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Corporate culture and strategy in environmental sustainability interventions

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A research proposal submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration

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ABSTRACT

The influence of corporate culture on the strategies used by firms to meet the environmental sustainability challenge has been explored in this dissertation. This was investigated through web-based questionnaires that were administered to employees in companies who would have knowledge of both their employer's corporate culture and corporate sustainability practices.

To determine this, the respondents were requested to rate both the corporate strategies undertaken to meet the environmental challenge, as well as the corporate culture where they work. The corporate strategies were evaluated using a bespoke instrument which was constructed from various strategy instruments found in the literature. The corporate culture was evaluated using a well-known organisational culture instrument available in the literature. Potential contextual variables pertaining to the perceptions of the respondents, as well as to the business and industry sector characteristics, were evaluated as well.

The findings indicated that the contextual variables had little or no effect on either the corporate culture or the corporate strategies undertaken by the firm, and that a strong comprehensive culture correlated strongly with positive corporate strategies. Corporate cultures that emphasise social coordination (or organic culture forms) exhibited stronger correlations with positive corporate strategies than those which emphasise formal control methods (or mechanistic forms). The focus of the firm, whether on internal dynamics or the external environment, did not show a significant effect on the corporate strategies that were undertaken by the firm.

A sustainability culture was synthesised from the findings of the research, which concludes with recommendations regarding further research into this topic.

KEYWORDS

Corporate culture, organisational culture, corporate strategy, environmental sustainability,

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I dedicate this research to my wife Erika and our two sons, Elijah and Joshua. Thank you for all the support, understanding and patience over the last two years. I'm not sure that I'll ever be able to make it up to you, but I intend to spend the rest of my life trying.

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Lastly, but not least, I would like to offer my appreciation to the respondents who participated in this research. It would not have been possible without you all, and I thank you for the time provided.

DECLARATION

I, Wayne Gordon, declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Signed: _____

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LIST OF ABBREVIATIONS

Abbreviation/acronym	Description
ANOVA	Analysis of variance
BS	British Standards
CO_2	Carbon dioxide
CVF	Competing Values Framework
DJSI	Dow Jones Sustainability Index
DEA	Department of Environmental Affairs (South Africa)
EMAS	European Eco-Management and Audit Scheme
EMS	Environmental Management System
EPA	Environmental Protection Agency (United States)
EU	European Union
FTSE	Financial Times Stock Exchange (London Stock Exchange)
GHG	Greenhouse Gas
GLM	General Linear Model
GRI	Global Reporting Initiative
H_A	Alternative hypothesis
H_0	Null hypothesis
IChemE	Institute of Chemical Engineers
ISO	International Organization for Standardization
MEA	Millennium Ecosystem Assessment
MNC's	Multi-National Companies
ρ	Pearson's Correlation Coefficient
PP&E	Property, Plant, and Equipment
Pr	Probability
Rho	Pearson's Correlation Coefficient
ROE	Return On Equity
ROI	Return On Investment
WCED	World Commission on Environment and Development

1. Orientation

1.1 Introduction

1.1.1 *The environmental sustainability challenge*

The World Commission on Environment and Development (WCED) is an entity of the United Nations, usually known as the Brundtland Commission, who brought the concept of sustainability to the global level through their report entitled "*Our Common Future*" (WCED, 1987). The WCED related sustainability to social equity and environmental integrity, but also obligated corporations by coining the term "sustainable development". This was defined as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987:43). For industrial corporations, this ultimately translates to reducing their ecological impact and improving their social/human welfare, whilst ensuring that organisational objectives are achieved (Sharma, 2003).

It is recognised that environmental sustainability is a key issue for all societies in the 21st century (Vlek and Steg, 2007:1; Winsemius and Guntram, 1992:12). As a result, environmental policy ranks first on the political priority list in many industrialised countries (Winsemius and Guntram, 1992:12). Commitment to the preservation of the natural environment has thus become one of the essential variables in modern competitive scenarios (Gonzalez-Benito, 2010:164), in that environmental sustainability should be seen not as an additional cost for companies, but rather as a win-win opportunity (Porter and van der Linde, 1995). A reputation for good environmental policies has been noted to be a source of market advantages in and of itself (Russo and Fouts, 1997:540).

This commitment to the natural environment is due to pressure exerted by societal reaction (Gonzalez-Benito, 2010:164), which has ultimately taken the form of legal requirements regarding environmental emissions in most industrialised countries. This has placed pressure on companies to acquire legitimacy by complying with legislation, conducting environmental audits, and developing networks within local communities (Albino et al, 2009:84). The competitive scenario around these environmental issues is highly dynamic due to changing legislation and standards, stakeholder pressures, and new technologies (Albino et al, 2009:85). The role of contextual factors (such as the

size of the company, the country in which it operates, and other such factors) has been researched in the literature (Jeswani, Wehrmeyer and Mulugetta, 2008).

