ideal_ 3rd_soc	B1b_ideal_ 1st_soc	B2a_ideal_ 3rd_econ	B2b_ideal_ 1st_econ	B3a_ideal _ 3rd_env	B3b_ideal_ 1st_env	B4a_real_ 3rd_soc	B4b_real_ 1st_soc
1	5	3	3	3	2	3	5	5	4	2	5	2	4
2	2	1	3	2	1	4	4	4	2	5	5	4	4
3	4	1	2	1	2	4	5	5	1	5	5	2	4
4	2	1	2	1	2	5	5	5	5	5	5	5	5
5	5	2	3	1	1	5	5	5	5	5	5	4	4
6	4	1	3	1	1	5	5	5	4	4	5	4	2
7	4	2	3	1	2	5	5	4	5	5	5	1	2
8	4	3	3	1	2	5	5	2	5	5	5	1	2
9	1	1	3	3	2	5	5	4	4	1	5	4	4
10	5	3	2	1	2	5	4	5	5	5	5	2	4
11	4	3	2	3	2	5	5	5	5	4	5	5	5
12	5	1	3	1	2	4	5	5	4	5	5	2	4
13	5	2	3	3	2	5	5	5	5	5	5	2	3
14	4	3	2	2	1	5	5	5	5	5	5	5	5
15	5	1	3	3	2	5	5	5	5	4	4	3	3
16	4	1	1	2	1	4	5	2	4	5	5	3	4
17	4	1	3	2	2	5	5	5	3	4	5	2	5
18	3	1	2	1	2	5	5	5	5	3	3	4	4
19	4	2	3	3	2	5	5	2	4	4	5	4	5
20	5	1	3	3	2	5	5	5	5	5	5	5	5
21	4	2	3	2	2	5	5	5	5	5	5	2	5
22	4	3	3	3	2	5	4	5	4	5	5	2	2
23	2	1	3	2	1	4	4	4	2	4	5	2	5
24	4	1	3	3	2	4	5	4	3	5	5	3	4
25	4	3	3	3	2	2	5	4	5	5	5	1	4
26	4	3	3	3	2	5	5	2	4	5	5	2	2
27	4	3	2	2	2	5	3	5	4	5	4	4	3
28	5	3	3	1	1	5	5	5	5	5	5	2	4
29	4	1	3	3	2	5	5	5	4	5	5	5	5
30	4	3	3	3	2	4	4	5	5	4	4	4	4
31	4	3	1	1	2	5	5	5	5	4	5	3	4
32	5	2	3	1	1	5	5	5	5	5	5	4	4
33	5	1	3	2	2	5	4	4	4	4	4	5	3
34	4	1	3	1	1	5	5	4	5	5	5	4	4
35	5	1	3	3	1	5	5	5	5	5	5	1	4
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37	5	1	3	1	1	4	5	4	3	4	5	2	3
38	5	1	3	3	2	5	5	5	5	5	5	5	5
39	4	1	3	2	2	5	5	3	5	3	4	2	5
40	5	1	3	3	2	5	5	5	5	5	5	4	4
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42	5	1	3	3	1	5	5	5	5	5	5	5	5
43	4	1	3	2	2	4	4	4	3	5	5	2	2
44	4	1	3	3	1	5	5	5	5	5	5	2	4
45	2	1	3	3	2	3	3	5	5	5	5	2	2
46	2	3	3	3	2	4	5	4	4	5	5	3	3
47	4	1	3	3	2	5	5	3	4	5	5	4	2
48	4	1	2	3	2	5	3	5	3	5	5	3	3
49	5	3	2	3	2	4	5	4	4	5	5	4	5
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56	5	2	1	3	1	4	4	4	5	5	5	2	2
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60	5	3	2	2	2	4	5	5	5	5	5	5	5
61	4	2	3	3	2	4	3	4	2	5	5	5	3
62	4	1	3	1	1	5	4	5	4	4	5	3	2
63	2	1	3	1	2	4	4	4	4	4	5	1	1
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66	4	1	3	1	1	4	4	5	4	4	5	3	3
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68	3	3	1	2	1	4	5	4	5	4	5	1	4
69	3	2	3	3	2	5	5	4	3	5	5	4	4
70	5	3	3	1	1	5	5	5	5	5	5	2	2
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73	5	3	3	3	2	2	5	5	5	2	5	2	4
74	5	1	2	1	2	5	5	5	5	5	5	5	5
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76	5	3	3	3	1	3	5	5	5	5	5	1	4
77	4	3	3	2	2	5	5	3	3	5	5	5	5
78	5	1	1	3	1	4	5	4	5	4	5	4	4
79	5	1	1	2	1	4	4	5	4	5	5	2	2
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86	5	1	3	3	2	4	4	4	5	5	5	3	4
87	5	3	2	3	1	5	5	5	5	5	5	5	5
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89	5	3	3	3	2	4	4	4	4	5	5	2	2
90	4	2	3	3	2	5	5	5	5	5	5	2	2
91	5	3	3	2	2	5	5	5	5	5	5	5	5

ID	B5a_real_ 3rd_env	B5b_real_ 1st_env	B6a_real_ 3rd_econ	B6b_real_ 1st_econ	B7a_fail_ 3rd_soc	B7b_fail_ 1st_soc	B8a_fail_ 3rd_env	B8b_fail_ 1st_env	B9a_fail_ 3rd_econ	B9b_fail_ 1st_econ
1	2	5	5	3	2	4	2	5	4	3
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3	5	5	5	1	2	1	5	5	5	1
4	5	5	5	4	4	4	5	5	4	4
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6	2	4	5	4	5	4	4	5	1	4
7	3	2	4	5	3	4	4	4	4	4
8	1	1	5	4	2	5	2	4	5	4
9	1	4	5	2	5	4	3	4	4	4
10	2	4	5	3	4	1	1	1	1	4
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12	5	5	5	5	2	4	4	5	5	5
13	2	5	4	2	5	5	2	5	4	2
14	5	5	4	4	4	5	4	4	4	4
15	2	2	5	5	5	5	3	3	5	5
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23	2	4	5	2	4	3	2	4	4	2
24	4	5	3	2	4	5	2	4	4	4
25	5	5	4	5	4	4	4	4	4	4
26	2	2	1	1	4	4	3	4	1	1
27	5	3	5	4	4	3	4	3	1	3
28	4	4	5	4	5	4	4	5	2	2
29	5	5	4	4	4	5	4	5	5	5
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71	4	5	5	4	3	3	4	5	3	3
72	4	5	5	3	2	4	3	5	5	5
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75	4	4	5	5	4	2	3	4	5	5
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87	5	5	2	2	5	5	4	4	5	5
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89	4	4	2	2	2	2	2	2	2	2
90	5	5	5	5	5	5	5	5	2	2
91	5	5	5	5	5	5	1	1	4	4

ID	Value_ of_waste	Standards	Social_ pressure	Risk_ management	Producer_ responsibility	Personal_ values	Life_cycle_ assessments	Legislation	Government_ leadership	Corporate_ leadership	Environmental _ taxes	Education	Economic_ incentives	Corporate_ governance
1	8	14	13	12	5	6	11	9	3	4	10	1	7	2
2	14	13	4	8	12	11	10	3	5	6	2	9	1	7
3	1	2	13	3	7	14	12	4	8	10	5	11	6	9
4	4	3	9	13	5	12	14	2	6	11	1	7	8	10
5	6	4	2	9	10	11	7	1	12	14	8	3	5	13
6	5	3	6	13	8	14	11	1	2	10	9	7	4	12
7	3	10	12	11	4	14	9	8	7	13	5	2	6	1
8	11	10	13	12	6	5	14	4	7	8	2	3	1	9
9	2	5	7	13	10	8	14	4	6	12	3	9	1	11
10	7	6	12	11	10	14	13	5	8	9	4	3	2	1
11	3	4	10	9	1	8	2	14	7	12	13	6	5	11
12	7	3	12	11	4	14	13	2	1	9	6	10	5	8
13	5	12	6	8	4	1	10	7	11	13	9	2	3	14
14	2	8	14	9	10	13	12	7	1	4	6	11	5	3
15	1	9	6	12	8	5	10	3	14	11	2	7	4	13
16	5	6	7	2	3	14	1	10	12	9	4	13	11	8
17	10	4	9	3	12	8	5	2	1	7	14	13	11	6
18	3	2	6	9	13	5	12	4	8	14	7	11	1	10
19	10	11	3	8	12	9	7	1	6	14	2	5	4	13
20	5	2	13	12	11	4	14	3	1	9	8	5	7	10
21	1	12	5	11	10	2	9	8	6	13	7	4	3	14
22	4	10	1	13	9	2	14	3	6	7	12	5	8	11
23	7	6	14	4	3	13	5	8	9	1	12	11	10	2
24	6	7	5	8	9	10	14	2	3	13	11	4	1	12
25	13	10	9	11	5	6	7	8	1	2	12	4	14	3
26	14	9	2	13	10	3	12	5	1	6	8	4	7	11
27	3	5	5	1	1	3	3	5	1	1	1	5	3	1
28	2	8	9	5	7	14	6	4	12	11	3	10	1	13
29	4	3	9	11	10	12	14	1	2	8	6	13	5	7
30	2	6	9	8	10	11	12	3	5	7	4	13	1	14
31	12	9	7	8	13	14	11	6	5	2	10	3	1	4
32	6	4	5	7	9	12	8	3	13	14	2	10	1	11
33	5	10	12	6	9	11	14	1	4	7	3	8	2	13
34	9	7	6	13	8	14	12	2	5	11	4	3	1	10
35	3	9	10	11	8	12	13	7	1	5	6	4	2	14
36	9	8	7	11	10	12	14	2	1	3	5	6	13	4
37	3	12	7	8	4	6	10	2	14	11	9	5	1	13
38	1	5	4	14	2	6	13	3	12	10	7	11	8	9
39	12	14	13	8	3	11	10	1	9	6	4	5	2	7
40	11	12	4	13	3	10	14	2	5	1	6	7	8	9
41	1	13	14	12	11	9	10	7	4	5	3	8	2	6
42	3	6	13	14	12	9	7	5	2	10	8	1	4	11
43	5	8	13	9	7	14	4	1	12	10	3	6	2	11
44	1	9	4	5	10	3	14	7	6	14	8	11	2	12
45	2	3	5	6	4	7	12	13	14	9	10	11	1	8
46	4	10	1	12	13	11	14	7	2	6	5	8	3	9
47	5	13	7	10	6	1	12	2	14	9	3	8	4	11
48	3	13	8	12	10	11	14	4	5	5	9	1	2	7
49	11	7	1	10	14	2	4	6	5	13	8	3	9	13
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53	5	11	12	10	4	3	10	13	9	7	2	6	1	8
54	2	3	8	5	4	9	6	10	12	11	14	7	1	13
55	1	10	6	12	11	5	13	2	9	7	8	4	3	14
56	4	12	7	11	3	6	14	1	9	8	10	5	2	13
57	4	11	1	13	8	7	14	3	2	10	12	6	5	9
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61	2	5	6	10	7	8	11	4	9	13	14	1	3	12
62	2	9	1	13	4	14	8	12	7	5	11	6	3	10
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67	7	9	10	11	2	12	8	6	1	2	5	13	4	3
68	13	4	14	1	9	12	11	8	7	5	10	6	3	2
69	4	2	10	14	9	8	13	7	11	5	1	3	6	12
70	13	2	14	11	1	1	6	5	4	8	10	3	7	9
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73	4	5	7	12	9	6	13	1	11	8	3	14	2	10
74	1	2	3	9	2	5	7	1	1	1	2	9	7	1
75	2	7	13	11	3	12	14	6	4	5	10	8	1	9
76	8	6	7	9	14	1	4	3	2	5	10	13	12	11
77	9	8	4	5	7	14	6	1	12	2	11	13	10	3
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81	3	13	12	11	2	1	4	10	9	6	14	8	7	5
82	2	11	4	10	5	9	8	6	7	13	14	1	3	12
83	4	6	5	11	10	3	14	7	9	12	8	2	1	13
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85	3	10	2	14	6	1	11	9	8	13	5	7	4	12
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87	14	3	8	2	12	9	13	4	1	11	7	5	6	10
88	4	13	3	14	9	12	11	2	1	5	8	7	10	6
89	13	5	6	14	9	3	10	4	1	7	12	2	11	8
90	2	5	6	12	1	9	13	3	14	11	10	4	7	8
91	7	6	13	5	1	11	10	12	2	3	14	9	8	4

ID	Ideal	Real	Fail	social	economic	environ	first	third	averank	QCL_1
1	4.00	3.50	3.33	3.33	4.00	3.50	4.22	3.00	3.61	3
2	4.00	3.83	3.00	3.67	3.17	4.00	3.22	4.00	3.61	2
3	4.17	3.67	3.17	3.00	3.00	5.00	3.11	4.22	3.67	2
4	5.00	4.83	4.33	4.67	4.50	5.00	4.67	4.78	4.72	2
5	5.00	4.67	5.00	4.67	5.00	5.00	4.89	4.89	4.89	1
6	4.67	3.50	3.83	4.17	3.83	4.00	4.11	3.89	4.00	2
7	4.83	2.83	3.83	3.33	4.33	3.83	4.00	3.67	3.83	2
8	4.50	2.33	3.67	3.33	4.17	3.00	3.89	3.11	3.50	2
9	4.00	3.33	4.00	4.50	3.83	3.00	4.00	3.56	3.78	1
10	4.83	3.33	2.00	3.33	3.83	3.00	3.44	3.33	3.39	2
11	4.83	3.83	4.17	4.67	4.67	3.50	4.11	4.44	4.28	3
12	4.67	4.33	4.17	3.50	4.83	4.83	4.67	4.11	4.39	2
13	5.00	3.00	3.83	4.17	3.67	4.00	4.11	3.78	3.94	1
14	5.00	4.67	4.17	4.83	4.33	4.67	4.67	4.56	4.61	2
15	4.67	3.33	4.33	4.33	5.00	3.00	4.11	4.11	4.11	1
16	4.17	4.50	4.67	4.33	4.00	5.00	4.67	4.22	4.44	3
17	4.50	3.67	3.67	4.17	3.67	4.00	4.44	3.44	3.94	3
18	4.33	3.50	4.00	4.50	4.50	2.83	4.00	3.89	3.94	1
19	4.17	4.00	4.33	4.83	3.17	4.50	4.67	3.67	4.17	1
20	5.00	4.83	4.00	4.83	4.67	4.33	4.44	4.78	4.61	2
21	5.00	3.83	4.33	4.50	4.67	4.00	5.00	3.78	4.39	1
22	4.67	3.67	4.33	3.50	4.33	4.83	4.11	4.33	4.22	1
23	3.83	3.33	3.17	3.67	3.17	3.50	3.44	3.44	3.44	3
24	4.33	3.50	3.83	4.17	3.33	4.17	4.11	3.67	3.89	1
25	4.33	4.00	4.00	3.33	4.33	4.67	4.56	3.67	4.11	3
26	4.33	1.67	2.83	3.67	1.67	3.50	3.11	2.78	2.94	2
27	4.33	4.00	3.00	3.67	3.67	4.00	3.33	4.22	3.78	3
28	5.00	3.83	3.67	4.17	3.83	4.50	4.22	4.11	4.17	1
29	4.83	4.67	4.67	4.83	4.50	4.83	4.78	4.67	4.72	2
30	4.33	4.00	3.67	3.33	5.00	3.67	4.00	4.00	4.00	2
31	4.83	3.50	3.67	4.50	3.83	3.67	4.22	3.78	4.00	2
32	5.00	4.67	4.00	4.67	4.00	5.00	4.56	4.56	4.56	1
33	4.17	4.33	4.50	4.17	4.33	4.50	4.11	4.56	4.33	2
34	4.83	4.33	4.50	4.33	4.83	4.50	4.56	4.56	4.56	2
35	5.00	2.50	2.67	3.83	3.17	3.17	3.89	2.89	3.39	2
36	3.83	3.50	3.17	3.50	3.00	4.00	3.44	3.56	3.50	2
37	4.17	3.33	3.83	3.83	3.67	3.83	4.00	3.56	3.78	1
38	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	1
39	4.17	4.00	2.83	3.50	3.83	3.67	3.89	3.44	3.67	2
40	5.00	4.67	3.33	4.33	4.00	4.67	4.56	4.11	4.33	2
41	4.33	4.00	4.50	4.50	4.33	4.00	4.22	4.33	4.28	2
42	5.00	4.83	4.17	4.83	4.33	4.83	4.44	4.89	4.67	2
43	4.17	3.67	4.00	3.00	4.17	4.67	3.89	4.00	3.94	2
44	5.00	3.50	4.33	4.00	4.17	4.67	4.56	4.00	4.28	1
45	4.33	3.17	3.17	2.50	4.50	3.67	3.89	3.22	3.56	1
46	4.50	4.00	4.67	4.17	4.00	5.00	4.44	4.33	4.39	2
47	4.50	3.83	4.67	4.00	4.17	4.83	4.22	4.44	4.33	1
48	4.33	3.50	4.00	3.83	3.83	4.17	3.67	4.22	3.94	2
49	4.50	4.83	3.83	4.50	4.00	4.67	4.67	4.11	4.39	1
50	4.00	4.50	3.83	4.33	3.83	4.17	4.44	3.78	4.11	2
51	3.67	3.17	4.50	3.83	2.83	4.67	3.89	3.67	3.78	2
52	4.00	4.50	3.83	4.33	3.83	4.17	4.44	3.78	4.11	2
53	4.00	3.67	4.33	4.33	5.00	2.67	4.00	4.00	4.00	1
54	5.00	4.00	1.00	2.67	3.67	3.67	3.33	3.33	3.33	1
55	4.17	2.83	3.17	3.50	3.50	3.17	3.00	3.78	3.39	1
56	4.50	2.83	4.17	3.50	4.33	3.67	3.89	3.78	3.83	1
57	4.50	3.67	4.17	4.33	3.50	4.50	4.33	3.89	4.11	1
58	5.00	4.83	4.67	5.00	5.00	4.50	5.00	4.67	4.83	1
59	4.33	4.17	4.33	5.00	4.50	3.33	4.33	4.22	4.28	1
60	4.83	5.00	5.00	4.83	5.00	5.00	5.00	4.89	4.94	2
61	3.83	4.17	3.17	3.50	3.33	4.33	3.22	4.22	3.72	1
62	4.50	3.67	3.83	3.83	4.00	4.17	3.89	4.11	4.00	1
63	4.17	3.33	4.17	3.17	4.17	4.33	4.00	3.78	3.89	1
64	4.33	3.67	4.17	3.83	3.67	4.67	4.11	4.00	4.06	1
65	4.33	4.00	3.33	3.50	4.00	4.17	4.00	3.78	3.89	1
66	4.33	3.83	4.17	3.67	4.33	4.33	4.11	4.11	4.11	2
67	5.00	3.00	5.00	4.50	4.00	4.50	4.67	4.00	4.33	3
68	4.50	3.83	4.33	3.33	4.67	4.67	4.44	4.00	4.22	3
69	4.50	3.50	3.50	4.00	4.00	3.50	4.00	3.67	3.83	1
70	5.00	4.00	5.00	4.00	5.00	5.00	4.67	4.67	4.67	3
71	4.67	4.00	3.50	3.50	4.00	4.67	4.11	4.00	4.06	3
72	4.17	4.50	4.00	4.17	4.17	4.33	4.44	4.00	4.22	2
73	4.00	3.33	3.67	3.17	4.67	3.17	4.11	3.22	3.67	1
74	5.00	5.00	4.50	4.67	4.83	5.00	4.78	4.89	4.83	3
75	4.17	4.17	3.83	3.67	4.83	3.67	4.22	3.89	4.06	2
76	4.67	4.17	3.00	3.50	3.67	4.67	4.33	3.56	3.94	3
77	4.33	4.33	2.67	3.67	4.00	3.67	3.78	3.78	3.78	3
78	4.50	4.33	5.00	4.50	4.83	4.50	4.78	4.44	4.61	1
79	4.50	3.67	4.00	3.50	4.00	4.67	3.89	4.22	4.06	1
80	4.17	3.50	4.17	3.33	4.50	4.00	4.22	3.67	3.94	1
81	4.17	2.83	3.67	3.67	3.50	3.50	3.89	3.22	3.56	3
82	5.00	4.00	4.33	4.00	4.33	5.00	4.44	4.44	4.44	1
83	5.00	2.67	4.00	3.67	4.33	3.67	3.89	3.89	3.89	1
84	4.67	4.33	4.67	4.83	4.00	4.83	4.33	4.78	4.56	2
85	4.67	3.83	3.83	3.50	4.67	4.17	4.22	4.00	4.11	1
86	4.50	4.17	4.17	3.83	4.33	4.67	4.67	3.89	4.28	1
87	5.00	4.00	4.67	5.00	4.00	4.67	4.56	4.56	4.56	2
88	4.00	3.33	3.83	3.67	3.67	3.83	3.67	3.78	3.72	2
89	4.33	2.67	2.00	2.67	2.67	3.67	3.00	3.00	3.00	3
90	5.00	4.00	4.00	4.00	4.00	5.00	4.33	4.33	4.33	1
91	5.00	5.00	3.33	5.00	4.67	3.67	4.44	4.44	4.44	3

Appendix J:

J. Multidimensional scaling: sections 'B' and 'C' of questionnaire

Proxscal within SPSS version 12.0:

Credit

Proxscal
Version 1.0
by
Data Theory Scaling System Group (DTSS)
Faculty of Social and Behavioral Sciences
Leiden University, The Netherlands

Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.07991
Stress-I	.28268(a)
Stress-II	.76517(a)
S-Stress	.17632(b)
Dispersion Accounted For (D.A.F.)	.92009
Tucker's Coefficient of Congruence	.95922

PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.087.
b Optimal scaling factor = .914.

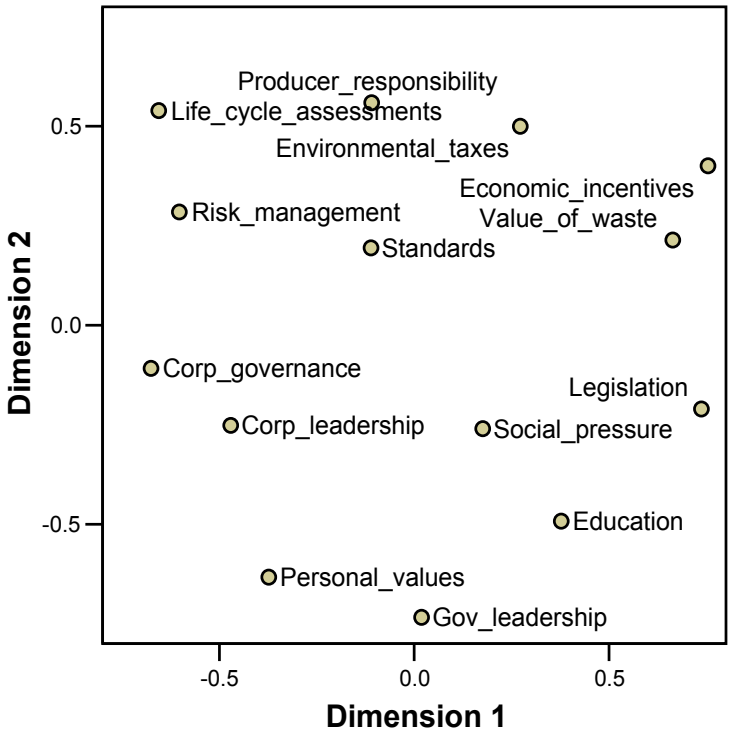
Common Space

Final Coordinates

	Dimension	
	1	2
Standards environmental	-.111	.194
Social pressure	.176	-.260
Risk management	-.603	.285
Producer responsibility	-.109	.559
Personal values	-.373	-.633
Life cycle assessments	-.656	.539
Legislation	.737	-.210
Government leadership	.019	-.734
Corporate leadership	-.471	-.252
Environmental taxes	.272	.500
Education	.377	-.492
Economic incentives	.754	.400
Corporate governance	-.675	-.109
Value of waste	.663	.214

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.08490
Stress-I	.29138(a)
Stress-II	.74859(a)
S-Stress	.19609(b)
Dispersion Accounted For (D.A.F.)	.91510
Tucker's Coefficient of Congruence	.95661

PROXSCAL minimizes Normalized Raw Stress.
a Optimal scaling factor = 1.093.
b Optimal scaling factor = .903.

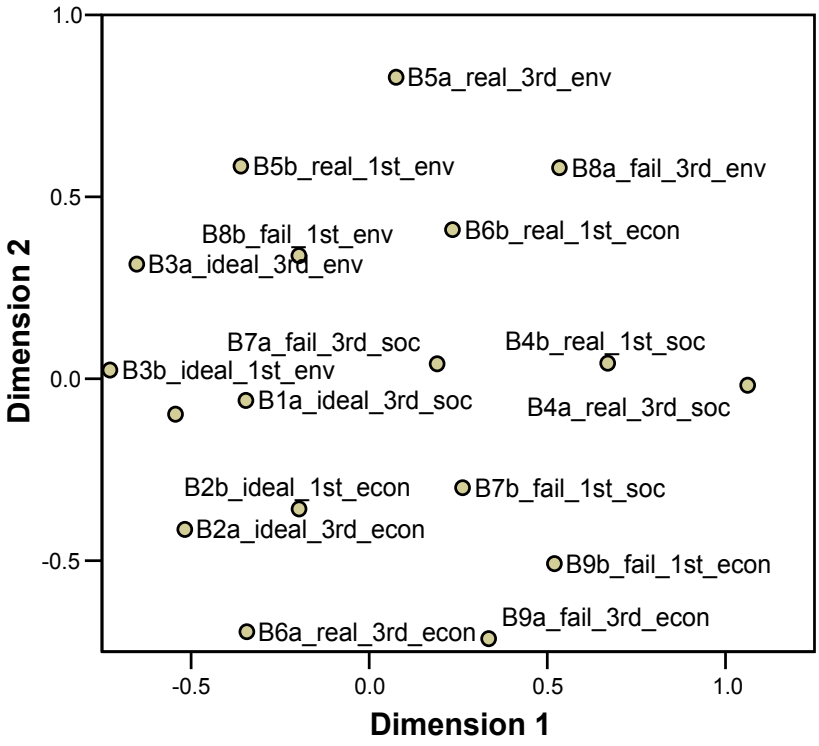
Common Space

Final Coordinates

	Dimension	
	1	2
B1a ideal: 3rd social	-.346	-.060
B1b ideal: 1st social	-.544	-.098
B2a ideal: 3rd economic	-.517	-.414
B2b ideal: 1st economic	-.197	-.358
B3a ideal: 3rd environment	-.652	.315
B3b ideal: 1st environment	-.728	.024
B4a real: 3rd social	1.062	-.018
B4b real: 1st social	.670	.043
B5a real: 3rd environment	.076	.828
B5b real: 1st environment	-.360	.585
B6a real: 3rd economic	-.343	-.695
B6b real: 1st economic	.234	.410
B7a fail: 3rd social	.191	.041
B7b fail: 1st social	.262	-.299
B8a fail: 3rd environment	.534	.580
B8b fail: 1st environment	-.197	.339
B9a fail: 3rd economic	.336	-.714
B9b fail: 1st economic	.520	-.508

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.04157
Stress-I	.20390(a)
Stress-II	.69683(a)
S-Stress	.13479(b)
Dispersion Accounted For (D.A.F.)	.95843
Tucker's Coefficient of Congruence	.97899

PROXSCAL minimizes Normalized Raw Stress.
a Optimal scaling factor = 1.043.
b Optimal scaling factor = .923.

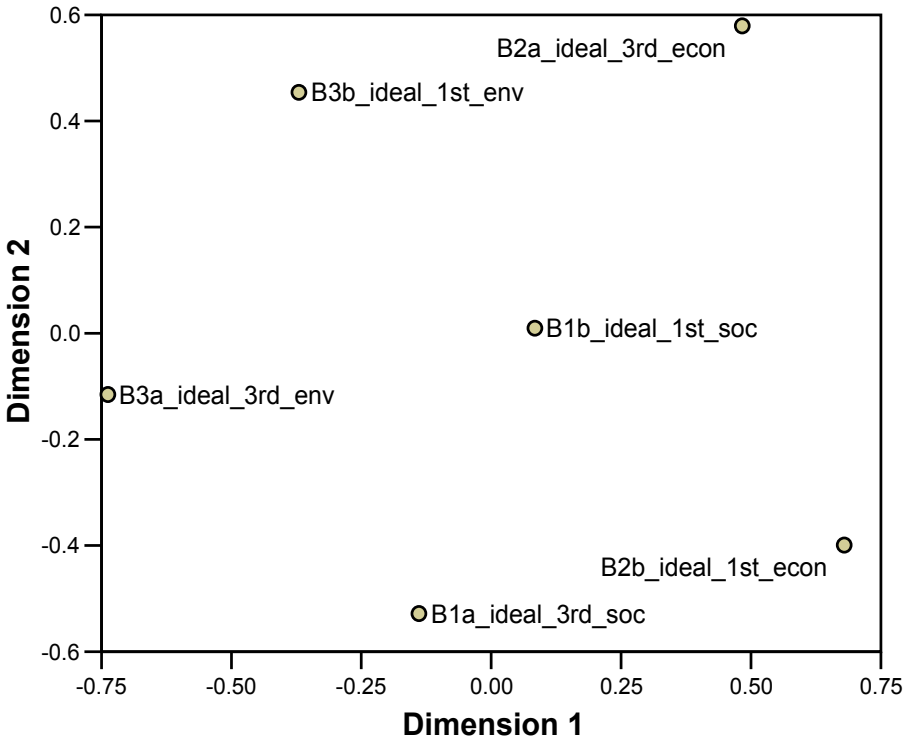
Common Space

Final Coordinates

	Dimension	
	1	2
B1a ideal: 3rd social	-.139	-.528
B1b ideal: 1st social	.084	.010
B2a ideal: 3rd economic	.483	.579
B2b ideal: 1st economic	.680	-.399
B3a ideal: 3rd environment	-.738	-.115
B3b ideal: 1st environment	-.370	.454

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.04475
Stress-I	.21155(a)
Stress-II	.70051(a)
S-Stress	.11462(b)
Dispersion Accounted For (D.A.F.)	.95525
Tucker's Coefficient of Congruence	.97737

PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.047.
b Optimal scaling factor = .942.

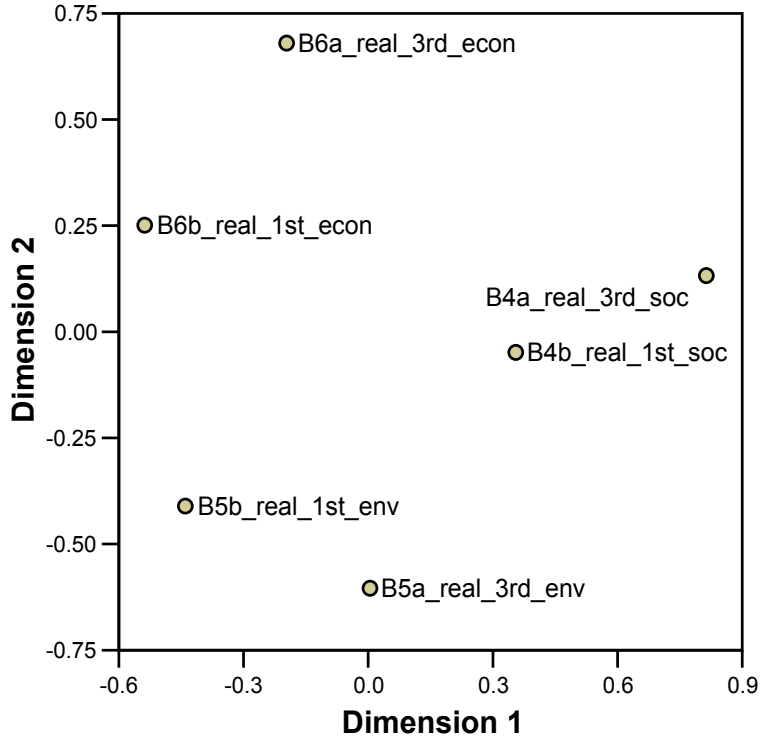
Common Space

Final Coordinates

	Dimension	
	1	2
B4a real: 3rd social	.814	.132
B4b real: 1st social	.355	-.049
B5a real: 3rd environment	.004	-.604
B5b real: 1st environment	-.440	-.411
B6a real: 3rd economic	-.196	.680
B6b real: 1st economic	-.538	.251

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.04378
Stress-I	.20923(a)
Stress-II	.74392(a)
S-Stress	.11527(b)
Dispersion Accounted For (D.A.F.)	.95622
Tucker's Coefficient of Congruence	.97787

PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.046.
b Optimal scaling factor = .944.

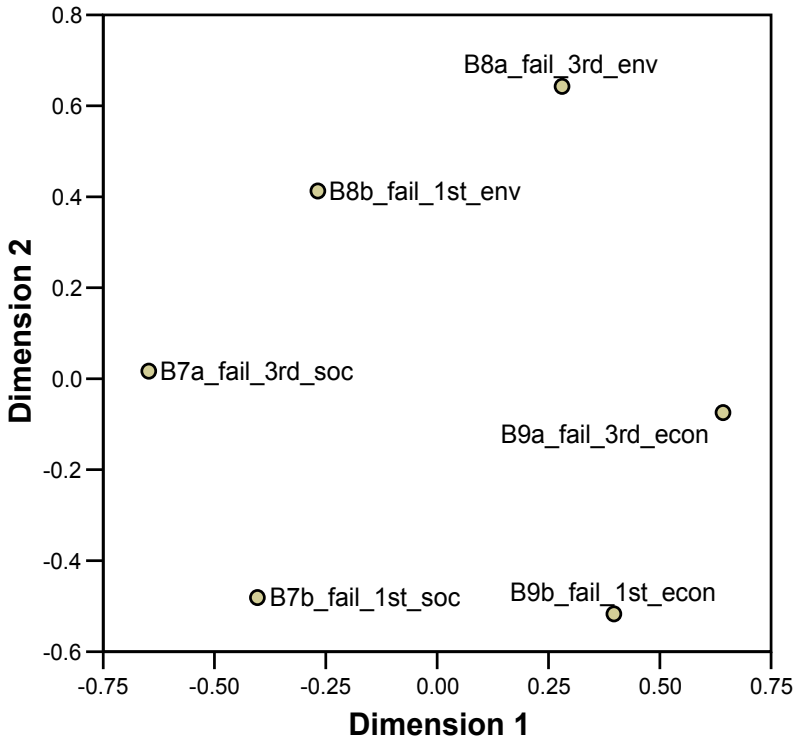
Common Space

Final Coordinates

	Dimension	
	1	2
B7a fail: 3rd social	-.648	.017
B7b fail: 1st social	-.404	-.481
B8a fail: 3rd environment	.280	.643
B8b fail: 1st environment	-.268	.413
B9a fail: 3rd economic	.642	-.074
B9b fail: 1st economic	.397	-.517

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.02861
Stress-I	.16914(a)
Stress-II	.52395(a)
S-Stress	.07484(b)
Dispersion Accounted For (D.A.F.)	.97139
Tucker's Coefficient of Congruence	.98559

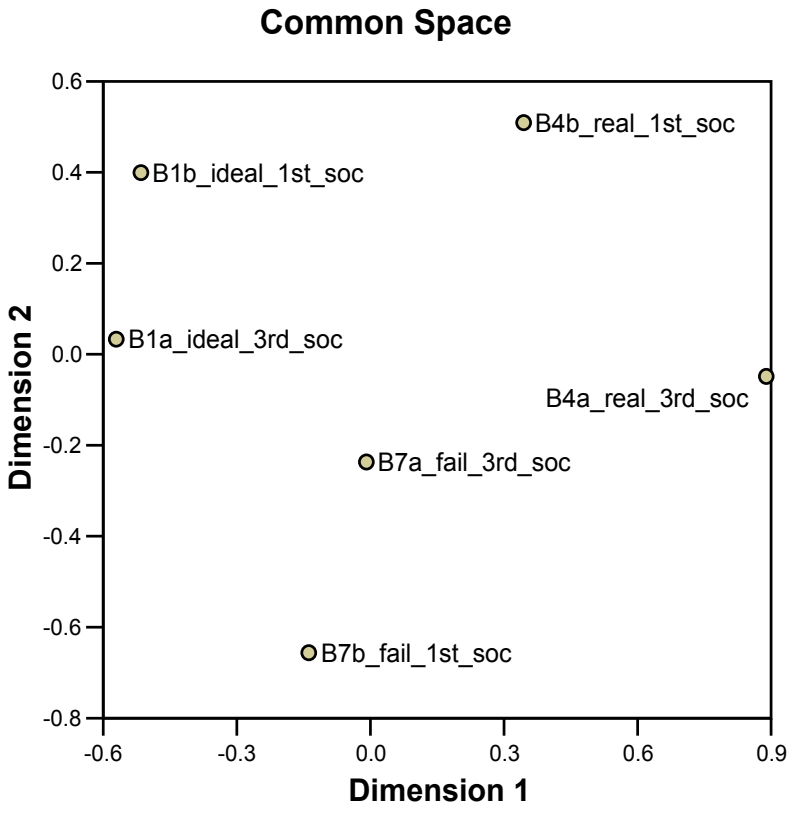
PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.029.
b Optimal scaling factor = .951.

Common Space

Final Coordinates

	Dimension	
	1	2
B1a ideal: 3rd social	-.571	.033
B1b ideal: 1st social	-.515	.399
B4a real: 3rd social	.889	-.049
B4b real: 1st social	.344	.509
B7a fail: 3rd social	-.009	-.237
B7b fail: 1st social	-.138	-.656

Object Points



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.02880
Stress-I	.16971(a)
Stress-II	.58648(a)
S-Stress	.07272(b)
Dispersion Accounted For (D.A.F.)	.97120
Tucker's Coefficient of Congruence	.98549

PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.030.
b Optimal scaling factor = .957.

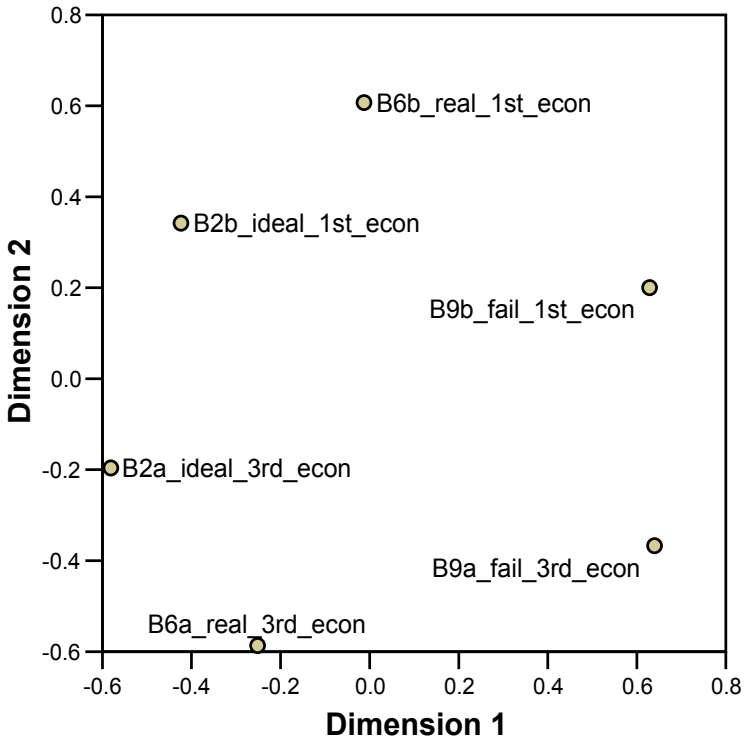
Common Space

Final Coordinates

	Dimension	
	1	2
B2a ideal: 3rd economic	-.581	-.196
B2b ideal: 1st economic	-.424	.342
B6a real: 3rd economic	-.252	-.586
B6b real: 1st economic	-.013	.607
B9a fail: 3rd economic	.640	-.367
B9b fail: 1st economic	.629	.200

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.02695
Stress-I	.16417(a)
Stress-II	.55673(a)
S-Stress	.06509(b)
Dispersion Accounted For (D.A.F.)	.97305
Tucker's Coefficient of Congruence	.98643

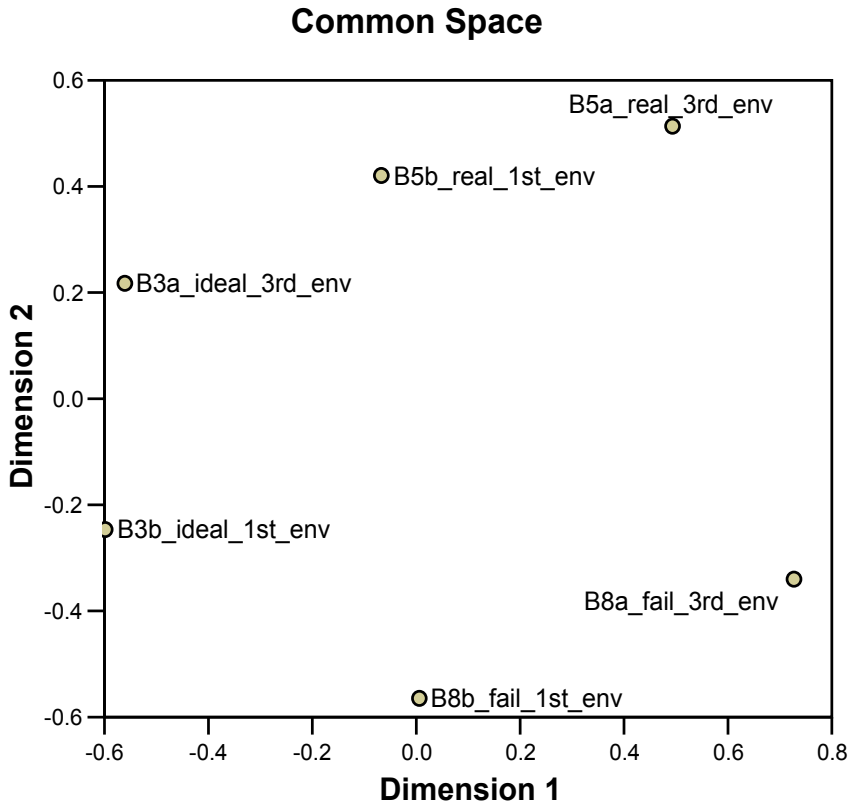
PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.028.
b Optimal scaling factor = .955.

Common Space

Final Coordinates

	Dimension	
	1	2
B3a ideal: 3rd environment	-.561	.217
B3b ideal: 1st environment	-.599	-.246
B5a real: 3rd environment	.493	.513
B5b real: 1st environment	-.067	.420
B8a fail: 3rd environment	.727	-.340
B8b fail: 1st environment	.006	-.565

Object Points



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.06909
Stress-I	.26285(a)
Stress-II	.76066(a)
S-Stress	.18038(b)
Dispersion Accounted For (D.A.F.)	.93091
Tucker's Coefficient of Congruence	.96484

PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.074.
b Optimal scaling factor = .918.

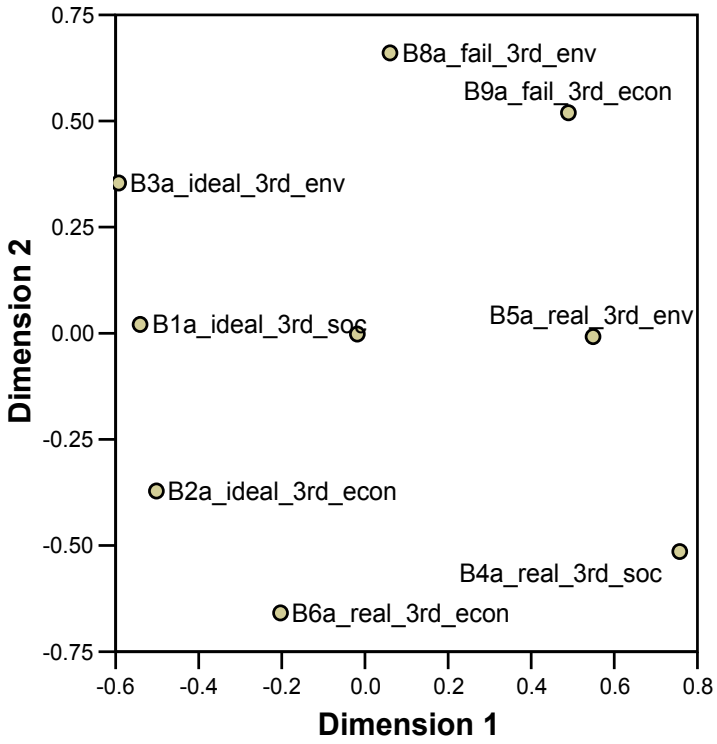
Common Space

Final Coordinates

	Dimension	
	1	2
B1a ideal: 3rd social	-.541	.021
B2a ideal: 3rd economic	-.502	-.372
B3a ideal: 3rd environment	-.593	.354
B4a real: 3rd social	.757	-.514
B5a real: 3rd environment	.549	-.008
B6a real: 3rd economic	-.203	-.659
B7a fail: 3rd social	-.018	-.002
B8a fail: 3rd environment	.060	.660
B9a fail: 3rd economic	.490	.519

Object Points

Common Space



Goodness of Fit

Stress and Fit Measures

Normalized Raw Stress	.05886
Stress-I	.24261(a)
Stress-II	.73097(a)
S-Stress	.16756(b)
Dispersion Accounted For (D.A.F.)	.94114
Tucker's Coefficient of Congruence	.97012

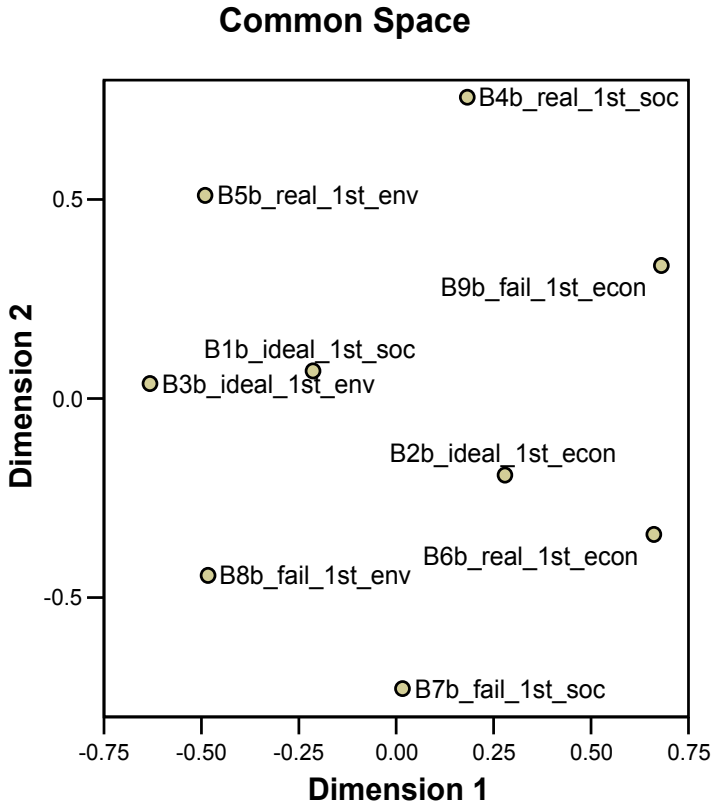
PROXSCAL minimizes Normalized Raw Stress.
A Optimal scaling factor = 1.063.
b Optimal scaling factor = .915.