In addition to legislation and other environmental issues, climate change due to carbon dioxide emissions has emerged as one of the most important issues that will affect industry in future. The Kyoto Protocol has been a major driving force behind this (Lee, 2011:33), and opportunities in carbon credit trading as well as the threat of carbon taxation has added to this. This represents the inclusion of market instruments into the decision-making criteria of environmental sustainability strategies. The Kyoto Protocol also highlights the responsibility that companies have towards the natural environment (Albino, Balice, and Dangelico, 2009: 84). Companies must therefore integrate environmental sustainability concerns into their business operations within this dynamic scenario, (Albino et al, 2009:85). resulting in the environmental sustainability challenge.

1.1.2 *The need for organisational change*

Compliance to environmental emission limits is a legal requirement for all industrial facilities. This can often require substantial changes to the way these facilities operate, including the requirement of major capital investments. This can often mean that major organisational changes will be necessary in order to achieve compliance. Organisational inertia counters against such changes, as rational corporate behaviour is to focus on its economic goals and ignore it's environmental and societal implications or externalities (Frankel, 1998). It is therefore necessary to overcome this organisational inertia. Since an integrated and interdisciplinary perspective to organisational change can assist with this, a clear link exists between sustainability and organisational change (Padarath, 2009:18). It is expected that the field of organisational development "will become increasingly concerned with ecological sustainability" (Cummings and Worley, 2009:707).

It was recognised as early as 1992 that the environmental challenge is ultimately translated as a challenge of implementation (Winsemius and Guntram, 1992). Loorbach et al (2010) argue that persistent environmental issues require a structural change of the system, in order to guide and influence transitions towards sustainability. However, structural changes are not easy to implement - "*The brutal fact is that about 70% of all change initiatives fail*" (Beer & Nohria 2000:133). In fact, initiatives to ensure environmental sustainability have not in general enjoyed spectacular success to date.

The personal beliefs of individual directors and managers of businesses with regard to environmental sustainability has been noted to not necessarily translate into business behaviour, due to performance expectations and accepted business processes (Cartwright and Craig, 2006:742). The question can then be asked as to why these factors cannot simply be changed.

Harich (2010) asks the question why the human system has failed to solve the problem of environmental sustainability despite over thirty years of prodigious effort. His conclusion is that systemic resistance to change is the crux of this problem, and that this needs to be solved first before any change can be successful. Despite societal awareness of the need for environmental sustainability, and the resulting creation of numerous practices to follow in order to achieve this, their effectiveness is stymied within the system itself (Harich, 2010:65) It was noted that no studies have been conducted on the problem of systemic change resistance within the context of environmental sustainability, and that we have therefore been trying to solve the wrong problem (Harich, 2010:66)!

1.1.3 *The role of corporate culture in organisational change*

Schein (2004) states that the root of resistance to organisational change is the culture of the organisation. The argument that organisational culture can either impede or facilitate organisational change (Schein, 2004) means that an understanding of the organisational culture is of utmost importance when considering a major organisational change. Organisational culture is often cited as a primary reason for an organisation failing to implement an organisational change program (Cameron and Quinn, 2006; Linnenleuke and Griffiths, 2010:359). Despite the presence of the necessary change strategies, tools and techniques, failure occurs because the fundamental organisational culture does not change (Cameron and Quinn, 2006:11). Purser (1994) states that "*the adoption of corporate sustainability principles requires a change in core assumptions regarding the interdependence of human and ecological systems*". However, the changes introduced by companies has been the incorporation of environmental responsibility onto existing cultural realities, with no change in organisational culture occurring (Harris and Crane, 2002:215). Companies that wish to integrate environmental sustainability into their business practices should ensure that their sustainability practices conforms with their organisational culture, in order to reduce the risk of hijacked environmentalism/sustainability (Baumgartner, 2009:112).

Although the change mechanisms, strategies, and leadership required for successful sustainability interventions has been researched by Padarath (2009) and Douglas (2008), limited work has been carried out on the organisational culture of corporate companies (corporate culture) required to facilitate such changes.

Considering the importance of environmental sustainability today, interventions intended to support should not fail. The issue therefore is no longer a matter of choice, but rather an issue of tackling the challenge of making it happen. This necessitates an understanding of the role that corporate culture plays in determining the strategies taken to address the issue of environmental sustainability. It is therefore important to research and understand the influence that corporate culture has in meeting the environmental challenge.