Common Space

Final Coordinates

	Dimension	
	1	2
B1b ideal: 1st social	-.214	.069
B2b ideal: 1st economic	.279	-.192
B3b ideal: 1st environment	-.632	.037
B4b real: 1st social	.182	.757
B5b real: 1st environment	-.491	.510
B6b real: 1st economic	.661	-.342
B7b fail: 1st social	.016	-.729
B8b fail: 1st environment	-.483	-.445
B9b fail: 1st economic	.680	.334

Object Points



Appendix K:

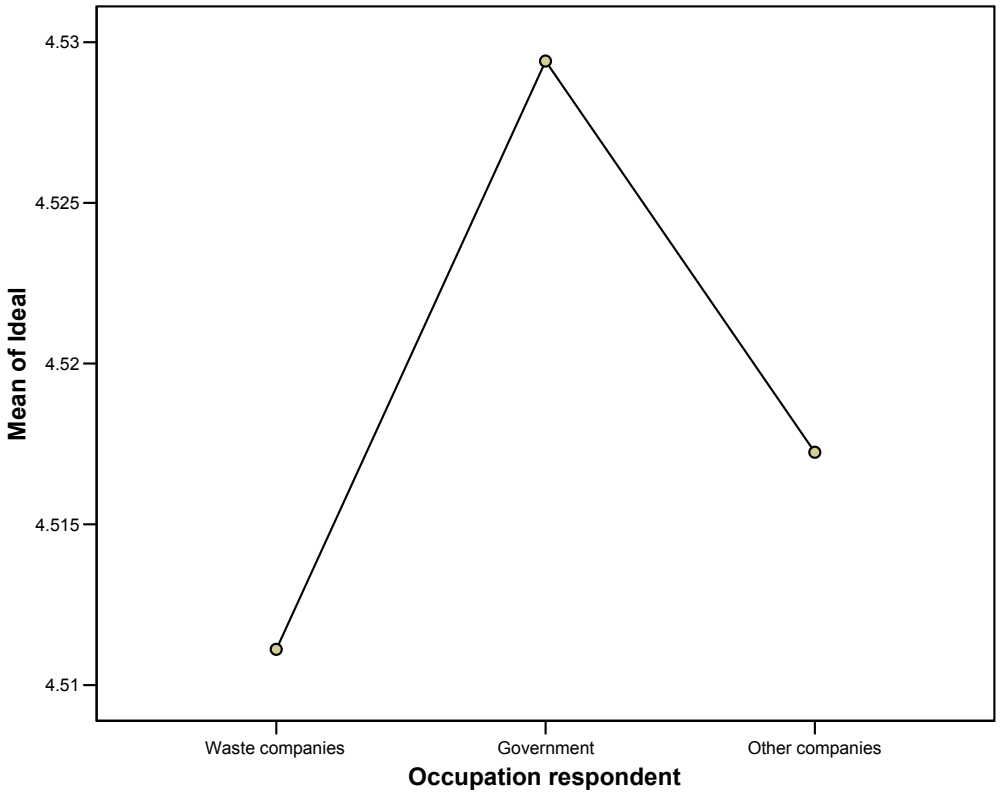
K. ANOVA on biographical data and Friedman tests on section 'B'

Oneway ANOVA:	Descriptives	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of 6 IDEAL opinions	Waste companies	45	4.5111	.37839	.05641	4.3974	4.6248	3.67	5.00
	Government	17	4.5294	.43794	.10622	4.3042	4.7546	3.83	5.00
	Other companies	29	4.5172	.34024	.06318	4.3878	4.6467	3.83	5.00
	Total	91	4.5165	.37438	.03925	4.4385	4.5945	3.67	5.00
Average of REAL opinions	Waste companies	45	3.9148	.59419	.08858	3.7363	4.0933	2.50	5.00
	Government	17	3.7353	.68480	.16609	3.3832	4.0874	2.67	4.67
	Other companies	29	3.7759	.74705	.13872	3.4917	4.0600	1.67	5.00
	Total	91	3.8370	.66014	.06920	3.6995	3.9745	1.67	5.00
Average FAIL opinion	Waste companies	45	4.0111	.72509	.10809	3.7933	4.2290	1.00	5.00
	Government	17	3.9118	.46442	.11264	3.6730	4.1505	3.17	5.00
	Other companies	29	3.7011	.76296	.14168	3.4109	3.9914	2.00	5.00
	Total	91	3.8938	.70383	.07378	3.7472	4.0404	1.00	5.00
Average SOCIAL opinion	Waste companies	45	4.0593	.61459	.09162	3.8746	4.2439	2.50	5.00
	Government	17	4.0196	.49959	.12117	3.7627	4.2765	3.33	4.83
	Other companies	29	3.8448	.62031	.11519	3.6089	4.0808	2.67	5.00
	Total	91	3.9835	.59838	.06273	3.8589	4.1081	2.50	5.00
Average ECONOMIC opinion	Waste companies	45	4.1148	.56500	.08422	3.9451	4.2846	2.83	5.00
	Government	17	4.0980	.53703	.13025	3.8219	4.3742	3.17	5.00
	Other companies	29	4.0287	.71418	.13262	3.7571	4.3004	1.67	5.00
	Total	91	4.0842	.60623	.06355	3.9580	4.2105	1.67	5.00
Average ENVIRONMENT opinion	Waste companies	45	4.2630	.60666	.09044	4.0807	4.4452	2.83	5.00
	Government	17	4.0588	.63174	.15322	3.7340	4.3836	2.67	5.00
	Other companies	29	4.1207	.63916	.11869	3.8776	4.3638	3.00	5.00
	Total	91	4.1795	.62075	.06507	4.0502	4.3088	2.67	5.00
Average 1st world opinion	Waste companies	45	4.2000	.45109	.06724	4.0645	4.3355	3.11	5.00
	Government	17	4.1569	.51976	.12606	3.8896	4.4241	3.00	5.00
	Other companies	29	4.1226	.48554	.09016	3.9379	4.3073	3.00	5.00
	Total	91	4.1673	.47122	.04940	4.0691	4.2654	3.00	5.00
Average 3RD WORLD opinion	Waste companies	45	4.0914	.48910	.07291	3.9444	4.2383	2.89	5.00
	Government	17	3.9608	.34681	.08411	3.7825	4.1391	3.67	4.89
	Other companies	29	3.8736	.55850	.10371	3.6611	4.0860	2.78	4.89
	Total	91	3.9976	.49496	.05189	3.8945	4.1006	2.78	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Average of 6 IDEAL opinions	Between Groups	.004	2	.002	.015	.986
	Within Groups	12.610	88	.143		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.557	2	.278	.634	.533
	Within Groups	38.664	88	.439		
	Total	39.221	90			
Average FAIL opinion	Between Groups	1.701	2	.851	1.745	.181
	Within Groups	42.883	88	.487		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.838	2	.419	1.175	.314
	Within Groups	31.387	88	.357		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.135	2	.067	.180	.836
	Within Groups	32.942	88	.374		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.661	2	.331	.855	.429
	Within Groups	34.018	88	.387		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.108	2	.054	.239	.788
	Within Groups	19.877	88	.226		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.865	2	.432	1.796	.172
	Within Groups	21.184	88	.241		
	Total	22.049	90			

Means Plots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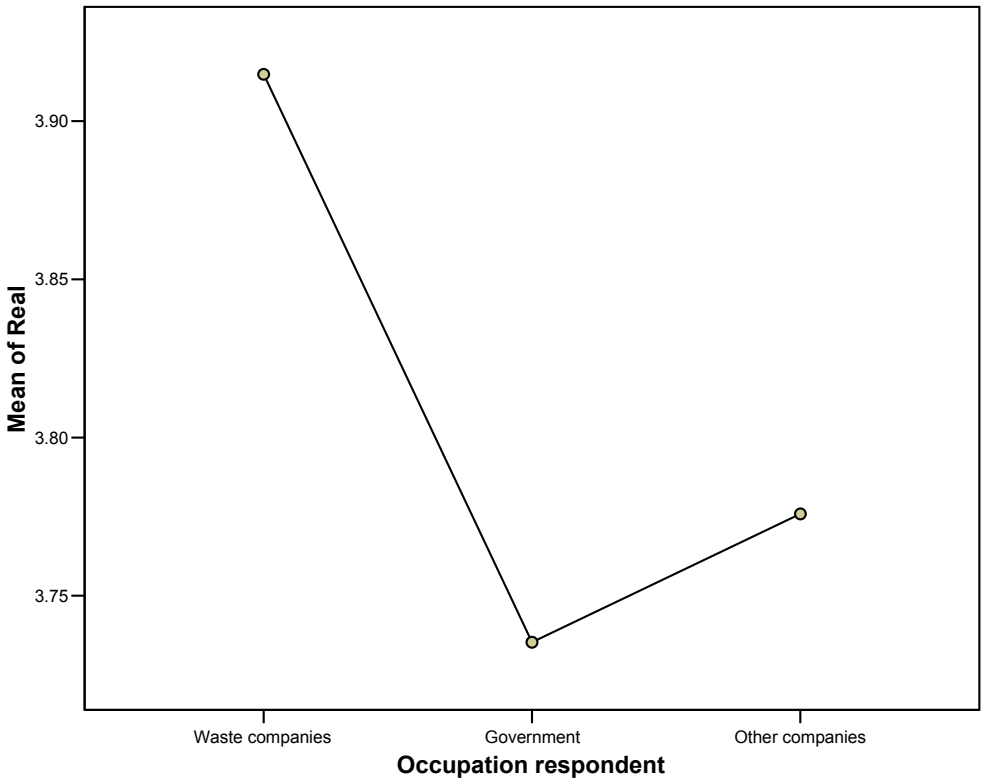
Mean of Ideal
Waste companies
Government
Other companies
Occupation respondent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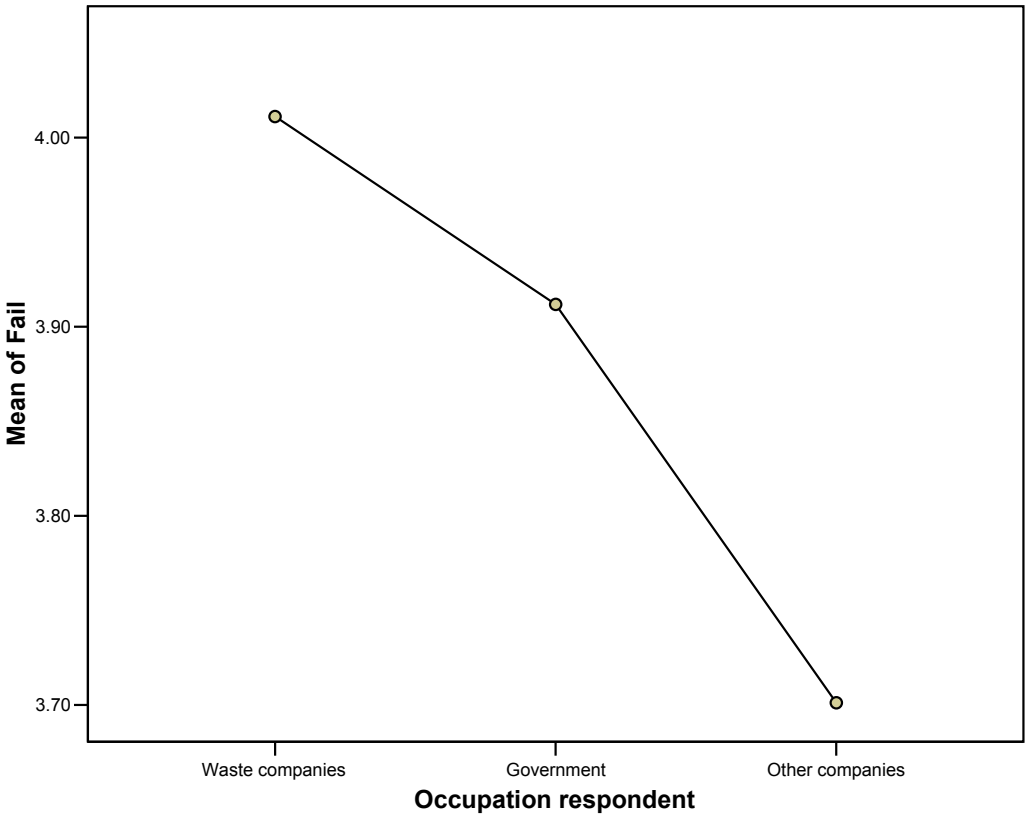
3.75
Mean of Real
Waste companies
Government
Other companies
Occupation respondent


Mean of Fail
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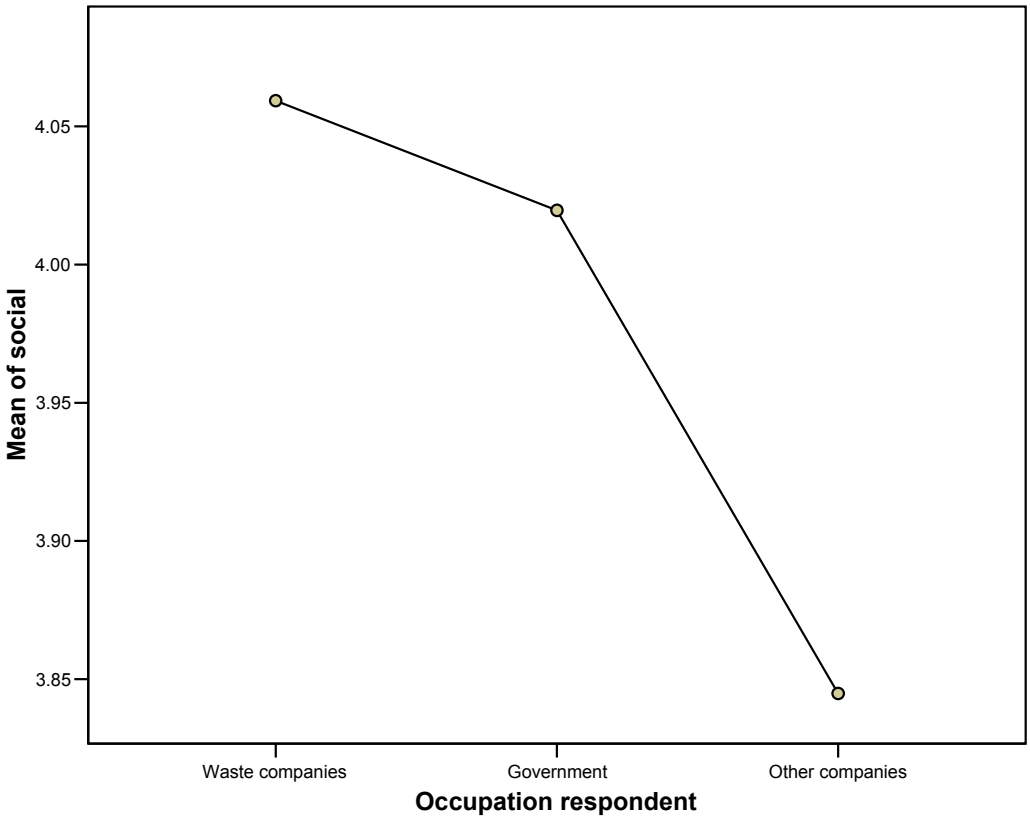
Waste companies
Government
Other companies
Occupation respondent


Mean of social
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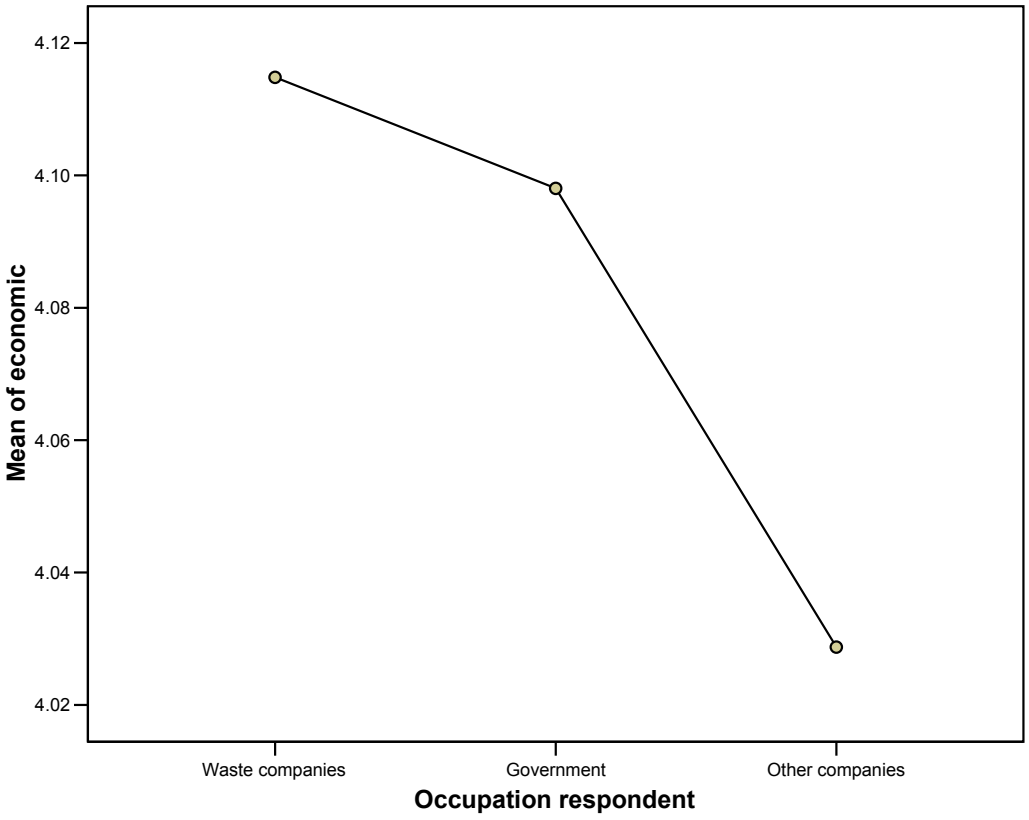
3.85
Waste companies
Government
Other companies
Occupation respondent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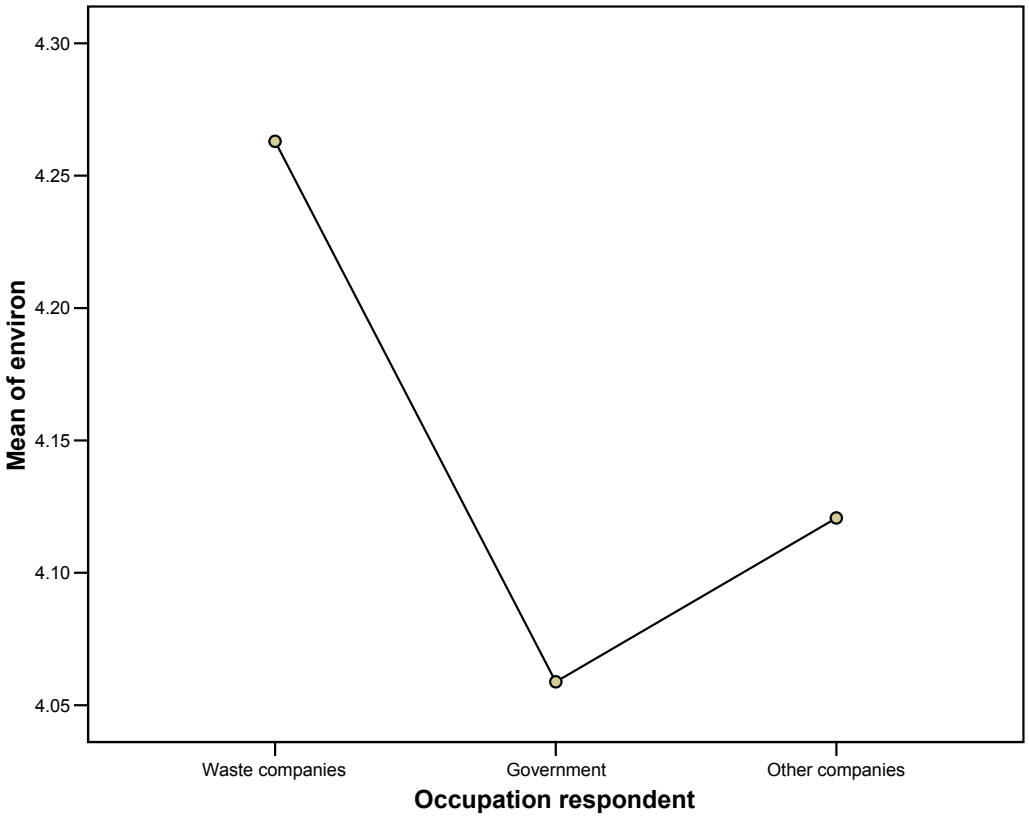
Mean of economic
Waste companies
Government
Other companies
Occupation respondent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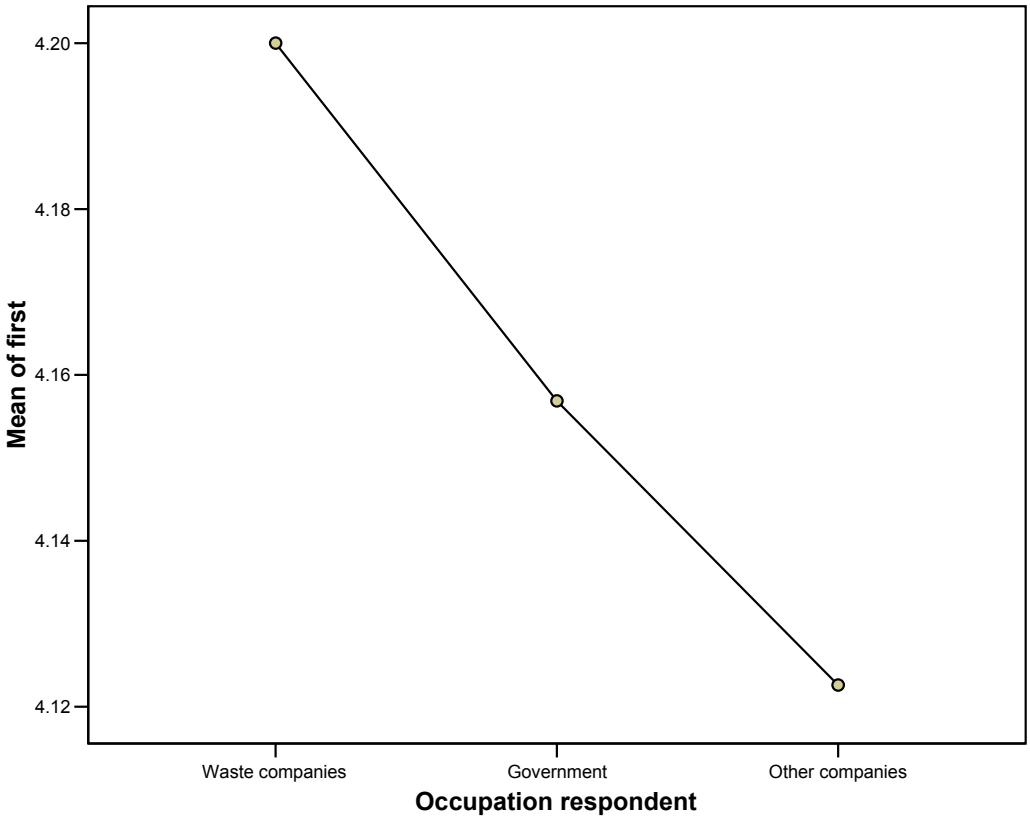
Mean of environ
Waste companies
Government
Other companies
Occupation respondent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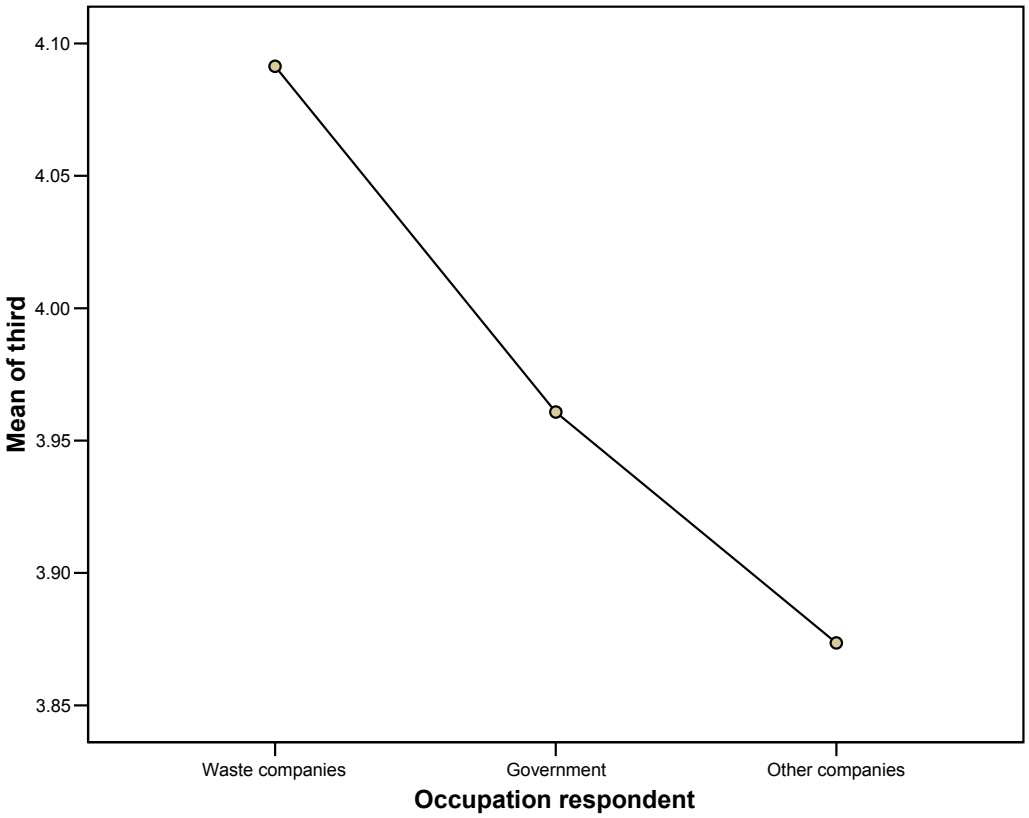
Mean of first
Waste companies
Government
Other companies
Occupation respondent


4.10
4.05
4.00
3.95
3.90
3.85
Mean of third
Waste companies
Government
Other companies
Occupation respondent

Oneway ANOVA

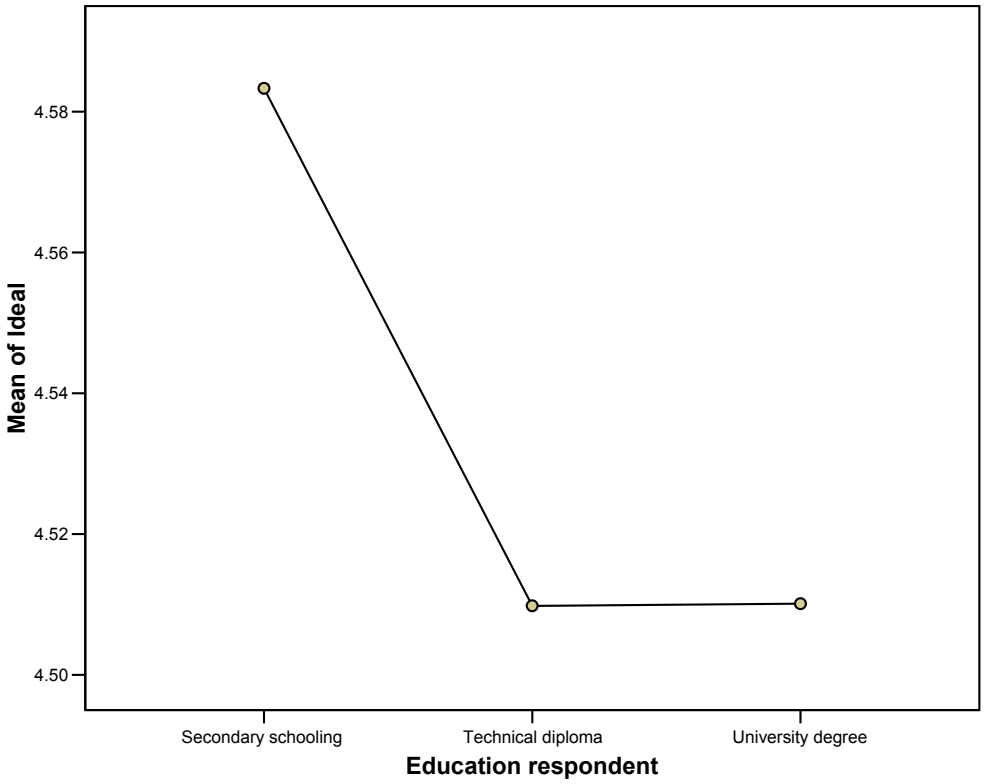
Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of 6 IDEAL opinions	Secondary schooling	8	4.5833	.25198	.08909	4.3727	4.7940	4.17	5.00
	Technical diploma	17	4.5098	.38851	.09423	4.3101	4.7096	4.00	5.00
	University degree	66	4.5101	.38661	.04759	4.4151	4.6051	3.67	5.00
	Total	91	4.5165	.37438	.03925	4.4385	4.5945	3.67	5.00
Average of REAL opinions	Secondary schooling	8	3.8750	.54736	.19352	3.4174	4.3326	2.83	4.50
	Technical diploma	17	4.1471	.58298	.14139	3.8473	4.4468	3.33	5.00
	University degree	66	3.7525	.67447	.08302	3.5867	3.9183	1.67	5.00
	Total	91	3.8370	.66014	.06920	3.6995	3.9745	1.67	5.00
Average FAIL opinion	Secondary schooling	8	3.9375	1.25968	.44537	2.8844	4.9906	1.00	5.00
	Technical diploma	17	3.9608	.70101	.17002	3.6004	4.3212	2.00	5.00
	University degree	66	3.8712	.62621	.07708	3.7173	4.0252	2.00	5.00
	Total	91	3.8938	.70383	.07378	3.7472	4.0404	1.00	5.00
Average SOCIAL opinion	Secondary schooling	8	3.8958	.75033	.26528	3.2685	4.5231	2.67	4.83
	Technical diploma	17	4.2843	.62295	.15109	3.9640	4.6046	3.00	5.00
	University degree	66	3.9167	.55720	.06859	3.7797	4.0536	2.50	5.00
	Total	91	3.9835	.59838	.06273	3.8589	4.1081	2.50	5.00
Average ECONOMIC opinion	Secondary schooling	8	4.1667	.40825	.14434	3.8254	4.5080	3.67	4.83
	Technical diploma	17	4.2255	.53665	.13016	3.9496	4.5014	3.00	5.00
	University degree	66	4.0379	.64171	.07899	3.8801	4.1956	1.67	5.00
	Total	91	4.0842	.60623	.06355	3.9580	4.2105	1.67	5.00
Average ENVIRONMENT opinion	Secondary schooling	8	4.3333	.57044	.20168	3.8564	4.8102	3.67	5.00
	Technical diploma	17	4.1078	.79263	.19224	3.7003	4.5154	2.67	5.00
	University degree	66	4.1793	.58274	.07173	4.0360	4.3225	3.00	5.00
	Total	91	4.1795	.62075	.06507	4.0502	4.3088	2.67	5.00
Average 1st world opinion	Secondary schooling	8	4.1944	.47420	.16766	3.7980	4.5909	3.33	4.78
	Technical diploma	17	4.2026	.54608	.13244	3.9218	4.4834	3.11	5.00
	University degree	66	4.1549	.45745	.05631	4.0424	4.2673	3.00	5.00
	Total	91	4.1673	.47122	.04940	4.0691	4.2654	3.00	5.00
Average 3RD WORLD opinion	Secondary schooling	8	4.0694	.44815	.15844	3.6948	4.4441	3.33	4.78
	Technical diploma	17	4.2092	.44250	.10732	3.9816	4.4367	3.33	4.89
	University degree	66	3.9343	.50297	.06191	3.8107	4.0580	2.78	5.00
	Total	91	3.9976	.49496	.05189	3.8945	4.1006	2.78	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Average of 6 IDEAL opinions	Between Groups	.039	2	.020	.137	.872
	Within Groups	12.575	88	.143		
	Total	12.614	90			
Average of REAL opinions	Between Groups	2.117	2	1.058	2.510	.087
	Within Groups	37.104	88	.422		
	Total	39.221	90			
Average FAIL opinion	Between Groups	.125	2	.063	.124	.884
	Within Groups	44.459	88	.505		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	1.895	2	.947	2.748	.070
	Within Groups	30.331	88	.345		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.535	2	.268	.724	.488
	Within Groups	32.541	88	.370		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.277	2	.138	.354	.703
	Within Groups	34.403	88	.391		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.037	2	.019	.082	.921
	Within Groups	19.947	88	.227		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	1.066	2	.533	2.236	.113
	Within Groups	20.983	88	.238		
	Total	22.049	90			

Means Plots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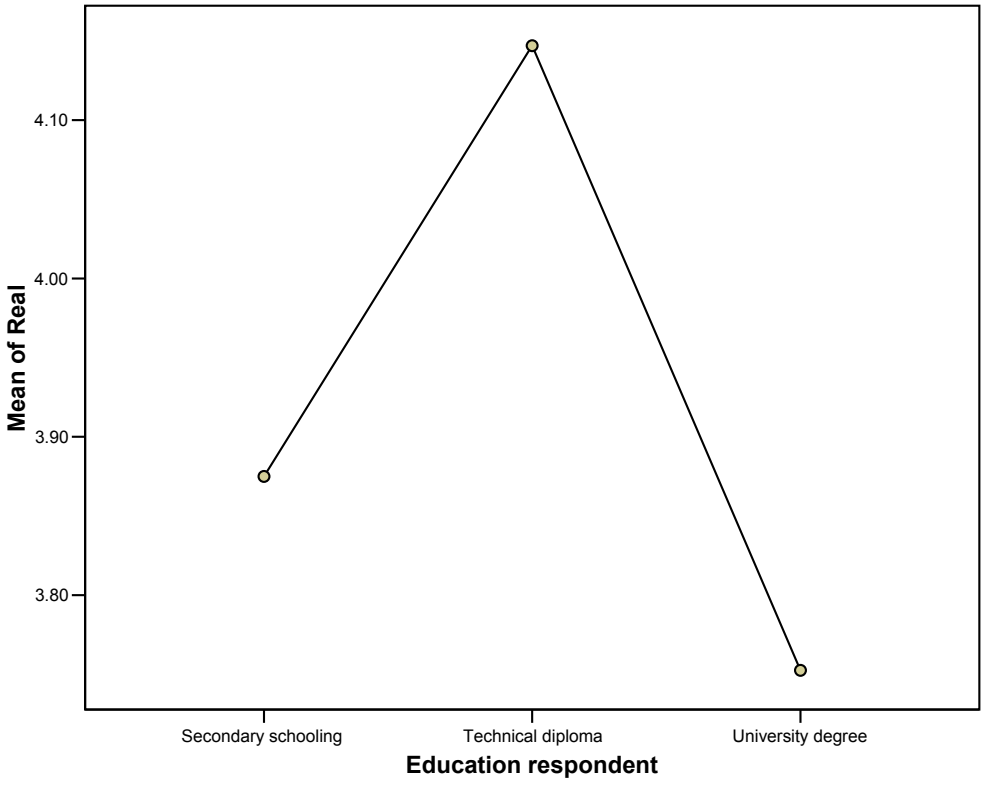
Mean of Ideal
Secondary schooling
Technical diploma
University degree
Education respondent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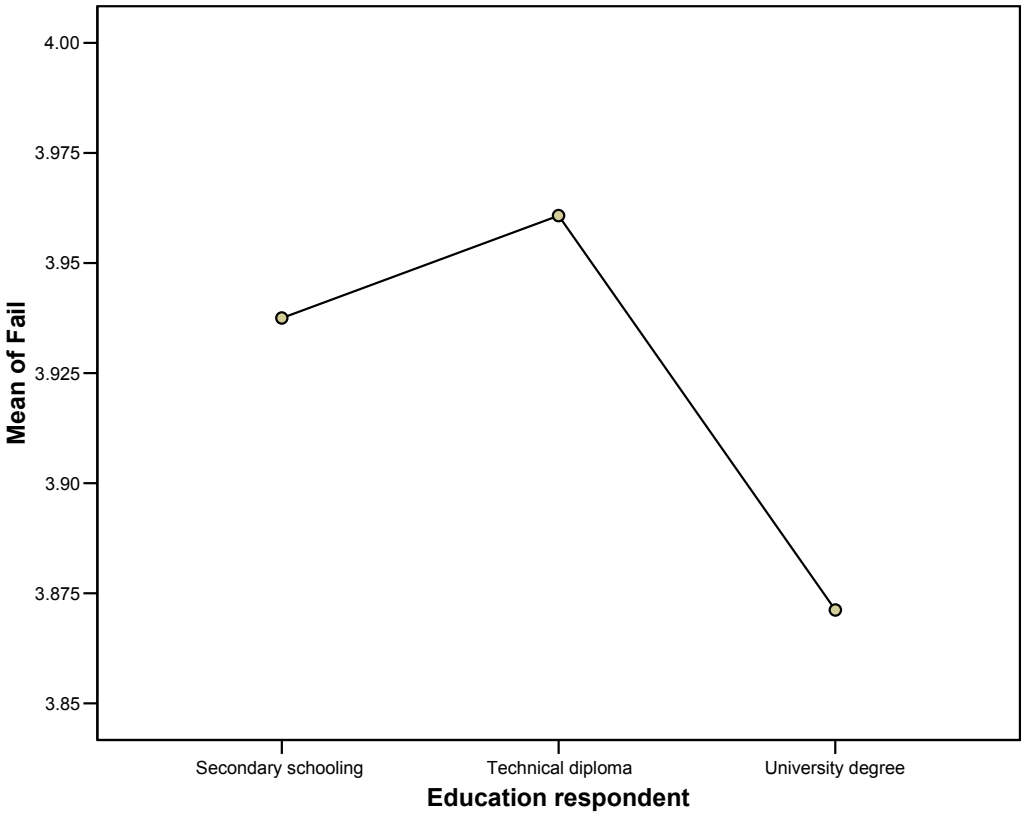
Mean of Real
Secondary schooling
Technical diploma
University degree
Education respondent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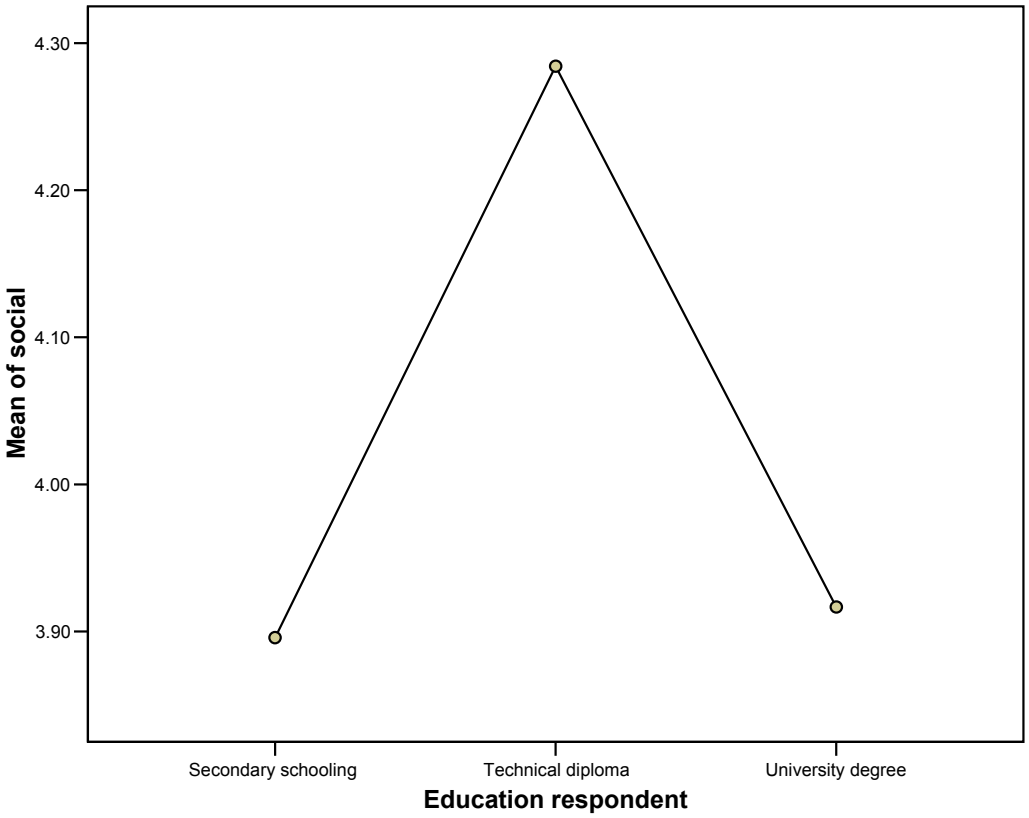
Mean of Fail
Secondary schooling
Technical diploma
University degree
Education respondent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4.00
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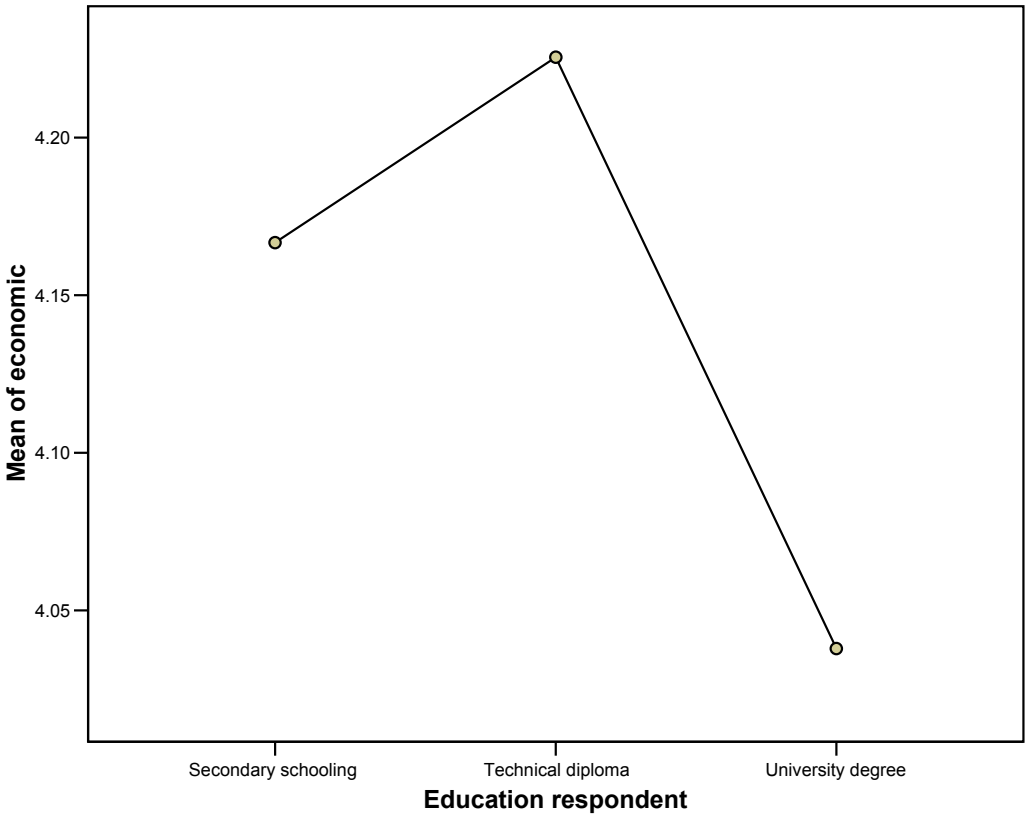
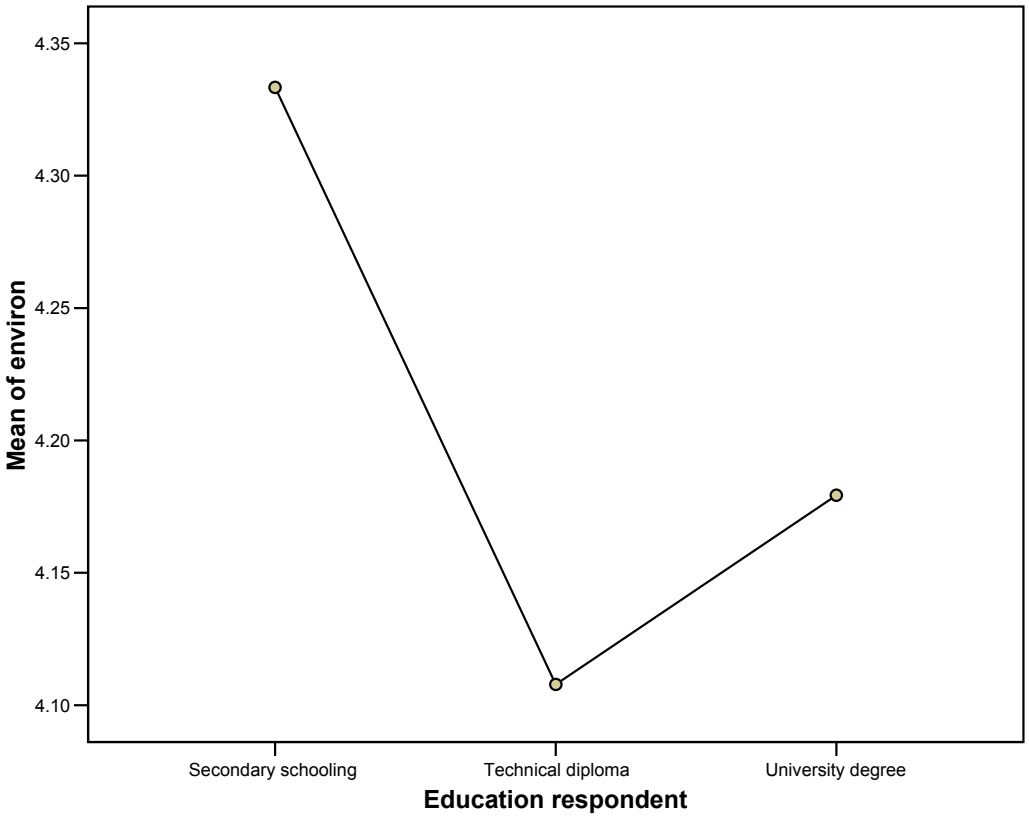
Mean of social
Secondary schooling
Technical diploma
University degree
Education respondent


Mean of economic
4.20
4.15
4.10
4.05
Secondary schooling
Technical diploma
University degree
Education respondent


Mean of environ
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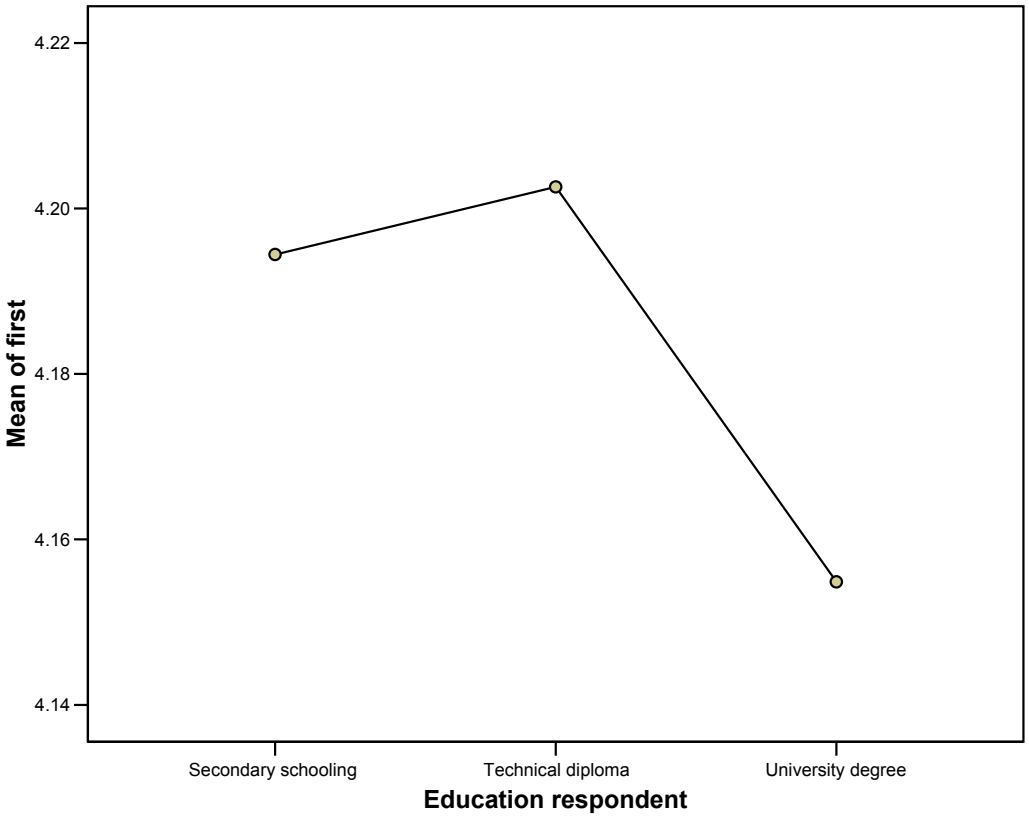
4.10
Secondary schooling
Technical diploma
University degree
Education respondent


4.22
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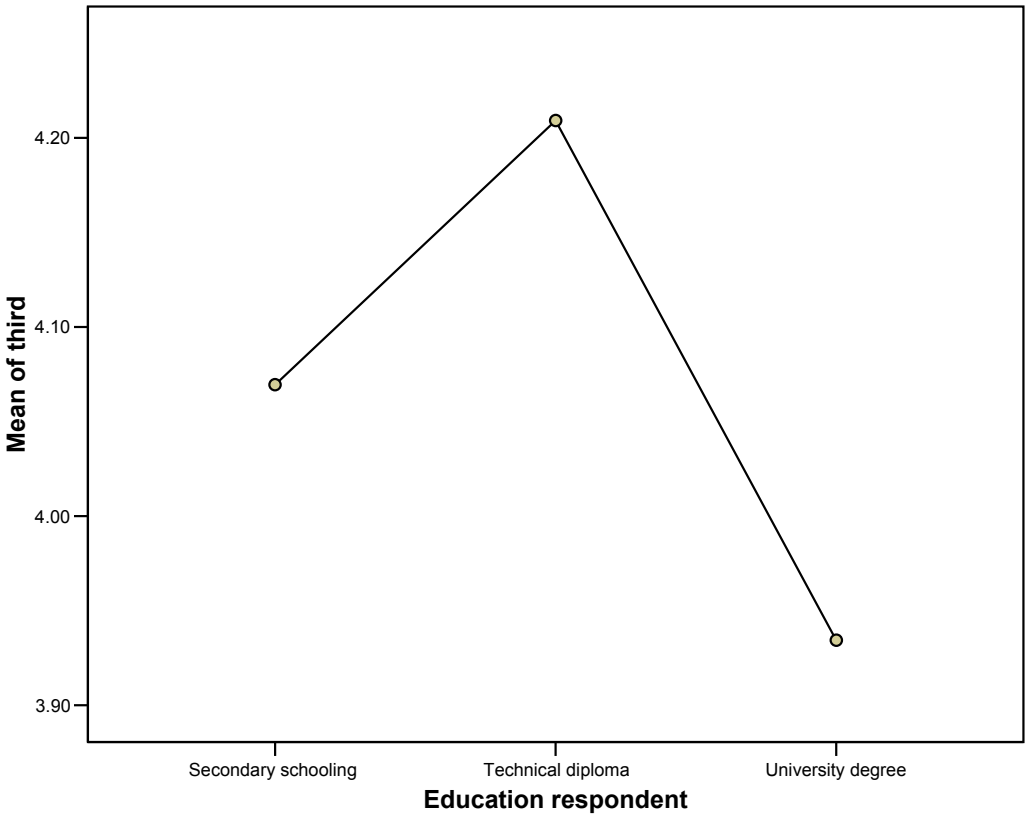
Mean of first
Secondary schooling
Technical diploma
University degree
Education respondent


4.20
4.10
4.00
3.90
Mean of third
Secondary schooling
Technical diploma
University degree
Education respondent