1.2 Purpose of the research

The main purpose of the research will be to conduct a descriptive study to determine whether there is a correlation between the corporate culture of an organisation, and the strategies by which the corporate responds to the environmental sustainability challenge. This will be researched by identifying and analysing the corporate cultures and the corporate strategies adopted due to the environmental sustainability challenge today.

This research has been carried out in the South African context, where industrial operations are now subject to legislation which is currently under development. This legislation does not only include promulgated Acts, but also Best Practices, Policies, Regulations to the Acts, and Case Law.

1.3 Research Objectives

The research objective is to understand the correlation between the corporate culture and the strategies utilised to address the environmental sustainability challenge.

1.4 Importance of the study

Environmental sustainability is a key issue for human societies today and for the foreseeable future, and has been legislated to force industrial facilities to comply with

environmental emissions standards. Organisational resistance to the change that is needed to comply, to legislation as well as to societal demands, acts to retard such compliance. Therefore, it is necessary to understand the underlying corporate culture variables involved in overcoming this resistance to change, and the resulting strategies that have been used to ensure environmental sustainability.

1.4.1 *The burning platform / gap in our knowledge*

It is well known that corporate culture plays a the major part in determining the success of organisational change. It is also well accepted that environmental sustainability has become a major challenge in today's society and business world, and that the outcome has not yet been sufficient to meet this challenge.

The fact that corporate culture has not yet been investigated with regards to assisting businesses to meet the environmental sustainability challenge leads to a major gap in our knowledge. It was hoped that this study would introduce an awareness of how corporate culture correlates with the strategies that a company would utilise in order to meet the environmental sustainability challenge. It was further hoped that continued studies into this topic would ultimately result in a substantial address of the environmental sustainability challenge.

1.4.2 *Business considerations*

Investigating this topic would assist in ensuring that the corporate strategies utilised in order to meet the environmental sustainability challenge will be appropriate, as internal resistance resulting from a mismatch with corporate culture will be minimised. This would have a positive impact on the success of these corporate strategies. A further consequence of investigating the problem is that future environmental sustainability initiatives will not be mismanaged, resulting in less financial loss, less wasted investment in resources and time, and potentially less legal compliance issues.

1.4.3 *Academic considerations*

This research complements academic work carried out by:

- Douglas (2008), who identified and analysed the organisational strategies, processes, and power bases used in successful HIV/AIDS interventions in the

workplace. The extrapolation from a social sustainability intervention of this type to environmental sustainability interventions will be complementary, due to the different drivers and needs of the two contexts. Furthermore, clarification on the role that organisational culture plays during environmental sustainability interventions will complement this research.

- Padarath (2009), who extrapolated Douglas' (2008) methodology to corporate sustainability interventions in general, with an additional focus on leadership. The corporate sustainability interventions studied were not categorised according to their different drivers and natures, and a large variance of strategies was noted, perhaps as a result of this. A greater focus on environmental sustainability interventions will be complementary, along with further clarification on the role that organisational culture plays during these interventions.

- Baumgartner (2009), who used Schein's model of organisational culture to characterise corporate sustainability initiatives. This was a qualitative case study of a mining company, which attempted to relate corporate strategies to corporate culture. The study recognised that more case studies were required to prove the theoretical model, and that other qualitative research methodologies were required. It also recognised that further studies are required to determine if sustainable development can catalyse organisational culture change, or if an organisational culture can be developed to facilitate sustainable development (Baumgartner, 2009:112). The scope of this study was limited to a single company and to qualitative techniques.

- Linnenleuke and Griffiths (2010), who discussed the relationship between organisational culture and sustainability, using the Competing Values Framework to understand the corporate culture (see Section 2.4.1). This study was predominantly a literature review. Although certain propositions had been suggested, there was no data gathering or analysis. The authors suggest that the proposed relationships between organisational culture and corporate sustainability requires further exploration (Linnenleuke and Griffiths, 2010:364).

Despite plentiful work that has been carried out on corporate sustainability interventions in general, few have focused specifically on environmental sustainability interventions. These interventions are unique in that there is usually no direct business case to motivate the intervention. The drivers are to avoid long-term environmental

degradation, and more recently to ensure legal compliance intended to enforce the former. Since the three areas of sustainability (economic, social, and environmental) are best understood and are at their clearest when kept separate due to the different aspects and different drivers of each (Goodland and Daly, 1996:1002), the needs of ensuring environmental sustainability should be investigated in isolation from other aspects of sustainability. Although each area of sustainability can be investigated in isolation, however, they do interact with each other (Baumgartner and Ebner, 2010:77), and a change in one area will probably have an influence on the others as well.

Therefore, it is also hoped that this research will contribute to socio-economic change as well, considering the importance of the context of this research.