Oneway ANOVA

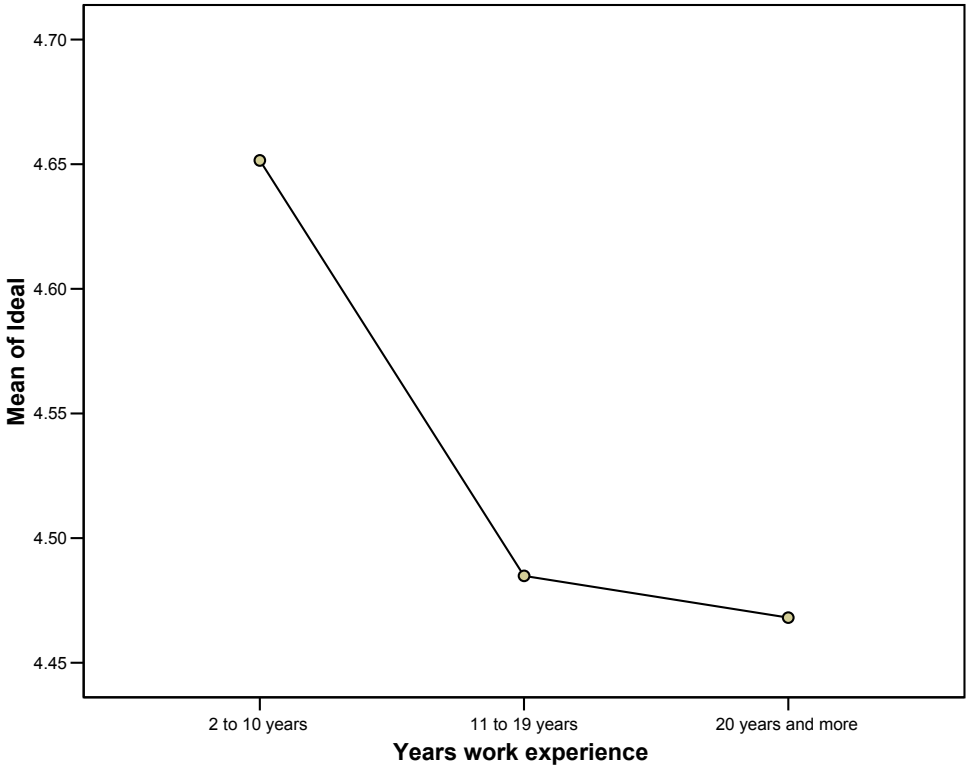
Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of 6 IDEAL opinions	2 to 10 years	22	4.6515	.32898	.07014	4.5057	4.7974	4.17	5.00
	11 to 19 years	22	4.4848	.39141	.08345	4.3113	4.6584	3.83	5.00
	20 years and more	47	4.4681	.37853	.05521	4.3569	4.5792	3.67	5.00
	Total	91	4.5165	.37438	.03925	4.4385	4.5945	3.67	5.00
Average of REAL opinions	2 to 10 years	22	3.8636	.65996	.14070	3.5710	4.1562	2.33	5.00
	11 to 19 years	22	3.9318	.65396	.13943	3.6419	4.2218	2.67	5.00
	20 years and more	47	3.7801	.67128	.09792	3.5830	3.9772	1.67	5.00
	Total	91	3.8370	.66014	.06920	3.6995	3.9745	1.67	5.00
Average FAIL opinion	2 to 10 years	22	3.9545	.63032	.13439	3.6751	4.2340	2.00	5.00
	11 to 19 years	22	3.8939	.69111	.14735	3.5875	4.2004	2.67	5.00
	20 years and more	47	3.8652	.75312	.10985	3.6441	4.0864	1.00	5.00
	Total	91	3.8938	.70383	.07378	3.7472	4.0404	1.00	5.00
Average SOCIAL opinion	2 to 10 years	22	3.9545	.53989	.11511	3.7152	4.1939	3.00	4.67
	11 to 19 years	22	4.0379	.61707	.13156	3.7643	4.3115	3.00	5.00
	20 years and more	47	3.9716	.62585	.09129	3.7879	4.1554	2.50	5.00
	Total	91	3.9835	.59838	.06273	3.8589	4.1081	2.50	5.00
Average ECONOMIC opinion	2 to 10 years	22	4.2273	.49212	.10492	4.0091	4.4455	3.00	5.00
	11 to 19 years	22	4.1061	.52085	.11105	3.8751	4.3370	3.17	5.00
	20 years and more	47	4.0071	.68451	.09985	3.8061	4.2081	1.67	5.00
	Total	91	4.0842	.60623	.06355	3.9580	4.2105	1.67	5.00
Average ENVIRONMENT opinion	2 to 10 years	22	4.2879	.69993	.14923	3.9775	4.5982	2.83	5.00
	11 to 19 years	22	4.1667	.52453	.11183	3.9341	4.3992	3.33	5.00
	20 years and more	47	4.1348	.63000	.09190	3.9498	4.3197	2.67	5.00
	Total	91	4.1795	.62075	.06507	4.0502	4.3088	2.67	5.00
Average 1st world opinion	2 to 10 years	22	4.2121	.43631	.09302	4.0187	4.4056	3.11	4.89
	11 to 19 years	22	4.1717	.53422	.11390	3.9349	4.4086	3.22	5.00
	20 years and more	47	4.1442	.46447	.06775	4.0078	4.2806	3.00	5.00
	Total	91	4.1673	.47122	.04940	4.0691	4.2654	3.00	5.00
Average 3RD WORLD opinion	2 to 10 years	22	4.1010	.48964	.10439	3.8839	4.3181	3.11	4.89
	11 to 19 years	22	4.0354	.43154	.09200	3.8440	4.2267	3.22	4.89
	20 years and more	47	3.9314	.52401	.07643	3.7776	4.0853	2.78	5.00
	Total	91	3.9976	.49496	.05189	3.8945	4.1006	2.78	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Average of 6 IDEAL opinions	Between Groups	.533	2	.267	1.942	.149
	Within Groups	12.081	88	.137		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.365	2	.183	.414	.662
	Within Groups	38.856	88	.442		
	Total	39.221	90			
Average FAIL opinion	Between Groups	.119	2	.060	.118	.889
	Within Groups	44.465	88	.505		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.090	2	.045	.123	.884
	Within Groups	32.135	88	.365		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.740	2	.370	1.007	.369
	Within Groups	32.336	88	.367		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.356	2	.178	.457	.635
	Within Groups	34.323	88	.390		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.070	2	.035	.154	.858
	Within Groups	19.915	88	.226		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.472	2	.236	.963	.386
	Within Groups	21.577	88	.245		
	Total	22.049	90			

Means Plots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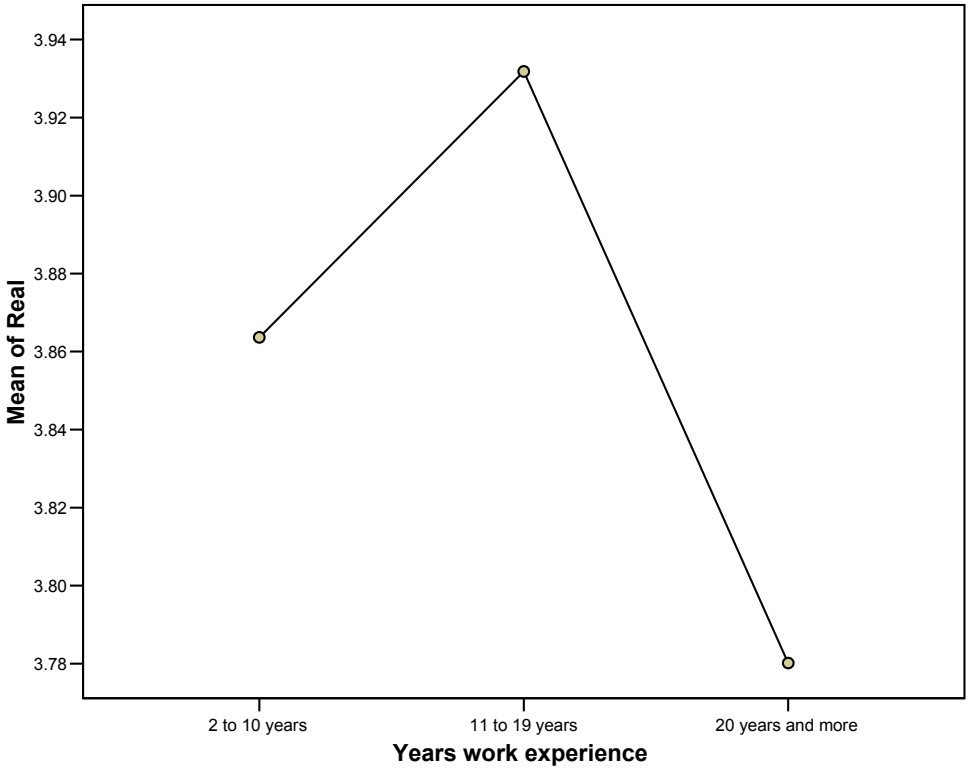
4.50
4.45
Mean of Ideal
2 to 10 years
11 to 19 years
20 years and more
Years work experience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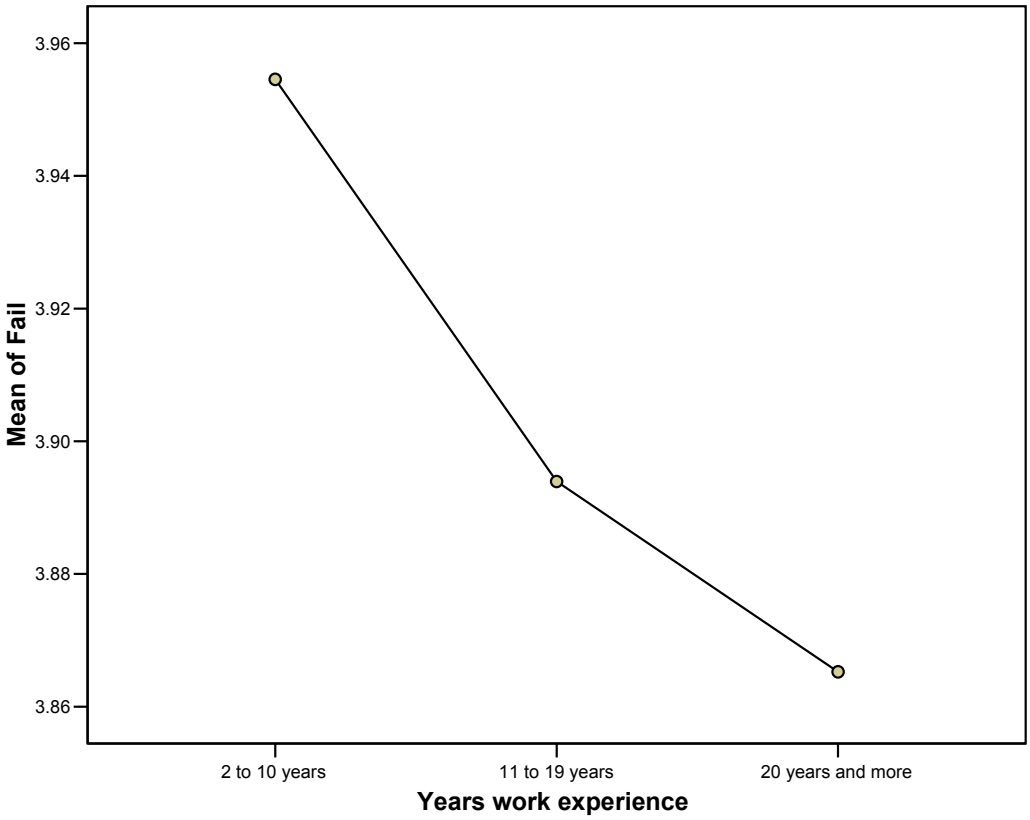
Mean of Real
2 to 10 years
11 to 19 years
20 years and more
Years work experience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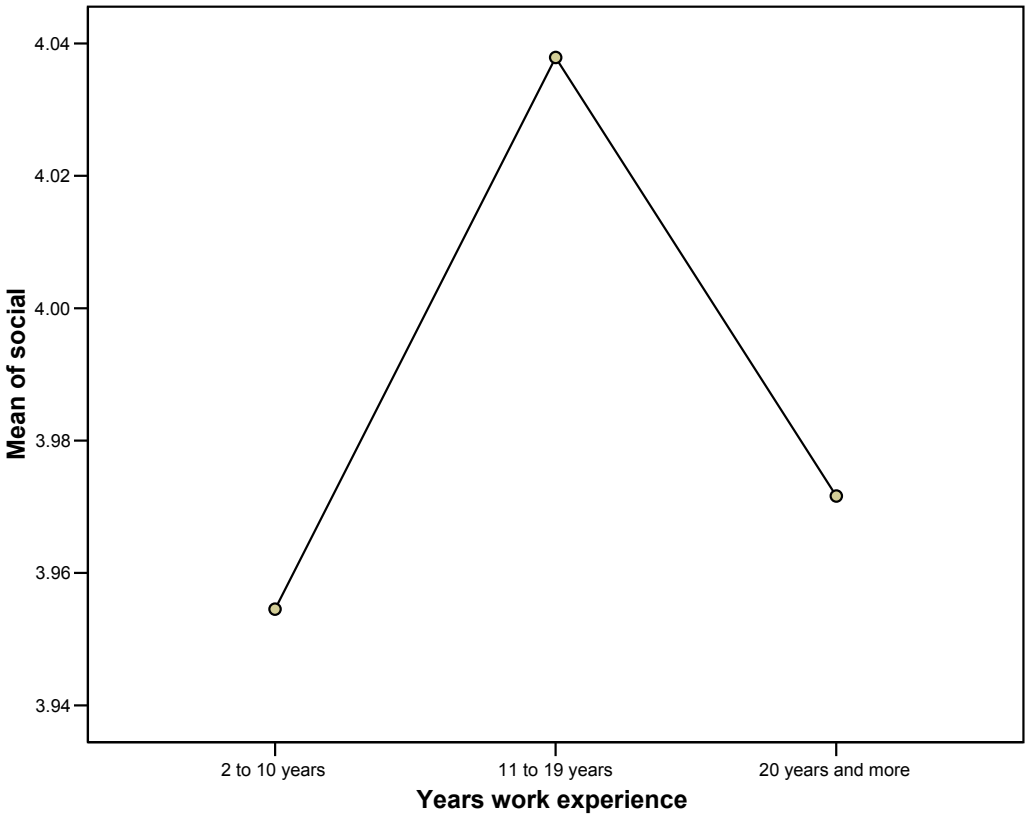
Mean of Fail
2 to 10 years
11 to 19 years
20 years and more
Years work experience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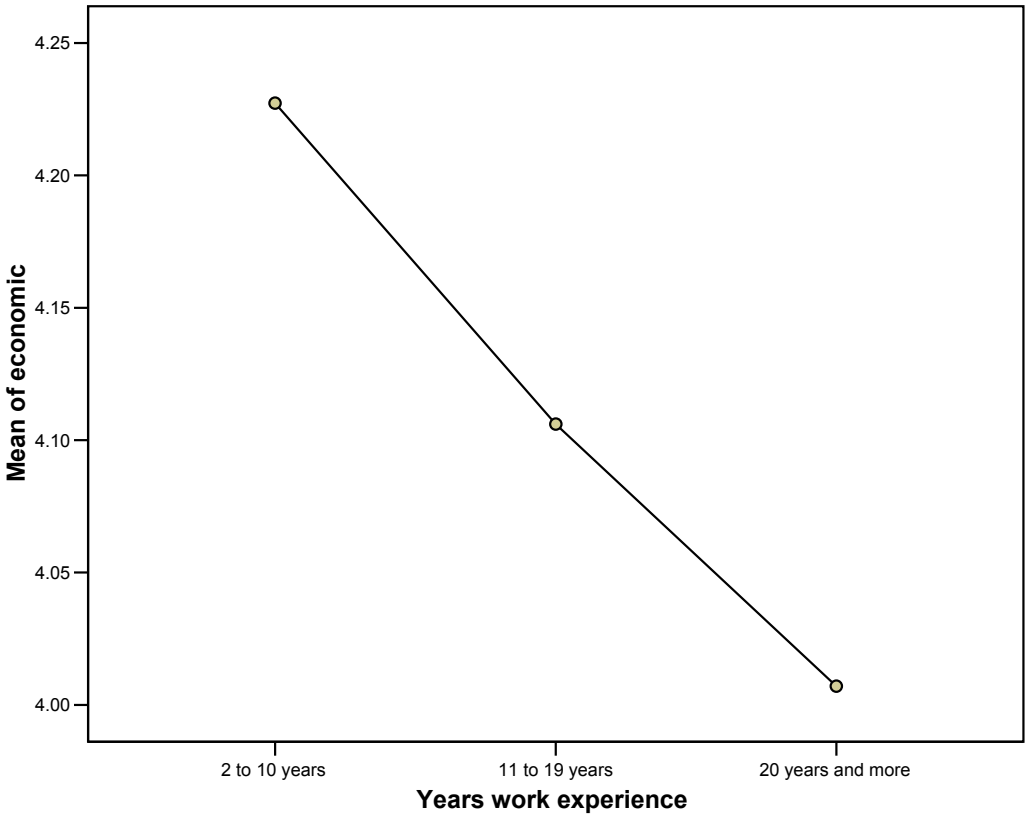
Mean of social
2 to 10 years
11 to 19 years
20 years and more
Years work experience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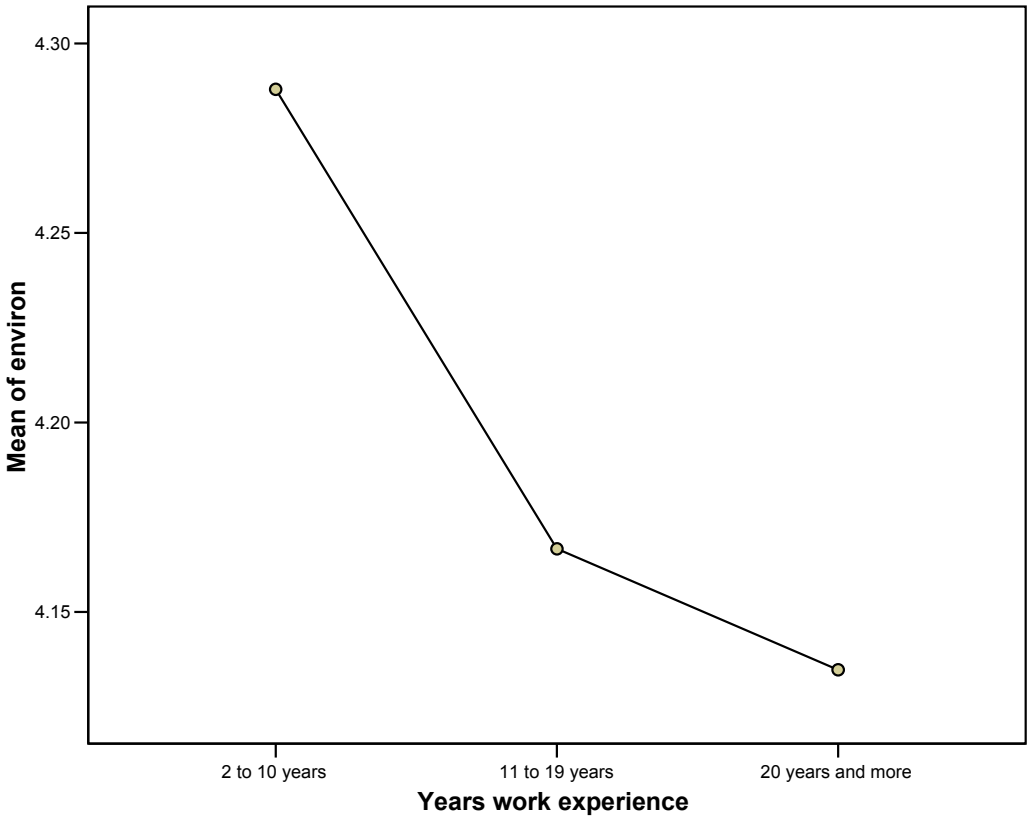
4.05
4.00
Mean of economic
2 to 10 years
11 to 19 years
20 years and more
Years work experience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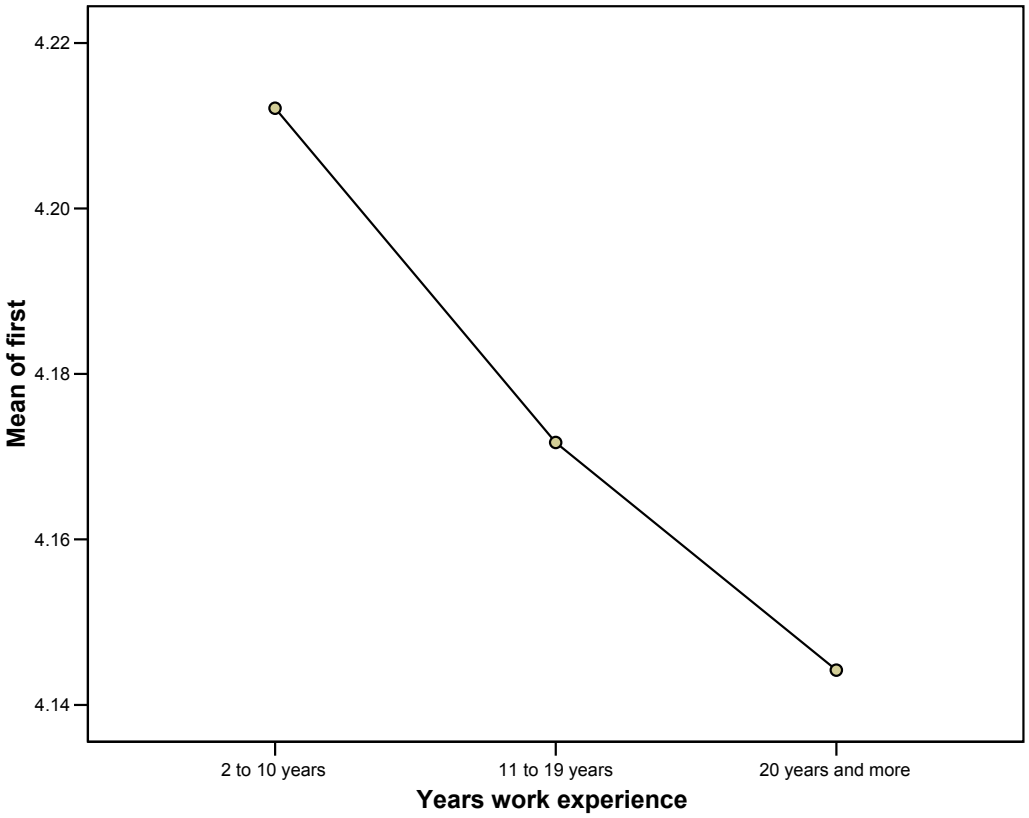
Mean of environ
2 to 10 years
11 to 19 years
20 years and more
Years work experience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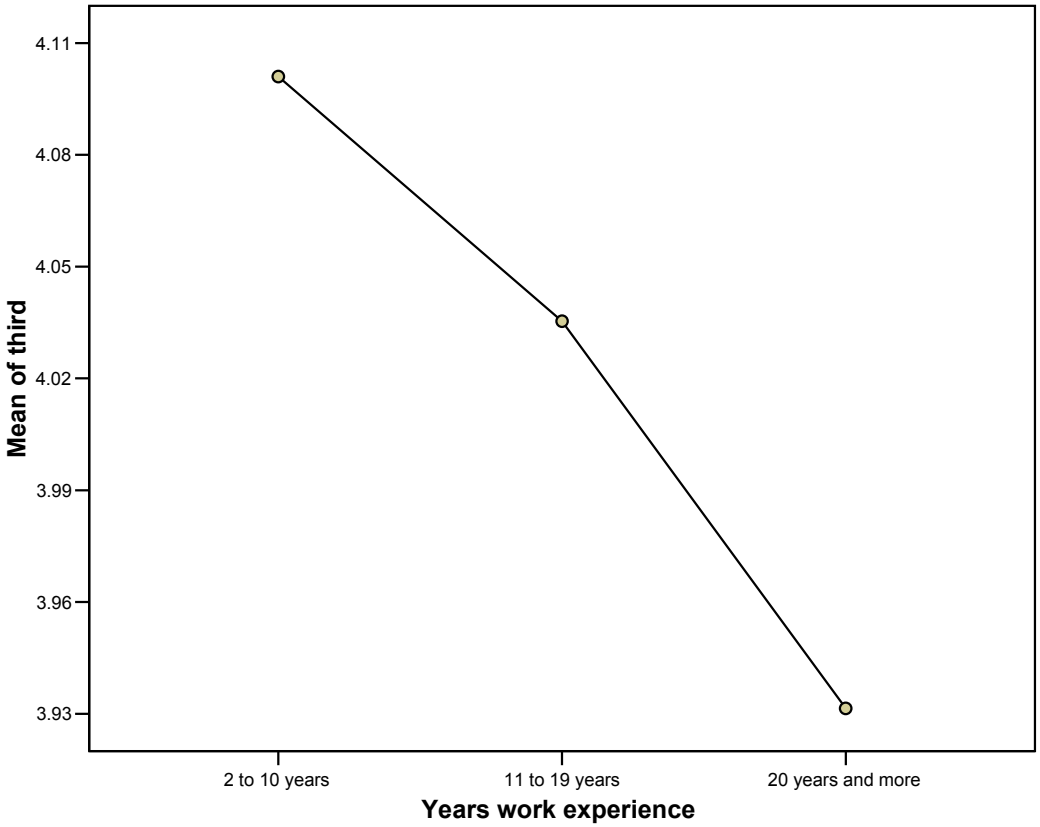
4.16
4.14
Mean of first
2 to 10 years
11 to 19 years
20 years and more
Years work experience


4.11
4.08
4.05
4.02
3.99
3.96
3.93
Mean of third
2 to 10 years
11 to 19 years
20 years and more
Years work experience