2. Literature Summary

2.1 Introduction

Environmental sustainability is discussed, describing the threat to the ecology resulting from industrial pollution and climate change, along with some initiatives that have been taken to mitigate against these threats. The legislation that has been enacted in South Africa in order to tackle the threats to environmental sustainability due to industrial pollution is also described.

A typology for categorising the **corporate strategies** adopted by organisations in response to environmental sustainability challenges is then presented. This is followed by a typology on corporate strategies that are adopted when implementing organisational change.

The relevance of **corporate culture** in environmental sustainability interventions is then discussed. A framework for evaluating the corporate culture that exists at the company is presented.

2.2 Environmental sustainability

The term “sustainable development” has been broken down into three interrelated concepts – economic, social, and environmental sustainability (WCED, 1987). This study focuses on issues pertaining directly to *environmental* sustainability, considered in isolation to the other aspects of sustainability. Literature is presented on the global state of affairs regarding environmental sustainability, and the South African response to it. The frameworks by which corporate strategies (to address environmental sustainability) are presented. Finally, a bespoke framework is developed in order to measure corporate strategies utilised to meet environmental sustainability requirements.

2.2.1 *The global environmental state of affairs*

The Millennium Ecosystem Assessment, carried out under the auspices of the United Nations Environmental Program, asserts that human activities in the last few decades have damaged vital ecosystem services more extensively and more rapidly than in any

other period of history (MEA, 2005:1). This has occurred largely to meet rapidly growing demands for food, fresh water, timber, fibre, and fuel. At least fifteen out of the twenty-four ecosystems that were evaluated are degraded, or otherwise used so unsustainably that "non-linear changes" (which includes abrupt, accelerating, and potentially irreversible changes) with detrimental consequence for human well-being are a significant risk (MEA, 2005:2). It was also stated that environmental degradation presents "*a significant barrier to achieving Millennium Development Goals*" agreed upon by the international community in September 2000 (MEA, 2005:2).

The global ecosystem is finite, and has now reached a stage where its assimilative and regenerative capacities have become very strained (Goodland and Daly, 1996:1008). If pollution and environmental degradation grows at the same or higher rate, then disastrous results to human health can ultimately ensue, and the growth itself would be self-defeating and undermined (Goodland and Daly, 1996:1008). Nevertheless, destruction to the ecosystem continues, as actions intended to reverse or even just slow down the degradation of ecosystems have resulted in some benefits, but have not kept pace with increasing pressures and demands in general. (MEA, 2005).

As a result, multinational firms are encountering increasing pressure to engage in environmental responsibility (Orlitzky et al, 2011). Legislation to ensure environmental responsibility has therefore been promulgated around the world, through powerful organisations such as the United States Environmental Protection Agency (EPA), the European Union (EU), and through national governments in most industrialised countries.

2.2.2 *The South African response to the environmental state of affairs*

The harmful effects of global environmental degradation are being borne disproportionately by the poor (MEA, 2005:2), particularly those in environmentally sensitive areas such as Sub-Saharan Africa (Vlek and Steg, 2007:4). South Africa is therefore strongly affected by the global environmental degradation. It is also the most industrialised country in Sub-Saharan Africa, with an industry that is largely dependent on coal and mining. South Africa's energy resource base is essentially dominated by coal, with about 77% of South Africa's primary energy needs provided domestically by coal (South African Department of Environmental Affairs, 2009:67). Coal is utilised for the generation of almost all of South Africa's electricity and a significant proportion of its liquid fuels (South African Department of Environmental Affairs, 2009:67). Both

mining operations and the use of coal results in substantial pollution to the environment (South African Department of Environmental Affairs, 2009:67).

It has been acknowledged by the South African Government, via the Department of Environmental Affairs (or DEA), that environmental systems need to be maintained at healthy levels in order to realise environmental sustainability, and that the condition of environmental systems and natural resources are affected by human activities (South African Department of Environmental Affairs, 2009:23). Some systems or resources are degraded due to human activities such as the release of pollutants, or over-extraction of a particular resource (South African Department of Environmental Affairs, 2009:23). It has therefore been argued that sustainability cannot be reasonably expected to be addressed during times of ongoing environmental pollution (South African Department of Environmental Affairs, 2009:23).

Legislation controlling emissions to the environment has therefore been promulgated in South Africa recently, following that of similar legislation in Europe and elsewhere. This legislation is designed to curb industrial emissions to the environment, such as:

- The National Environmental Management Act South African Department of Environmental Affairs, 1998).
- The Air Quality Act (South African Department of Environmental Affairs, 2010).
- The Waste Act (South African Department of Environmental Affairs, 2008).