Oneway ANOVA

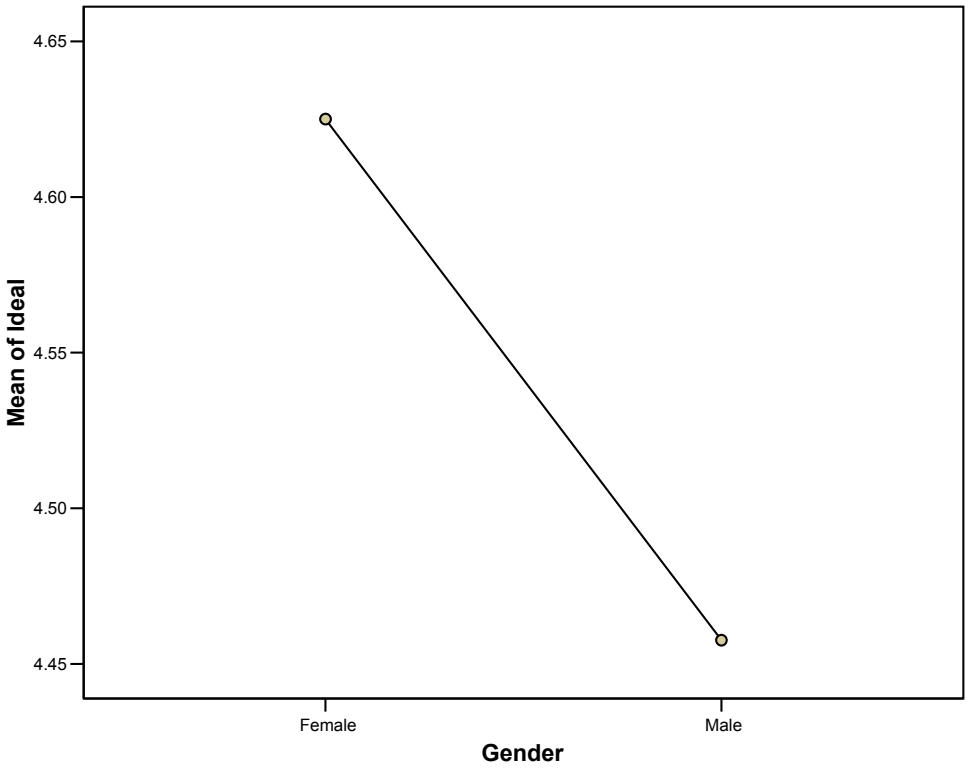
Descriptives

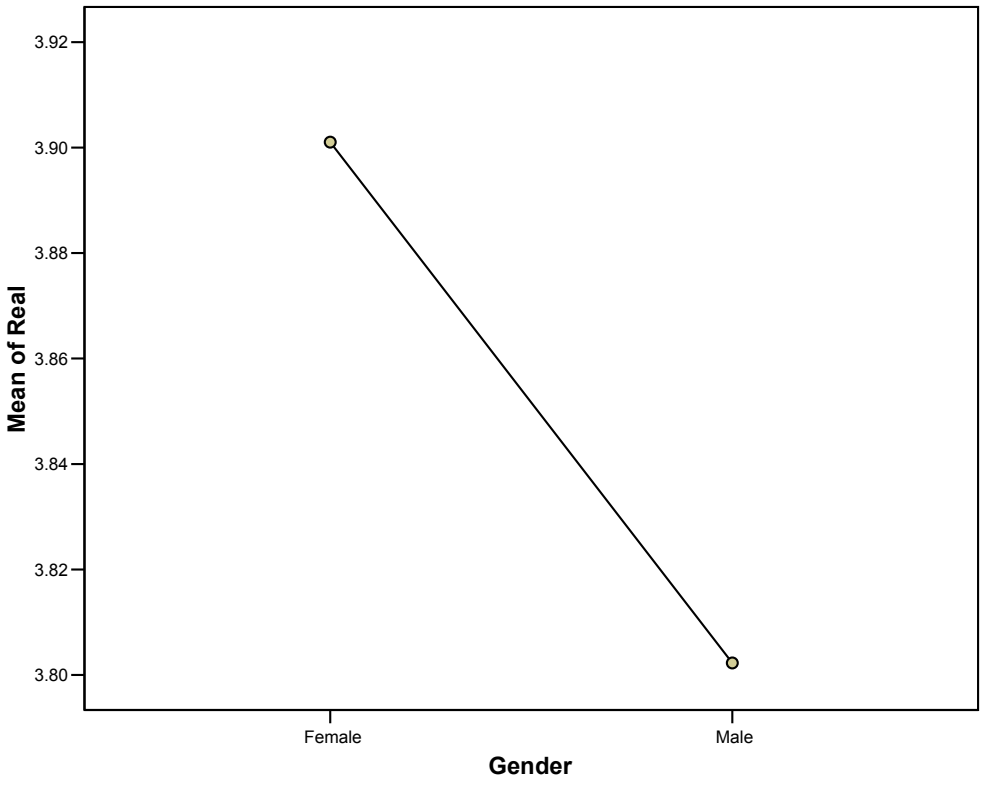
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of 6 IDEAL opinions	Female	32	4.6250	.35671	.06306	4.4964	4.7536	3.83	5.00
	Male	59	4.4576	.37344	.04862	4.3603	4.5549	3.67	5.00
	Total	91	4.5165	.37438	.03925	4.4385	4.5945	3.67	5.00
Average of REAL opinions	Female	32	3.9010	.61908	.10944	3.6778	4.1242	2.50	4.83
	Male	59	3.8023	.68402	.08905	3.6240	3.9805	1.67	5.00
	Total	91	3.8370	.66014	.06920	3.6995	3.9745	1.67	5.00
Average FAIL opinion	Female	32	4.0417	.61201	.10819	3.8210	4.2623	2.67	5.00
	Male	59	3.8136	.74155	.09654	3.6203	4.0068	1.00	5.00
	Total	91	3.8938	.70383	.07378	3.7472	4.0404	1.00	5.00
Average SOCIAL opinion	Female	32	4.1042	.53170	.09399	3.9125	4.2959	3.33	5.00
	Male	59	3.9181	.62619	.08152	3.7549	4.0813	2.50	5.00
	Total	91	3.9835	.59838	.06273	3.8589	4.1081	2.50	5.00
Average ECONOMIC opinion	Female	32	4.1146	.51577	.09118	3.9286	4.3005	3.17	5.00
	Male	59	4.0678	.65369	.08510	3.8974	4.2382	1.67	5.00
	Total	91	4.0842	.60623	.06355	3.9580	4.2105	1.67	5.00
Average ENVIRONMENT opinion	Female	32	4.3490	.55254	.09768	4.1497	4.5482	3.17	5.00
	Male	59	4.0876	.64055	.08339	3.9206	4.2545	2.67	5.00
	Total	91	4.1795	.62075	.06507	4.0502	4.3088	2.67	5.00
Average 1st world opinion	Female	32	4.2396	.45517	.08046	4.0755	4.4037	3.00	5.00
	Male	59	4.1281	.47894	.06235	4.0032	4.2529	3.00	5.00
	Total	91	4.1673	.47122	.04940	4.0691	4.2654	3.00	5.00
Average 3RD WORLD opinion	Female	32	4.1389	.45419	.08029	3.9751	4.3026	2.89	4.89
	Male	59	3.9209	.50289	.06547	3.7899	4.0520	2.78	5.00
	Total	91	3.9976	.49496	.05189	3.8945	4.1006	2.78	5.00

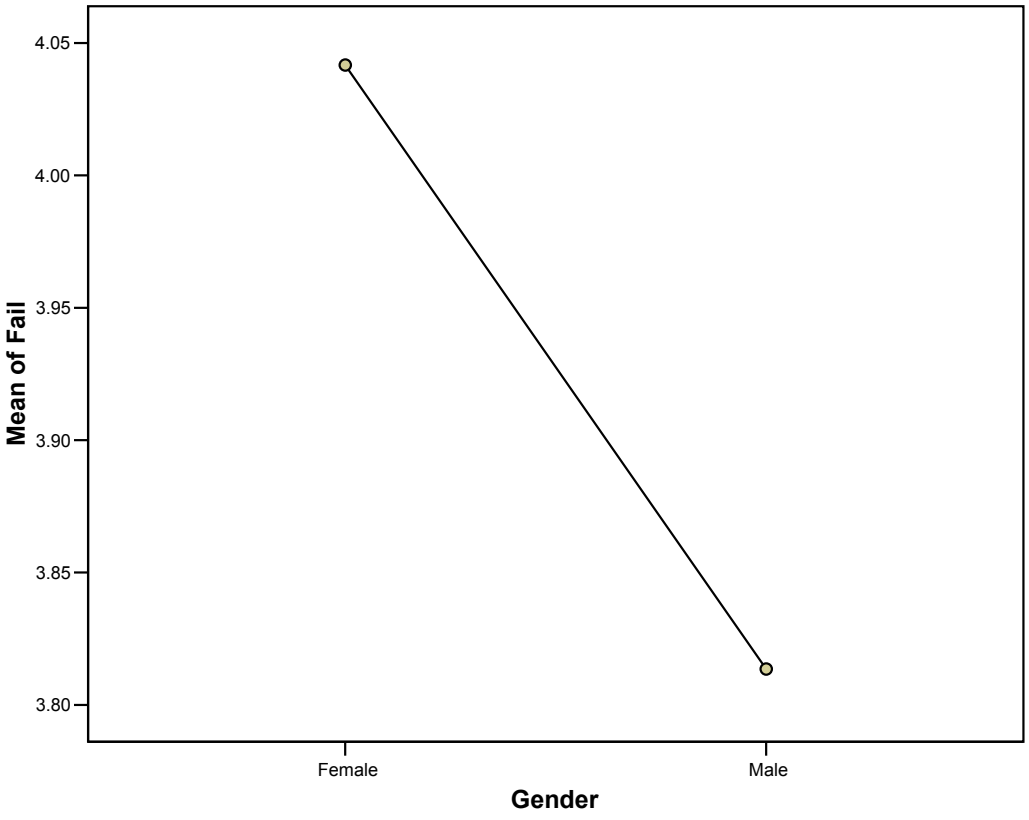
ANOVA

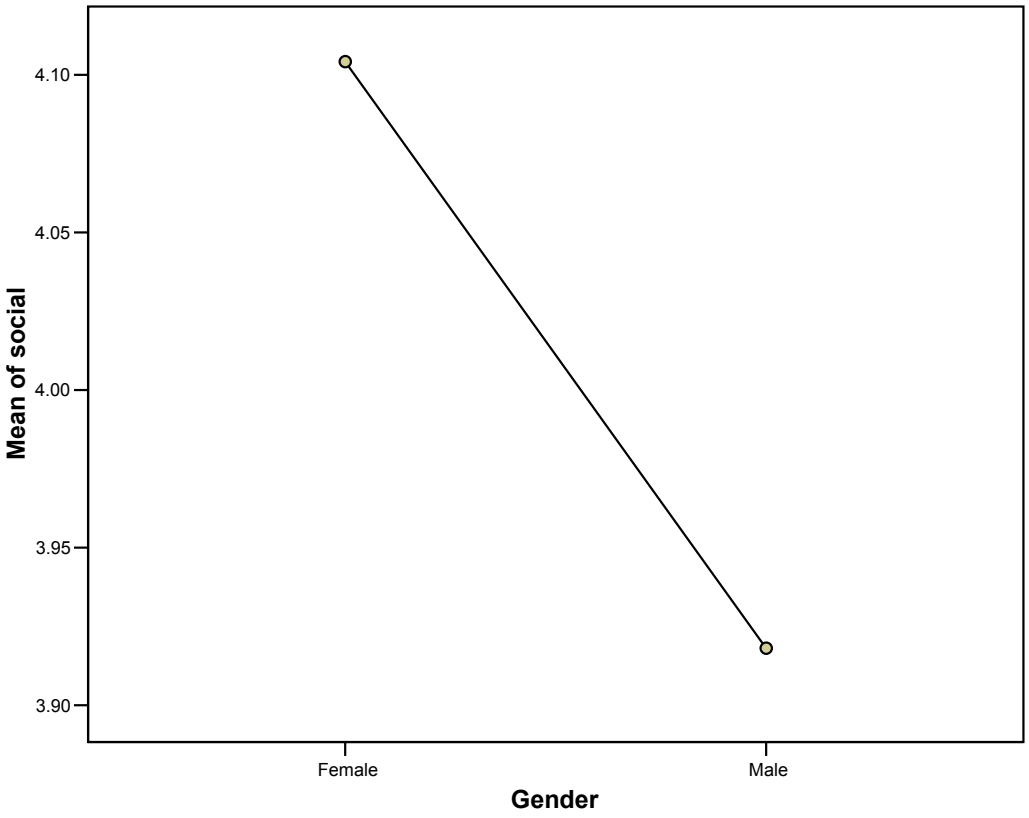
		Sum of Squares	df	Mean Square	F	Sig.
Average of 6 IDEAL opinions	Between Groups	.581	1	.581	4.299	.041
	Within Groups	12.033	89	.135		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.202	1	.202	.462	.499
	Within Groups	39.019	89	.438		
	Total	39.221	90			
Average FAIL opinion	Between Groups	1.080	1	1.080	2.208	.141
	Within Groups	43.505	89	.489		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.718	1	.718	2.029	.158
	Within Groups	31.507	89	.354		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.045	1	.045	.122	.727
	Within Groups	33.031	89	.371		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	1.418	1	1.418	3.793	.055
	Within Groups	33.262	89	.374		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.258	1	.258	1.164	.284
	Within Groups	19.726	89	.222		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.986	1	.986	4.166	.044
	Within Groups	21.063	89	.237		
	Total	22.049	90			

Means Plots


4.65
4.60
4.55
4.50
4.45
Mean of Ideal
Female
Male
Gender


3.92
3.90
3.88
3.86
3.84
3.82
3.80
Mean of Real
Female
Male
Gender


4.05
4.00
3.95
3.90
3.85
3.80
Mean of Fail
Female
Male
Gender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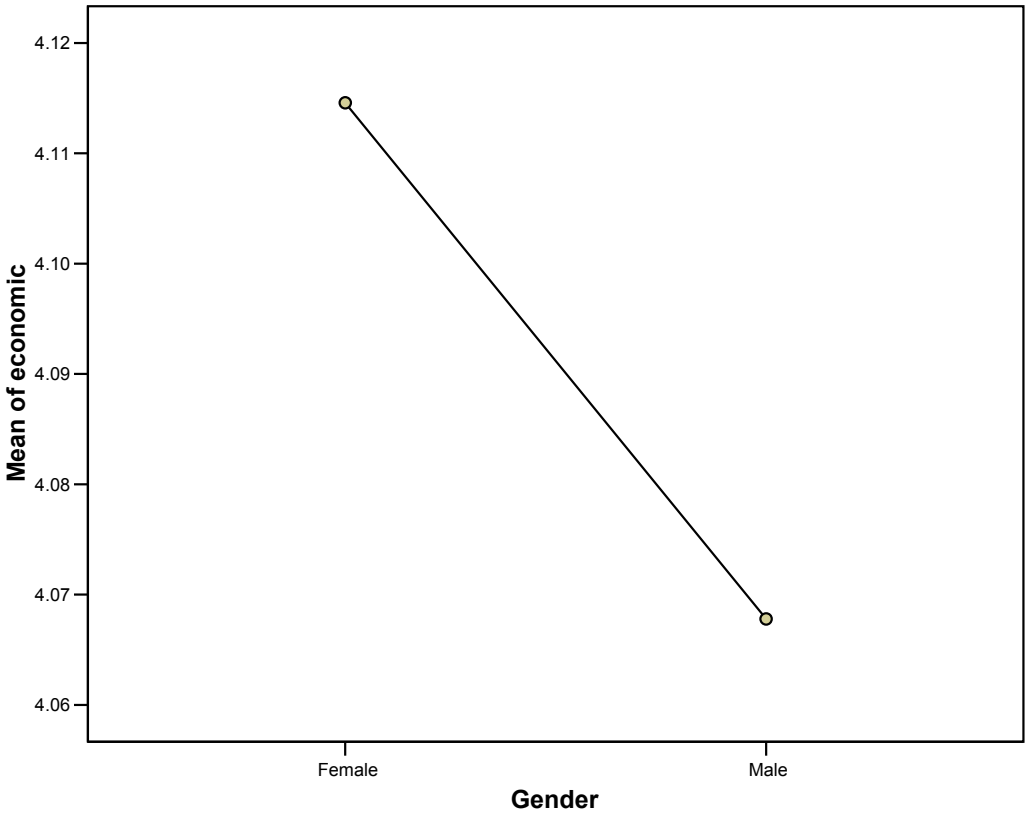
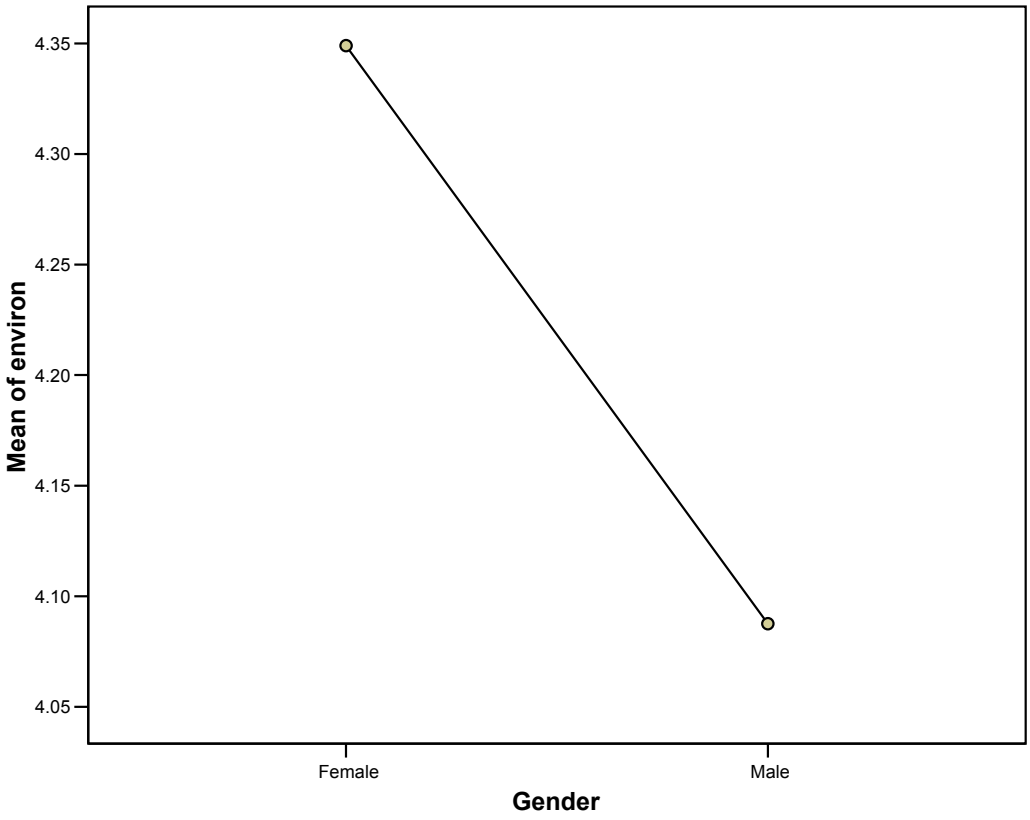
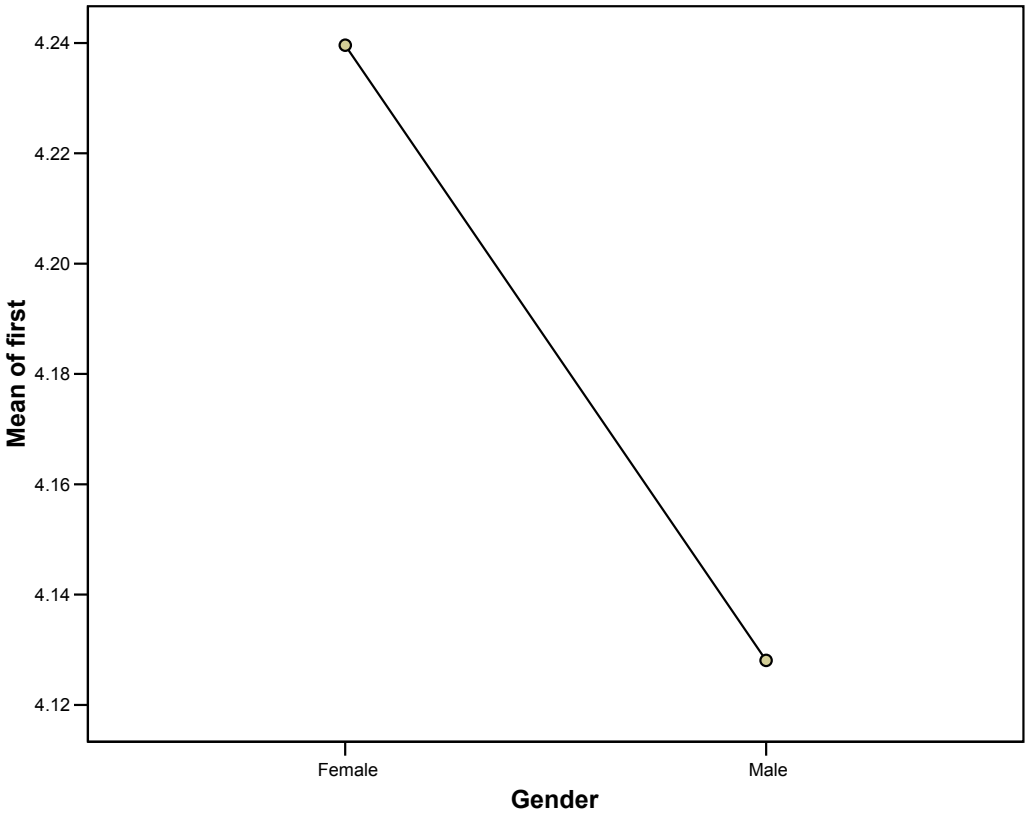
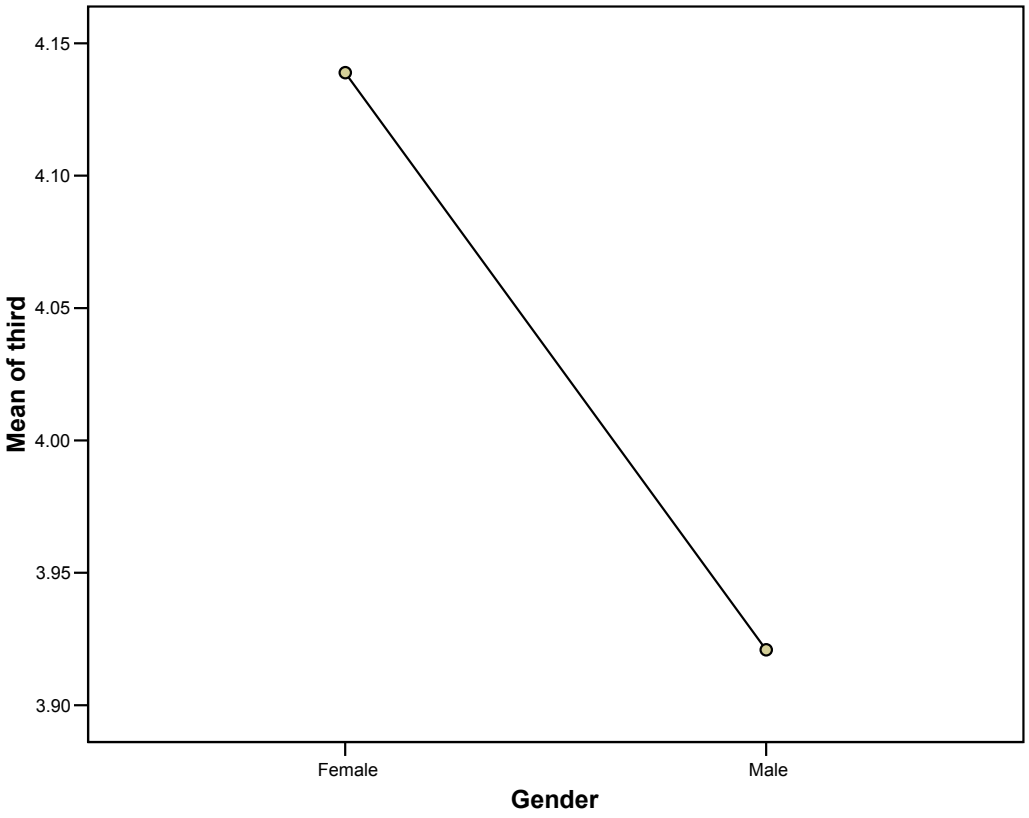
4.05
4.00
3.95
3.90
Mean of social
Female
Male
Gender


4.12
4.11
4.10
4.09
4.08
4.07
4.06
Mean of economic
Female
Male
Gender


4.35
4.30
4.25
4.20
4.15
4.10
4.05
Mean of environ
Female
Male
Gender


4.24
4.22
4.20
4.18
4.16
4.14
4.12
Mean of first
Female
Male
Gender


4.15
4.10
4.05
4.00
3.95
3.90
Mean of third
Female
Male
Gender

Oneway ANOVA

Descriptives

Average rating of 18 questions

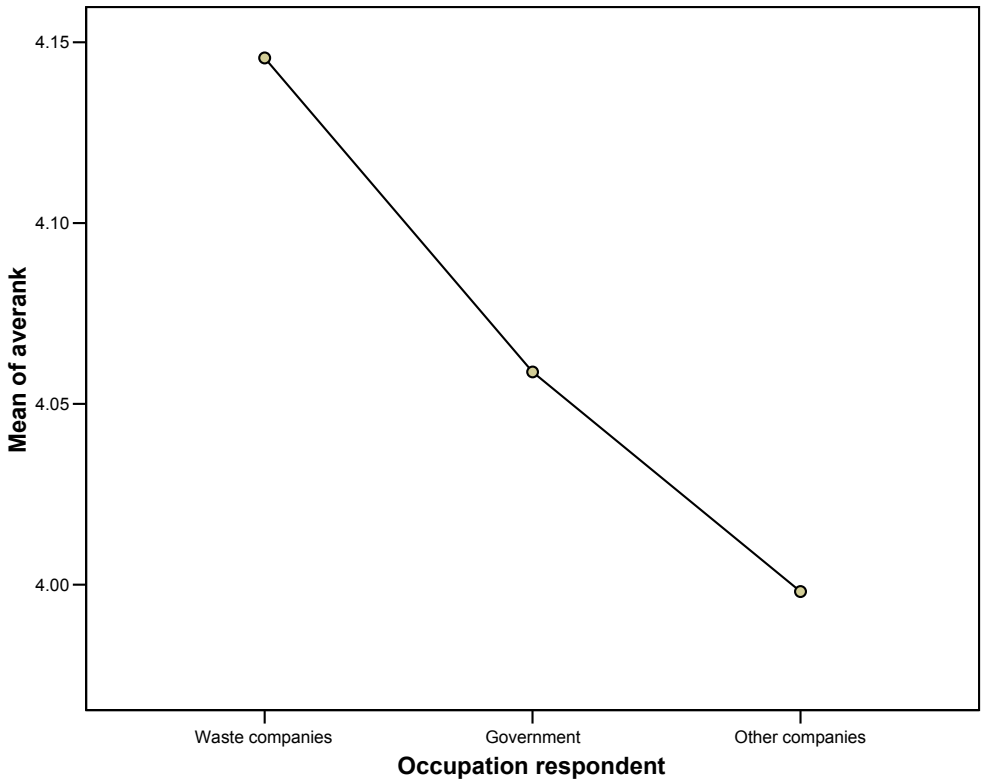
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Waste companies	45	4.1457	.41528	.06191	4.0209	4.2704	3.33	5.00
Government	17	4.0588	.34721	.08421	3.8803	4.2373	3.39	4.89
Other companies	29	3.9981	.47594	.08838	3.8170	4.1791	2.94	4.94
Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

ANOVA

Average rating of 18 questions

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.396	2	.198	1.098	.338
Within Groups	15.860	88	.180		
Total	16.255	90			

Means Plots



Oneway ANOVA

Descriptives

Average rating of 18 questions

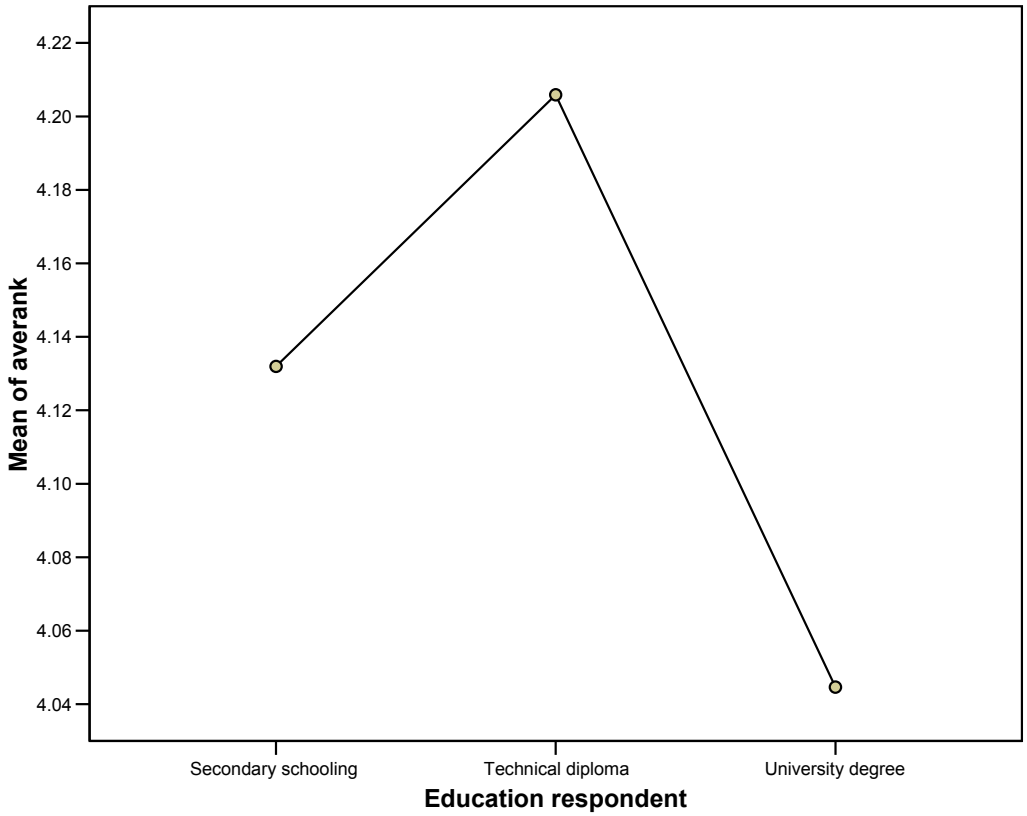
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Secondary schooling	8	4.1319	.42511	.15030	3.7765	4.4873	3.33	4.61
Technical diploma	17	4.2059	.42888	.10402	3.9854	4.4264	3.39	4.94
University degree	66	4.0446	.42380	.05217	3.9404	4.1488	2.94	5.00
Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

ANOVA

Average rating of 18 questions

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.373	2	.187	1.034	.360
Within Groups	15.882	88	.180		
Total	16.255	90			

Means Plots



Oneway ANOVA

Descriptives

Average rating of 18 questions

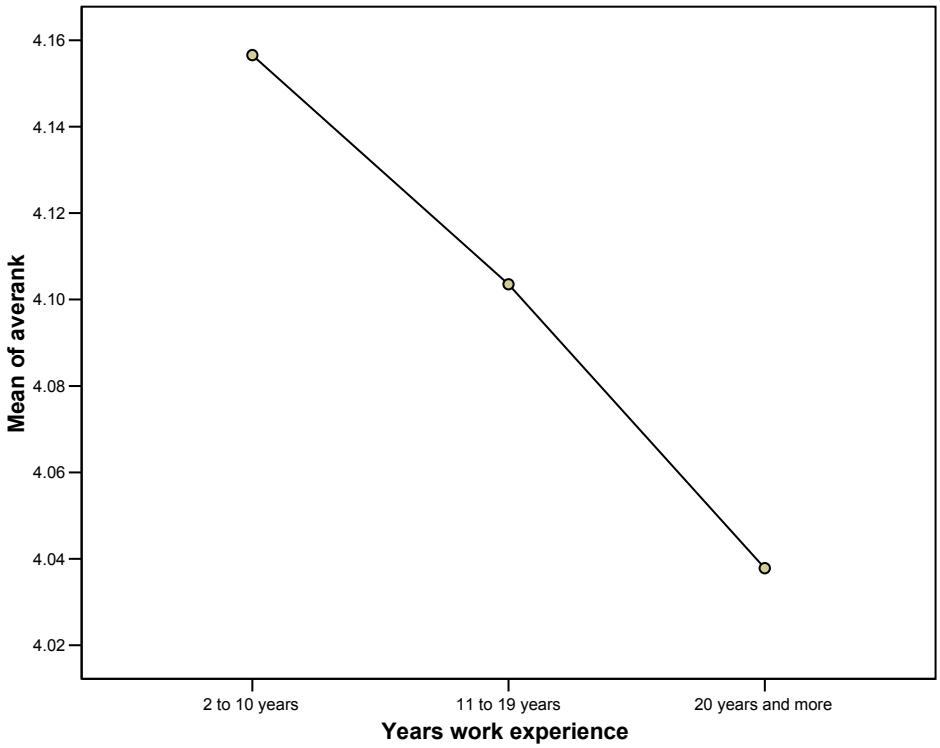
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
2 to 10 years	22	4.1566	.42574	.09077	3.9678	4.3453	3.39	4.89
11 to 19 years	22	4.1035	.41336	.08813	3.9203	4.2868	3.44	4.94
20 years and more	47	4.0378	.43330	.06320	3.9106	4.1650	2.94	5.00
Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

ANOVA

Average rating of 18 questions

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.224	2	.112	.615	.543
Within Groups	16.031	88	.182		
Total	16.255	90			

Means Plots



Oneway ANOVA

Descriptives

Average rating of 18 questions

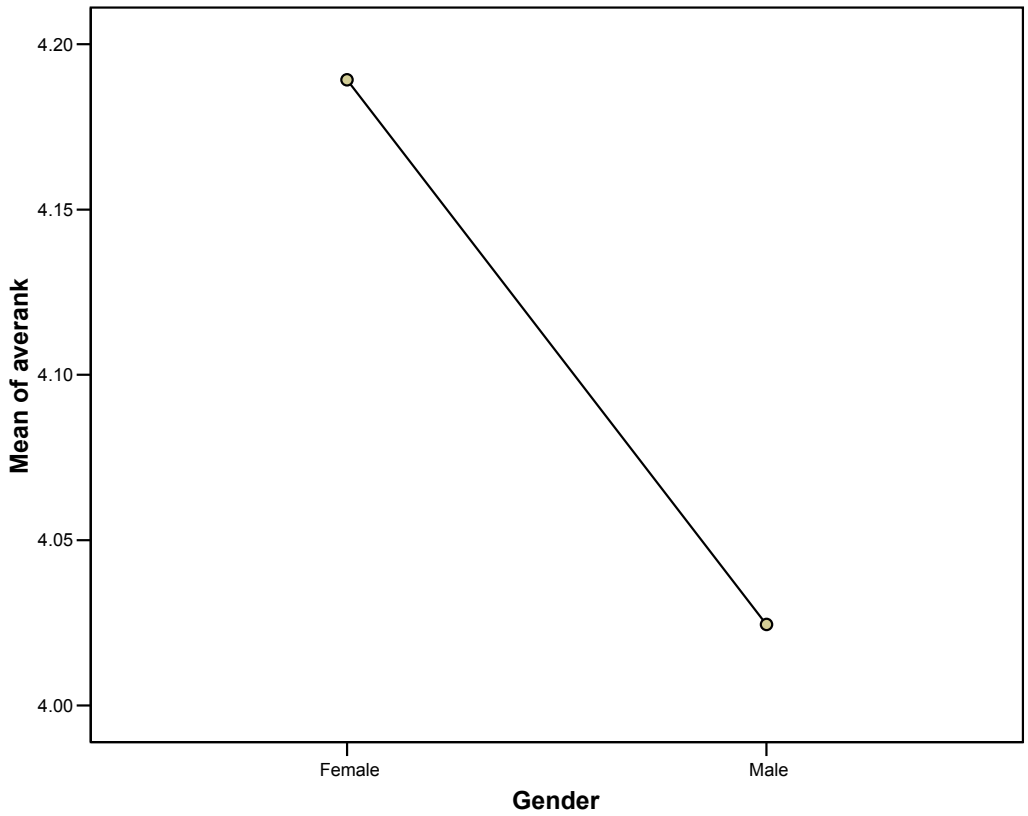
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Female	32	4.1892	.41065	.07259	4.0412	4.3373	3.39	4.89
Male	59	4.0245	.42476	.05530	3.9138	4.1352	2.94	5.00
Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

ANOVA

Average rating of 18 questions

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.563	1	.563	3.194	.077
Within Groups	15.692	89	.176		
Total	16.255	90			

Means Plots



Non-parametric Tests

Friedman Test

Ranks

	Mean Rank
Average of 6 IDEAL opinions	2.73
Average of REAL opinions	1.52
Average FAIL opinion	1.75

Test Statistics(a)

N	91
Chi-Square	79.699
df	2
Asymp. Sig.	.000

a Friedman Test

Non-parametric Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Average of 6 IDEAL opinions	91	4.5165	.37438	3.67	5.00
Average of REAL opinions	91	3.8370	.66014	1.67	5.00
Average FAIL opinion	91	3.8938	.70383	1.00	5.00

Friedman Test

Ranks

	Mean Rank
Average of 6 IDEAL opinions	2.73
Average of REAL opinions	1.52
Average FAIL opinion	1.75

Test Statistics(a)

N	91
Chi-Square	79.699
df	2
Asymp. Sig.	.000

a Friedman Test

Non-parametric Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Average SOCIAL opinion	91	3.9835	.59838	2.50	5.00
Average ECONOMIC opinion	91	4.0842	.60623	1.67	5.00
Average ENVIRONMENT opinion	91	4.1795	.62075	2.67	5.00

Friedman Test

Ranks

	Mean Rank
Average SOCIAL opinion	1.85
Average ECONOMIC opinion	1.91
Average ENVIRONMENT opinion	2.24

Test Statistics(a)

N	91
Chi-Square	9.006
df	2
Asymp. Sig.	.011

a Friedman Test

Non-parametric Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Average 1st world opinion	91	4.1673	.47122	3.00	5.00
Average 3RD WORLD opinion	91	3.9976	.49496	2.78	5.00

Friedman Test

Ranks

	Mean Rank
Average 1st world opinion	1.67
Average 3RD WORLD opinion	1.33

Test Statistics(a)

N	91
Chi-Square	13.164
df	1
Asymp. Sig.	.000

a Friedman Test

Appendix L:

L. Cluster analysis, ANOVA and Kruskal-Wallis tests on section 'C'

Quick Cluster

Final Cluster Centres

	Cluster		
	1	2	3
Value of waste	3	6	8
Standards environmental	8	8	7
Social pressure	5	9	9
Risk management	10	10	8
Producer responsibility	7	9	5
Personal values	7	11	7
Life cycle assessments	11	12	7
Legislation	5	4	7
Government leadership	10	5	4
Corporate leadership	10	7	4
Environmental taxes	7	6	10
Education	6	7	8
Economic incentives	3	4	8
Corporate governance	11	8	5

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
Value of waste	137.743	2	11.277	88	12.215	.000
Standards environmental	14.309	2	13.023	88	1.099	.338
Social pressure	164.872	2	12.050	88	13.683	.000
Risk management	47.195	2	10.212	88	4.622	.012
Producer responsibility	110.869	2	10.919	88	10.154	.000
Personal values	200.767	2	12.784	88	15.705	.000
Life cycle assessments	166.805	2	8.399	88	19.860	.000
Legislation	62.792	2	9.938	88	6.318	.003
Government leadership	287.995	2	11.369	88	25.332	.000
Corporate leadership	228.693	2	8.846	88	25.853	.000
Environmental taxes	85.211	2	13.504	88	6.310	.003
Education	18.051	2	12.619	88	1.430	.245
Economic incentives	175.058	2	7.841	88	22.326	.000
Corporate governance	261.785	2	8.793	88	29.771	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Number of Cases in each Cluster

Cluster	1	39
	2	35
	3	17
Valid		91
Missing		0

Occupation respondent * Cluster Number of Case

Crosstab

			Cluster Number of Case			Total
			1	2	3	
Occupation respondent	Waste companies	Count	19	21	5	45
		% within Occupation respondent	42.2%	46.7%	11.1%	100.0%
		% within Cluster Number of Case	48.7%	60.0%	29.4%	49.5%
	Government	Count	14	3	0	17
		% within Occupation respondent	82.4%	17.6%	.0%	100.0%
		% within Cluster Number of Case	35.9%	8.6%	.0%	18.7%
	Other companies	Count	6	11	12	29
		% within Occupation respondent	20.7%	37.9%	41.4%	100.0%
		% within Cluster Number of Case	15.4%	31.4%	70.6%	31.9%
Total		Count	39	35	17	91
		% within Occupation respondent	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.776(a)	4	.000
Likelihood Ratio	26.014	4	.000
Linear-by-Linear Association	6.492	1	.011
N of Valid Cases	91		

a 1 cells (11.1%) have expected count less than 5. The minimum expected count is 3.18.

Education respondent * Cluster Number of Case

Crosstab

			Cluster Number of Case			Total
			1	2	3	
Education respondent	Secondary schooling	Count	4	2	2	8
		% within Education respondent	50.0%	25.0%	25.0%	100.0%
		% within Cluster Number of Case	10.3%	5.7%	11.8%	8.8%
	Technical diploma	Count	5	9	3	17
		% within Education respondent	29.4%	52.9%	17.6%	100.0%
		% within Cluster Number of Case	12.8%	25.7%	17.6%	18.7%
	University degree	Count	30	24	12	66
		% within Education respondent	45.5%	36.4%	18.2%	100.0%
		% within Cluster Number of Case	76.9%	68.6%	70.6%	72.5%
Total		Count	39	35	17	91
		% within Education respondent	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.485(a)	4	.647
Likelihood Ratio	2.508	4	.643
Linear-by-Linear Association	.188	1	.665
N of Valid Cases	91		

a 4 cells (44.4%) have expected count less than 5. The minimum expected count is 1.49.

Years work experience * Cluster Number of Case

Crosstab

			Cluster Number of Case			Total
			1	2	3	
Years work experience	2 to 10 years	Count	9	11	2	22
		% within Years work experience	40.9%	50.0%	9.1%	100.0%
		% within Cluster Number of Case	23.1%	31.4%	11.8%	24.2%
	11 to 19 years	Count	5	7	10	22
		% within Years work experience	22.7%	31.8%	45.5%	100.0%
		% within Cluster Number of Case	12.8%	20.0%	58.8%	24.2%
	20 years and more	Count	25	17	5	47
		% within Years work experience	53.2%	36.2%	10.6%	100.0%
		% within Cluster Number of Case	64.1%	48.6%	29.4%	51.6%
Total		Count	39	35	17	91
		% within Years work experience	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.501(a)	4	.004
Likelihood Ratio	13.922	4	.008
Linear-by-Linear Association	1.383	1	.240
N of Valid Cases	91		

a 2 cells (22.2%) have expected count less than 5. The minimum expected count is 4.11.

Gender * Cluster Number of Case

Crosstab

			Cluster Number of Case			Total
			1	2	3	
Gender	Female	Count	16	10	6	32
		% within Gender	50.0%	31.3%	18.8%	100.0%
		% within Cluster Number of Case	41.0%	28.6%	35.3%	35.2%
	Male	Count	23	25	11	59
		% within Gender	39.0%	42.4%	18.6%	100.0%
		% within Cluster Number of Case	59.0%	71.4%	64.7%	64.8%
Total		Count	39	35	17	91
		% within Gender	42.9%	38.5%	18.7%	100.0%
		% within Cluster Number of Case	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.255(a)	2	.534
Likelihood Ratio	1.264	2	.531
Linear-by-Linear Association	.439	1	.508
N of Valid Cases	91		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.98.

One-way ANOVA: Average scores of section 'B' versus clusters of section 'C'

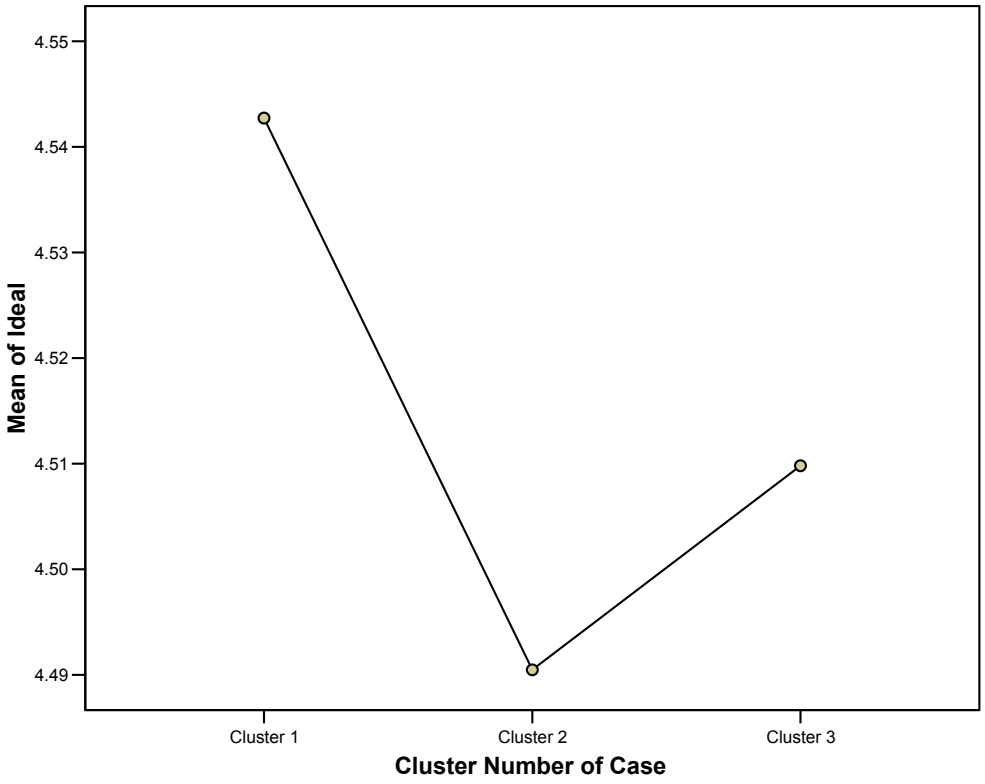
Descriptives

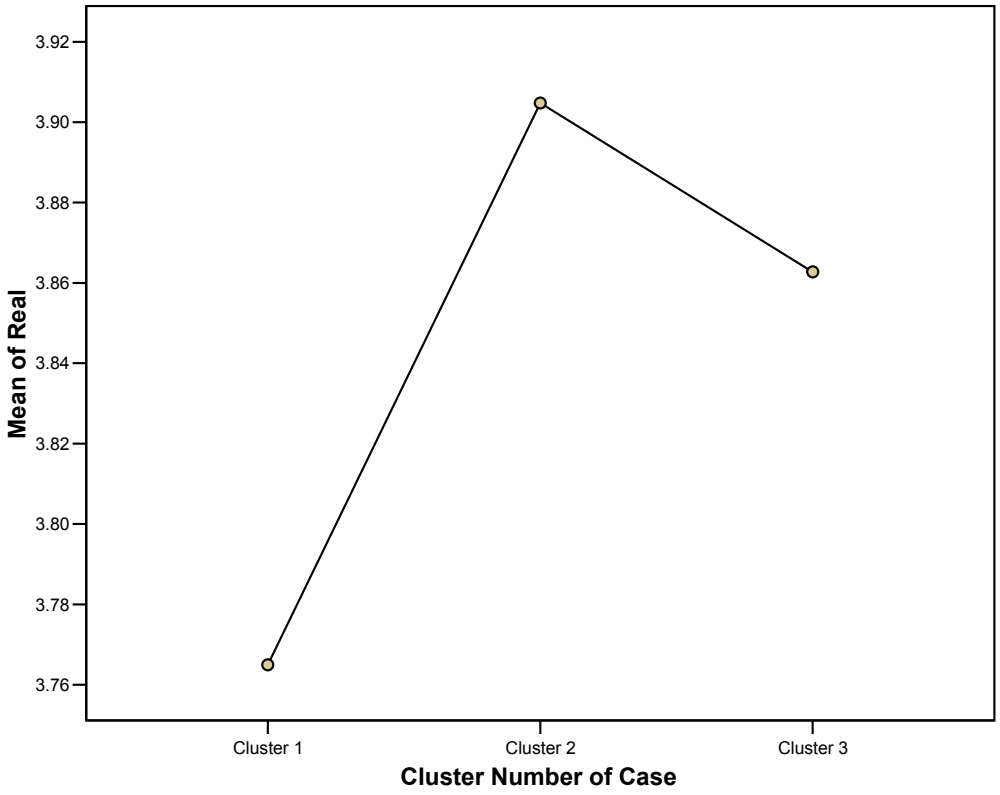
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Average of 6 IDEAL opinions	Cluster 1	39	4.5427	.36015	.05767	4.4260	4.6595	3.83	5.00
	Cluster 2	35	4.4905	.40005	.06762	4.3531	4.6279	3.67	5.00
	Cluster 3	17	4.5098	.37020	.08979	4.3195	4.7001	3.83	5.00
	Total	91	4.5165	.37438	.03925	4.4385	4.5945	3.67	5.00
Average of REAL opinions	Cluster 1	39	3.7650	.55635	.08909	3.5846	3.9453	2.67	5.00
	Cluster 2	35	3.9048	.76727	.12969	3.6412	4.1683	1.67	5.00
	Cluster 3	17	3.8627	.66467	.16121	3.5210	4.2045	2.67	5.00
	Total	91	3.8370	.66014	.06920	3.6995	3.9745	1.67	5.00
Average FAIL opinion	Cluster 1	39	3.9915	.67098	.10744	3.7739	4.2090	1.00	5.00
	Cluster 2	35	3.8762	.67075	.11338	3.6458	4.1066	2.00	5.00
	Cluster 3	17	3.7059	.83651	.20288	3.2758	4.1360	2.00	5.00
	Total	91	3.8938	.70383	.07378	3.7472	4.0404	1.00	5.00
Average SOCIAL opinion	Cluster 1	39	3.9872	.60864	.09746	3.7899	4.1845	2.50	5.00
	Cluster 2	35	4.0381	.58868	.09951	3.8359	4.2403	3.00	5.00
	Cluster 3	17	3.8627	.61304	.14868	3.5475	4.1779	2.67	5.00
	Total	91	3.9835	.59838	.06273	3.8589	4.1081	2.50	5.00
Average ECONOMIC opinion	Cluster 1	39	4.1838	.51127	.08187	4.0180	4.3495	3.17	5.00
	Cluster 2	35	4.0000	.69192	.11696	3.7623	4.2377	1.67	5.00
	Cluster 3	17	4.0294	.62148	.15073	3.7099	4.3489	2.67	5.00
	Total	91	4.0842	.60623	.06355	3.9580	4.2105	1.67	5.00
Average ENVIRONMENT opinion	Cluster 1	39	4.1282	.67371	.10788	3.9098	4.3466	2.67	5.00
	Cluster 2	35	4.2333	.58046	.09811	4.0339	4.4327	3.00	5.00
	Cluster 3	17	4.1863	.60059	.14566	3.8775	4.4951	3.50	5.00
	Total	91	4.1795	.62075	.06507	4.0502	4.3088	2.67	5.00
Average 1st world opinion	Cluster 1	39	4.1994	.45038	.07212	4.0534	4.3454	3.00	5.00
	Cluster 2	35	4.1302	.48017	.08116	3.9652	4.2951	3.11	5.00
	Cluster 3	17	4.1699	.52133	.12644	3.9019	4.4380	3.00	4.78
	Total	91	4.1673	.47122	.04940	4.0691	4.2654	3.00	5.00
Average 3RD WORLD opinion	Cluster 1	39	4.0000	.41023	.06569	3.8670	4.1330	3.22	5.00
	Cluster 2	35	4.0508	.54921	.09283	3.8621	4.2395	2.78	4.89
	Cluster 3	17	3.8824	.56310	.13657	3.5928	4.1719	3.00	4.89
	Total	91	3.9976	.49496	.05189	3.8945	4.1006	2.78	5.00
Average rating of 18 questions	Cluster 1	39	4.0997	.37337	.05979	3.9787	4.2207	3.33	5.00
	Cluster 2	35	4.0905	.46502	.07860	3.9307	4.2502	2.94	4.94
	Cluster 3	17	4.0261	.47022	.11405	3.7844	4.2679	3.00	4.83
	Total	91	4.0824	.42499	.04455	3.9939	4.1709	2.94	5.00