Although these Acts have been promulgated recently, the Regulations to some of these Acts are under development, and Case Law around them is still to be developed.

2.3 Corporate strategies to meet the environmental sustainability challenge

Organisations respond to the environmental challenge in different ways, embarking on certain combinations of strategies which collectively can be termed the "*corporate response*". A significant amount of research has been carried out regarding the response of organisations to the challenge of environmental sustainability, some of which are presented in Table 1. Increasing pressures from financial institutions (as lenders), customers (as end consumers), public opinion and regulatory authorities has resulted in aspects of environmental sustainability (such as climate change) being considered in corporate strategy (Weinhofer and Hoffman, 2010).

The strategies adopted by corporations with respect to environmental sustainability (in particular the matter of climate change) has been investigated by a number of researchers (see Table 1). The response types alluded to in the table are expanded on below.

Table 1. Corporate response typologies developed by various researchers, adapted from and including research by Lee (Lee, 2012). (Presented in chronological order)

RESEARCH	CORPORATE RESPONSE TYPE
Winsemius and Guntram (1992)	Reactive, receptive, constructive, proactive
Levy and Kolk (2002)	Avoidant, resistant, compliant, proactive
Jeswani, Wehrmeyer and Mulugetta (2008)	Indifferent, beginner, emerging, active
Sprengel and Busch (2010)	Minimalists, regulation shapers, pressure managers, emission avoiders,
Weinhofer and Hoffmann (2010)	All-rounder, compensator, substituting compensator, reducer, substituting reducer, preserver
Baumgartner and Ebner (2010)	Beginning, elementary, satisfying, sophisticated
Lee (2012)	Wait-and-see observer, cautious reducer, product enhancer, all-round enhancer, emergent explorer, all-round explorer

Table 1 is by no means a complete list. Research into characterising environmental activities of companies has led to the development of more than fifty models and typologies with which to classify corporate strategies, behaviours and performances (Kolk and Mauser, 2002). This number has certainly increased since 2002, with no generic framework having become dominant since then. However, a few were selected for further discussion, in order to highlight some of the issues that should be considered when designing a bespoke model for this research.

2.3.1 *Winsemius and Guntram's corporate response framework*

Following a survey of more than four hundred senior executives of major companies worldwide, Winsemius and Guntram (1992) classified the corporate strategies that they utilised into various types, as shown in Table 2.

The framework presented by Winsemius and Guntram focuses mainly on the corporate response as an attitude of willingness. It presents as a linear continuum from resistant at the one end to compliant at the other end. It is therefore a **one-dimensional continuum or progression**. It does not take contextual industry factors into account, such as the size of the firm, the nature of the industry that it is in, or the legislation that it must comply with. It was developed twenty years ago, and corporate strategies can be expected to have become more sophisticated since then.

The central aspect of environmental sustainability scoring used was the a*ttitude* of the decision-makers in the companies. It was found that the different corporate response types exhibited markedly different attitudes (Winsemius and Guntram, 1992:17-18), and that these attitudes translated into the degree of compliance that was observed.

Table 2. Corporate strategies utilised by companies in order to meet the environmental sustainability challenge (adapted from Winsemius and Guntram, 1992).

	Reactive	Receptive	Constructive	Pro-active
Attitude	defensive, provide claims of exaggerations, and adopt a posture of being loyal citizens	compliant with the law	look beyond boundaries of being compliant with current business, and find fundamental answers to the environmental challenge	internalise the environmental challenge as an element of quality management
Responsibility	assign responsibility to staff and specialists, as an extension to existing health and safety departments	to line management within boundaries of current business	departmental	at corporate level. Pool resources with other firms to find solutions
Characteristic solutions	end-of-pipe solutions, and add-ons to existing equipment	optimise current configurations, some process redesign	adopt cradle-to-grave approach. Co-operate with third-parties	solutions to the complex environmental challenge, and pass the 3E test (efficiency, effectiveness, equity)
Aim	Minimise response and associated costs	meet government criteria in the most efficient manner	meet the environmental challenge in the most efficient manner	optimise the value proposition and focus on needs of customers

2.3.2 *Levy and Kolk's corporate response framework*

Levy and Kolk (2002) adopted the framework used in earlier research by Gladwin and Walter (1980), which is a **two dimensional categorical typology**. It is richer in its portrayal of strategic options than a simple one-dimensional continuum from resistance through to pro-activeness. The labels for each quadrant were changed to be more self-evident and in accord with terminology in recent literature. The quadrants are shown in Figure 1, wherein the corporate response types of a corporate to environmental sustainability challenges can be categorised.

This framework also highlights the attitude of the decision-makers in the corporate, and uses two dimensions to describe this – cooperativeness and assertiveness. In the context investigated, "cooperative" refers to the support for mandatory emissions control, as well as the support for investment in renewable energy technologies (Levy and Kolk, 2002:288). "Assertiveness" refers to the degree of assertiveness with which the company opposes or supports regulatory efforts (Levy and Kolk, 2002:288).

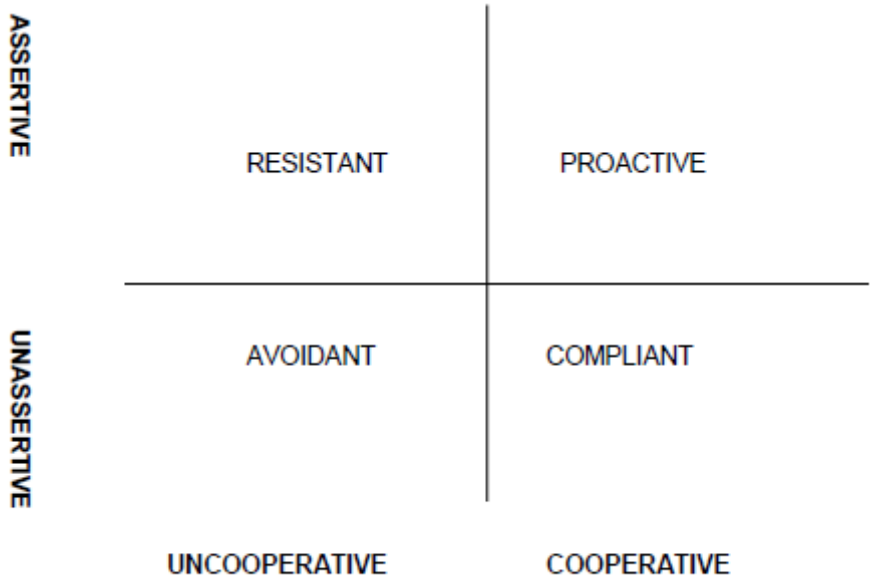

Figure 1. Strategies to environmental sustainability challenges (adapted from Levy and Kolk, 2002).

2.3.3 *Jeswani's corporate response framework*

Jeswani, Wehrmeyer and Mulugetta (2008) produced a **one-dimensional** continuum model, using data gathered from respondents in Pakistan and the United Kingdom. Organisations

were categorised according to two main components – operational activities and management activities, which were then used to describe and detail their corporate strategies. The four categories are described as follows (Jeswani et al, 2008):

1. Indifferent: These scored low on all strategy dimensions, and are organisations that are apathetic about environmental sustainability regulations and issues.
2. Beginner: These companies have started some limited operational changes, and management commits minimum resources, mostly towards energy efficiency and lowering costs.
3. Emerging: These companies are doing more than the "beginner" group, but are not first movers. They are followers and not leaders in meeting environmental challenges, and are involved in external activities only where legislation demands it.
4. Active: These are companies that are most involved in all aspects of meeting the environmental challenge.

It can be seen that Jeswani et al. (2008) focused primarily on the degree of a firm's pro-activity in response to carbon reduction requirements (Lee, 2012:34). This is a result of the **one-dimensional continuum** used to score the strategies, in contrast to some other authors who allowed for multi-dimensional frameworks that provide for a more qualitative discussion.

Jeswani et al (2008) suggest that the corporate strategies depend on the location of the firm, the sector that it does business in, the size and type of ownership, stakeholder pressures on the industries, and that both barriers and drivers for taking actions vary between countries and also across industrial sectors, size and specific types of the industrial operations. These factors were tested, and found to have an influence within the sample that was tested, namely companies in the UK and in Pakistan. For instance, due to several factors such as a lack of financial resources, lack of awareness, lack of expertise and absence of policies, most of the Pakistani companies are either in the "indifferent" or "beginner" phase. This contrasts with the companies based in the UK, which responded predominantly with "emerging" or "active" strategies (Jeswani et al, 2008:57).

2.3.4 *Sprengel and Busch framework*

Sprengel and Busch (2010) carried out a cluster analysis on a sample from the Dow Jones global index companies, forming a **multi-dimensional or categorical typology** (see Table 1). The cluster analysis resulted in four distinct strategic responses, namely (Sprengel and Busch, 2010:358):

1. **Minimalists**: These companies engage in a minimalistic strategic response. This is a low-engagement, passive response.
2. **Regulation shapers**: The companies exhibit higher activity than the minimalists in responding to stakeholder pressures, and they actively engage in the political process in order to influence future regulations.
3. **Pressure managers**: These companies engage in the political process, but simultaneously attempt to decrease emissions in order to reduce stakeholder pressures. The focus is on externally oriented responses.
4. **Emission avoiders**: These companies are characterised by a high level of overall activity, including those to decrease their emissions and involve stakeholders. The focus is on internally oriented responses.