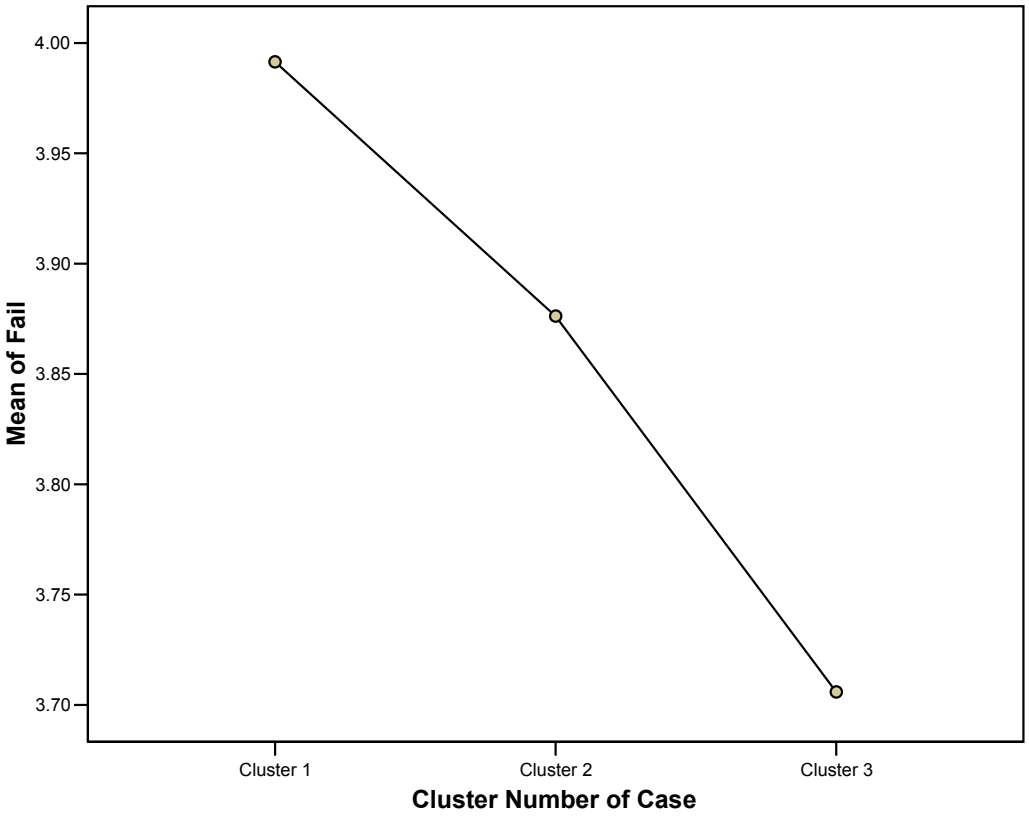
ANOVA : Average scores of section 'B' versus clusters of section 'C'

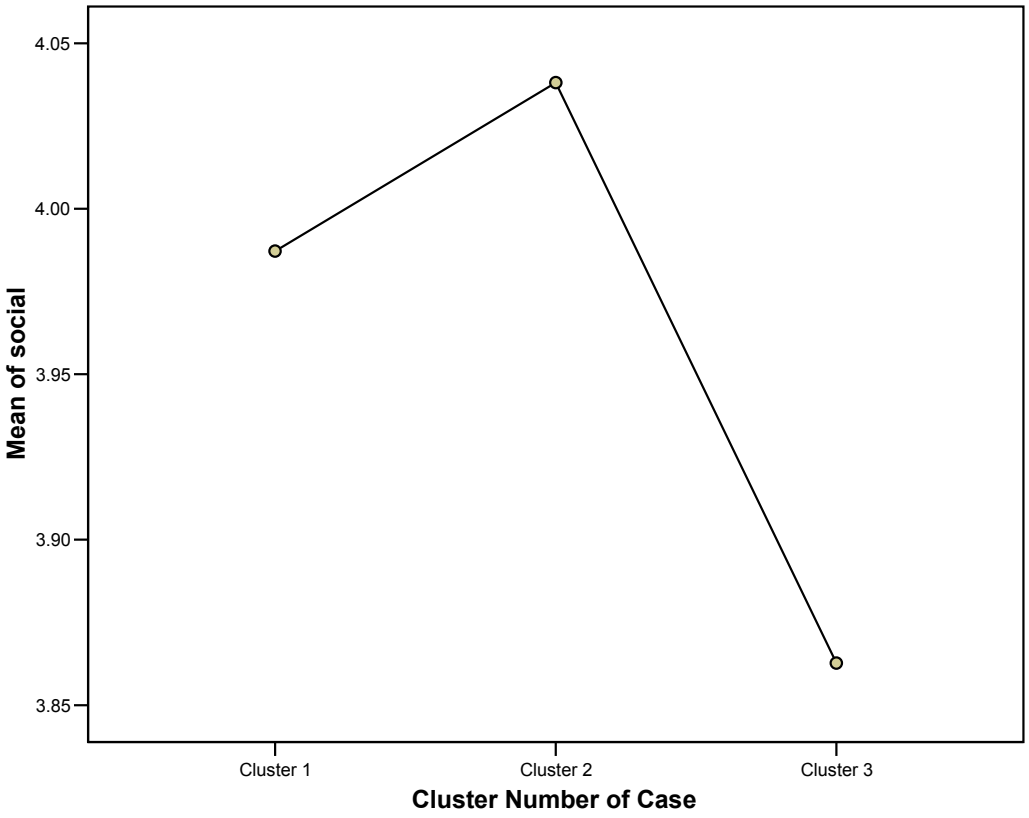
		Sum of Squares	df	Mean Square	F	Sig.
Average of 6 IDEAL opinions	Between Groups	.051	2	.026	.180	.836
	Within Groups	12.563	88	.143		
	Total	12.614	90			
Average of REAL opinions	Between Groups	.374	2	.187	.424	.656
	Within Groups	38.847	88	.441		
	Total	39.221	90			
Average FAIL opinion	Between Groups	.983	2	.492	.992	.375
	Within Groups	43.601	88	.495		
	Total	44.584	90			
Average SOCIAL opinion	Between Groups	.353	2	.176	.487	.616
	Within Groups	31.873	88	.362		
	Total	32.225	90			
Average ECONOMIC opinion	Between Groups	.686	2	.343	.932	.398
	Within Groups	32.391	88	.368		
	Total	33.076	90			
Average ENVIRONMENT opinion	Between Groups	.205	2	.102	.261	.771
	Within Groups	34.475	88	.392		
	Total	34.679	90			
Average 1st world opinion	Between Groups	.089	2	.044	.196	.822
	Within Groups	19.896	88	.226		
	Total	19.985	90			
Average 3RD WORLD opinion	Between Groups	.325	2	.163	.658	.520
	Within Groups	21.724	88	.247		
	Total	22.049	90			
Average rating of 18 questions	Between Groups	.068	2	.034	.184	.832
	Within Groups	16.188	88	.184		
	Total	16.255	90			

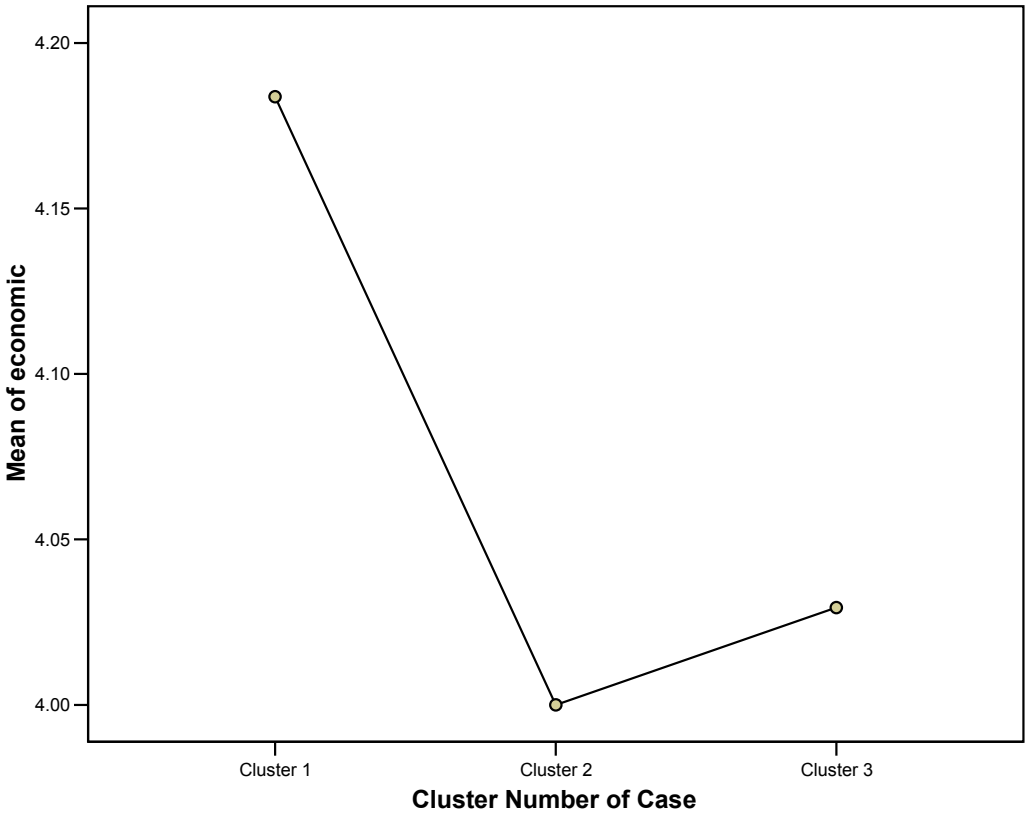
Means Plots

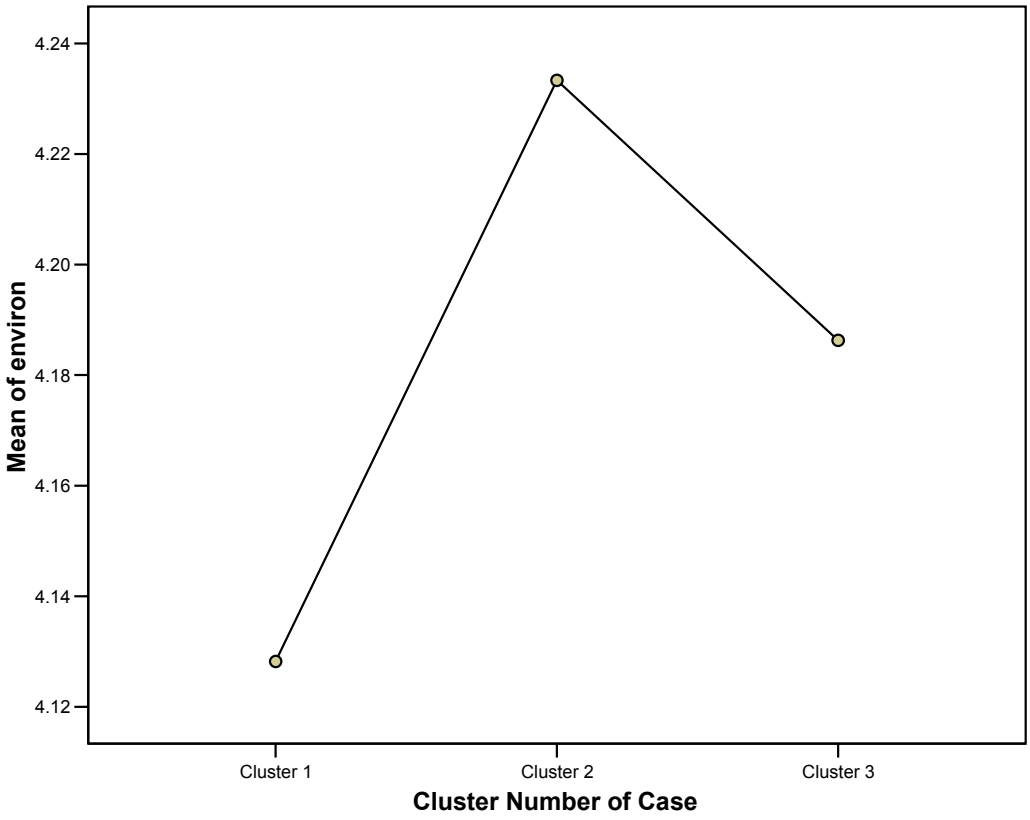

4.55
4.54
4.53
4.52
4.51
4.50
4.49
Mean of Ideal
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case

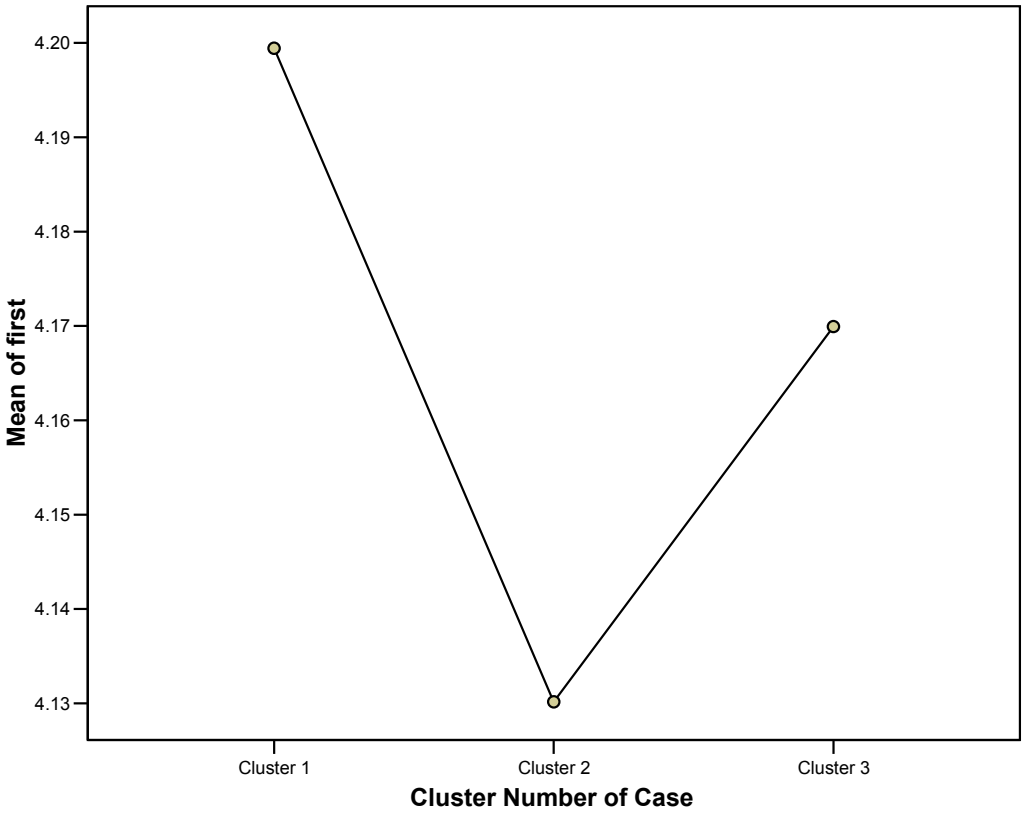

3.92
3.90
3.88
3.86
3.84
3.82
3.80
3.78
3.76
Mean of Real
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case

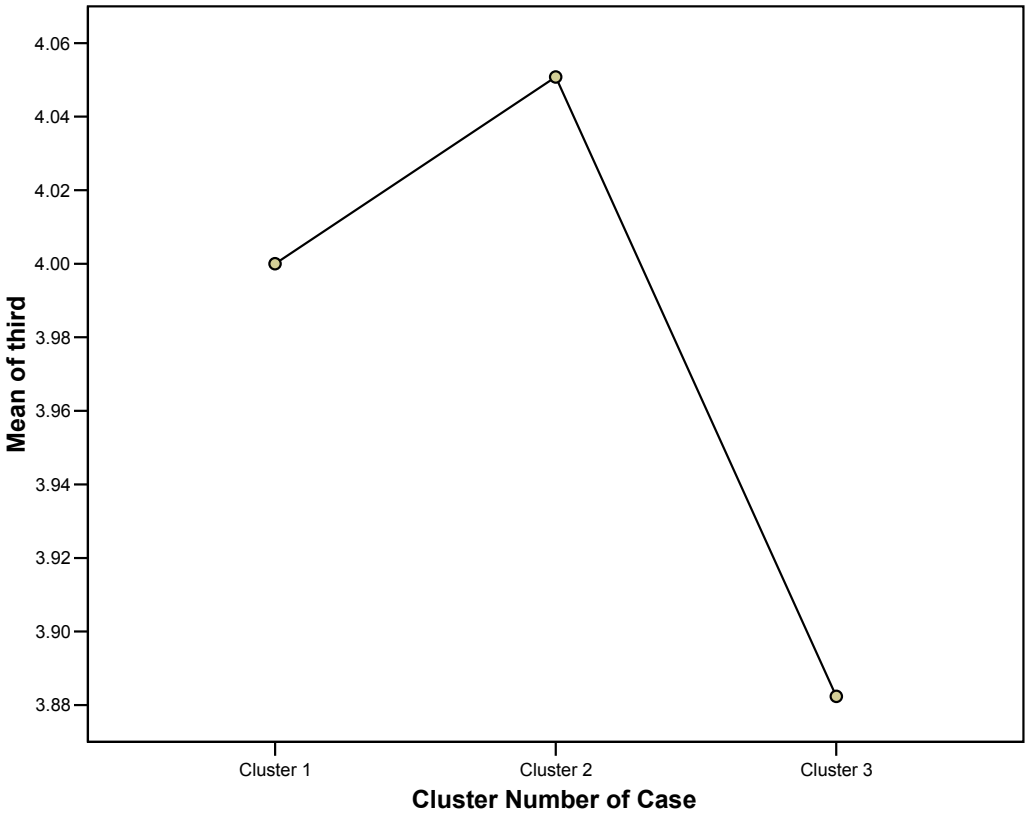

4.00
3.95
3.90
3.85
3.80
3.75
3.70
Mean of Fail
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case

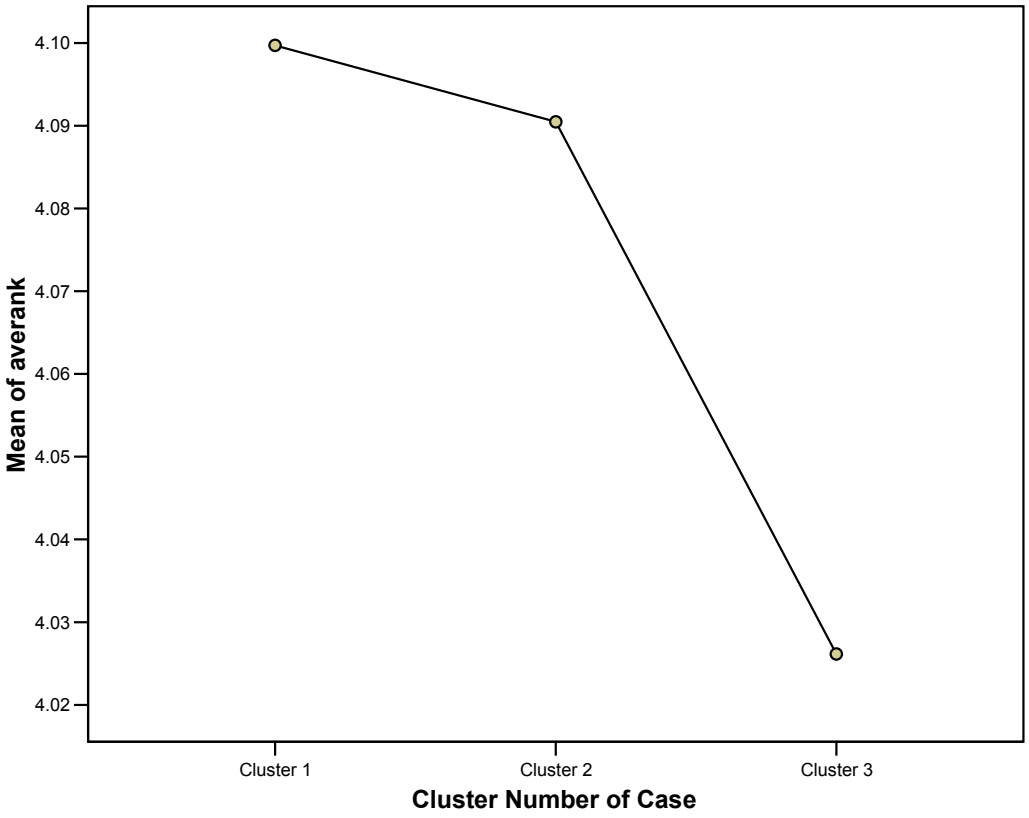

4.05
4.00
3.95
3.90
3.85
Mean of social
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case


4.20
4.15
4.10
4.05
4.00
Mean of economic
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case


4.24
4.22
4.20
4.18
4.16
4.14
4.12
Mean of environ
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case


4.20
4.19
4.18
4.17
4.16
4.15
4.14
4.13
Mean of first
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case


4.06
4.04
4.02
4.00
3.98
3.96
3.94
3.92
3.90
3.88
Mean of third
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case


4.10
4.09
4.08
4.07
4.06
4.05
4.04
4.03
4.02
Mean of averank
Cluster 1
Cluster 2
Cluster 3
Cluster Number of Case

Non-parametric Tests: Kruskal-Wallis Test

Ranks

	Cluster Number of Case	N	Mean Rank
Value of waste	Cluster 1	39	32.83
	Cluster 2	35	52.19
	Cluster 3	17	63.47
Standards environmental	Cluster 1	39	47.96
	Cluster 2	35	48.01
	Cluster 3	17	37.35
Social pressure	Cluster 1	39	31.55
	Cluster 2	35	56.81
	Cluster 3	17	56.88
Risk management	Cluster 1	39	50.21
	Cluster 2	35	47.97
	Cluster 3	17	32.29
Producer responsibility	Cluster 1	39	43.35
	Cluster 2	35	58.16
	Cluster 3	17	27.06
Personal values	Cluster 1	39	33.97
	Cluster 2	35	63.26
	Cluster 3	17	38.06
Life cycle assessments	Cluster 1	39	51.09
	Cluster 2	35	53.74
	Cluster 3	17	18.38
Legislation	Cluster 1	39	45.97
	Cluster 2	35	38.63
	Cluster 3	17	61.24
Government leadership	Cluster 1	39	64.28
	Cluster 2	35	32.56
	Cluster 3	17	31.74
Corporate leadership	Cluster 1	39	62.78
	Cluster 2	35	38.94
	Cluster 3	17	22.03
Environmental taxes	Cluster 1	39	46.44
	Cluster 2	35	37.24
	Cluster 3	17	63.03
	Total	91	
Education	Cluster 1	39	42.81
	Cluster 2	35	45.46
	Cluster 3	17	54.44
Economic incentives	Cluster 1	39	36.31
	Cluster 2	35	43.49
	Cluster 3	17	73.41
Corporate governance	Cluster 1	39	63.35
	Cluster 2	35	38.61
	Cluster 3	17	21.41
	Total	91	

Test Statistics(a,b)

	Chi-Square	df	Asymp. Sig.
Value of waste	19.281	2	.000
Standards environmental	2.256	2	.324
Social pressure	20.598	2	.000
Risk management	5.848	2	.054
Producer responsibility	16.700	2	.000
Personal values	24.796	2	.000
Life cycle assessments	23.668	2	.000
Legislation	8.510	2	.014
Government leadership	33.024	2	.000
Corporate leadership	32.487	2	.000
Environmental taxes	11.003	2	.004
Education	2.341	2	.310
Economic incentives	24.379	2	.000
Corporate governance	34.557	2	.000

a Kruskal Wallis Test
b Grouping Variable: Cluster Number of Case

GLOSSARY

Table 32: Abbreviations used in the text

Abbreviation	Description
CSR	Corporate social responsibility
EDIT	Environmental design industrial template
EIA	Environmental impact assessment
EM	Ecosystem management
EMS	Environmental management system
ERE	Environmental resource economics
IEM	Integrated environmental management
ISO	EU international standards organisation
IWMSA	Institute of Waste Management of Southern Africa
LCA	Life cycle assessment
LCI	Life cycle inventory
MDS	Multidimensional scaling
MSW	Municipal solid waste
NGO	Non-governmental organisations
PP	Precautionary principle
SSWRM	Sustainable solid waste reduction management
SW	Solid waste
SWM	Solid waste management
SWRM	Solid waste reduction management
UN	United Nations Organisation
WCED	World Commission on Environment and Development
WTO	World Trade Organisation