This corporate response typology corresponds with that of Murillio-Luna, Garcés-Ayerbe and Rivera-Torres (2008), although other terminologies are used. It was also found that the findings of Murillo-Luna et al. (2008) were supported in that (Sprengel and Busch, 2010:362):

1. The grouping of companies into the clusters, as well as the strategies employed by them, are independent of the sources of stakeholder pressures (such as the media, investors, customers, government, suppliers, and others). The study showed that managers do not differentiate between the different sources of stakeholder pressures.
2. The level of pollution, as measured by its greenhouse gas intensity, is important for the choice of the strategic response used. For instance, companies that are dependent on carbon adopt a "pressure managers" response upon receiving stakeholder pressure, whereby they focus on managing the external pressures instead of significantly accelerating their internal reduction efforts.
3. The choice of the strategy utilised by the company could not be attributed to general company characteristics other than carbon dependency (such as revenue, market capitalisation, and return on assets).

2.3.5 *Weinhofer and Hoffman's framework*

Weinhofer and Hoffman (2010) carried out a cluster analysis on companies in the electrical industry, forming a **multi-dimensional or categorical typology**. The corporate strategies responses within this sample were analysed according to three strategies used to handle carbon emissions, namely (Weinhofer and Hoffman, 2010:80):

1. CO_2 compensation – including emissions trading and investments in carbon offset projects.
2. CO_2 reduction – investing in new or improving existing processes with lower carbon emissions.
3. Carbon independence - investing in new processes with no carbon emissions.

These three strategies form six corporate responses when analysed with cluster analysis (Weinhofer and Hoffman, 2010:85):

1. **All rounders**: These companies utilise a combination of all three strategy types.
2. **Compensators**: These companies focus primarily on CO_2 compensation strategies.
3. **Substituting compensators**: These companies focus on both CO_2 compensation and carbon independence, but not on CO_2 reduction.
4. **Reducers**: These companies focus on CO_2 reduction strategies.
5. **Substituting reducers**: These companies focus on both CO_2 reduction and carbon independence, but not on CO_2 compensation strategies.
6. **Preservers**: These companies do not apply any of the three carbon strategies.

This study focused on the strategic respones that indicate a company's strategic objectives with regards to CO_2 emission reduction only ((Weinhofer and Hoffman, 2010:88). It was also found that:

1. Approximately half of the companies followed a combination of the three carbon strategies, whilst the other half followed selected strategic objectives only.
2. The companies that adopted the "all-rounder" response type had higher emission rates on average than the companies in other clusters.
3. A significant difference in carbon strategies were found between the companies situated in the European Union, United States, and Japan, indicating a possible impact of regional climate change policies.
4. Relative emission rates (i.e. emission intensity) had no effect on corporate strategy type.

The study was limited to carbon emissions amongst electricity producers, but did indicate that high emission levels affect the corporate strategies employed by the firm.

2.3.6 *Baumgartner's corporate maturity framework*

Baumgartner and Ebner (2010) discuss the role of corporate sustainability *profiles* and sustainability *maturity levels*. The sustainability *maturity levels* are a description of the

corporate strategies employed to meet the environmental challenge. It forms a **one-dimensional continuum**, with the poorest performing on the one end, and best performing on the other end. These maturity levels are termed *beginning*, *elementary*, *satisfying*, and *sophisticated/outstanding*.

Baumgartner and Ebner state that the link between the corporate sustainability profile and the corporate maturity level is often missing in practice (Baumgartner and Ebner, 2010:76). They aim to narrow this gap by forming a link between specific *aspect profiles* for sustainability strategies, which may be implemented in order to efficiently reach their defined sustainability goals (Baumgartner and Ebner, 2010:76). In order to narrow this gap, they developed specific aspect profiles for sustainability strategies, including for ecological sustainability. A company can therefore be placed on this continuum by considering these *aspect profiles*, namely the resource use, emissions, waste handling, biodiversity, and the environmental issues of the product.

Baumgartner and Ebner state that by understanding the relationship between aspects of corporate sustainability and corporate sustainability strategies, they can support a company in improving its sustainability targets (Baumgartner and Ebner, 2010:87). Once the maturity level that the company must reach is known, the correct strategy can be adopted in order to meet that. This framework has several advantages (Baumgartner and Ebner, 2010), namely:

1. It is consistent with literature, in that its sustainability aspects are based on popular concepts as well as papers of sustainability (Baumgartner and Ebner, 2010: 79).
2. The metrics used are consistent with the sustainability framework issued by the Institute of Chemical Engineers to measure the sustainability of operations within the process industry (see Figure 2). These metrics strongly favour environmental aspects and quantifiable indicators (Labuschagne, Brent and van Erck, 2005: 376).
3. It is simple, but succinct in that it captures a large amount of information into one framework.
4. It can be presented as a straight-line continuum, where weaker strategic strategies are captured on one end of the spectrum, and stronger strategic strategies are captured at the other end. It can score the applicability of the strategies undertaken by the companies in order to meet the environmental sustainability challenge.
5. The most relevant ecological aspects have been summarised by Baumgartner and Ebner (2010), using data taken from several publications (DJSI, 2007; FTSE, 2006; GRI, 2006:27; Labuschagne et al., 2005). This summary of the most important ecological aspects to consider, a model that was synthesised from the above-mentioned literature, is presented in Table 3.

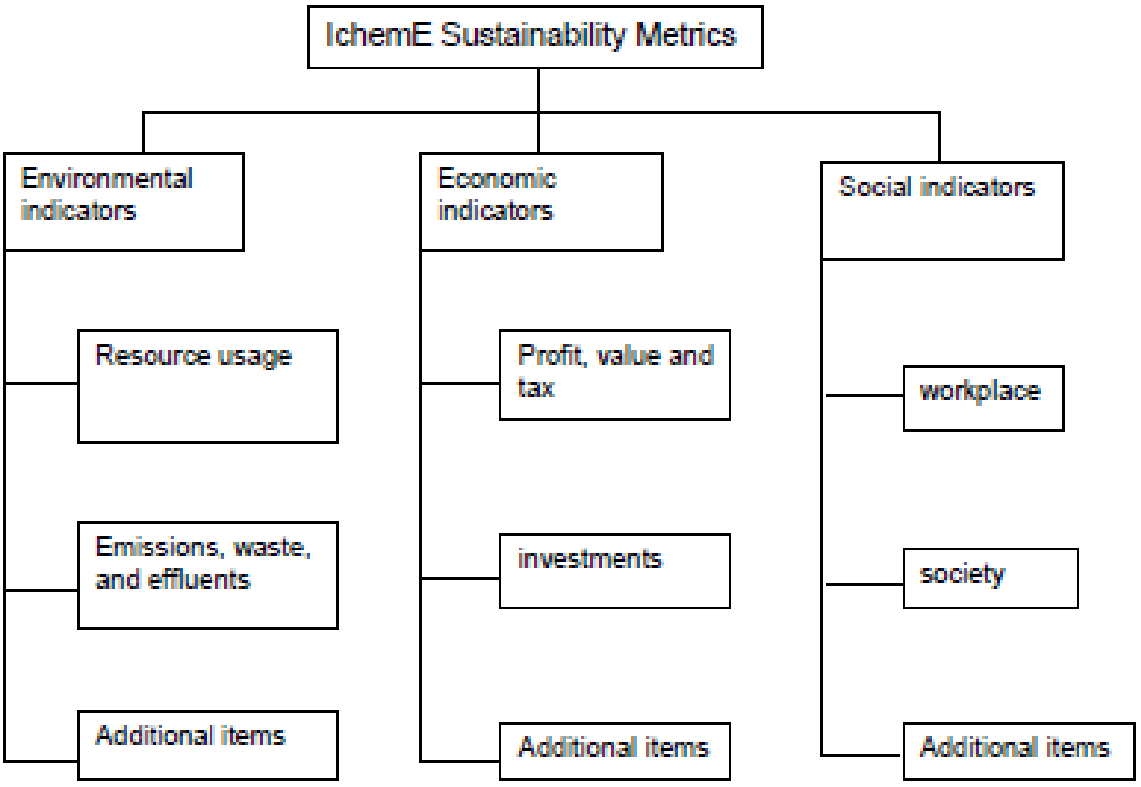

Figure 2. The sustainability metrics proposed by the Institute of Chemical Engineers (IChemE, 2002 in Labuschagne, Brent and van Erck, 2005).

Table 3. Ecological aspects of corporate ecological sustainability (from Baumgartner and Ebner, 2010:79)

Content dimensions	Description
Resources (materials, energy) including recycling	Use of renewable and non-renewable resources and energy through the company including recycled resources
Emissions into the air	Emissions into the air due to corporate activities
Emissions into the water	Emissions into the water due to corporate activities
Emissions into the ground	Emissions into the ground due to corporate activities
Waste and hazardous waste	Waste and hazardous waste due to corporate activities
Biodiversity	Impact on biodiversity due to corporate activities
Environmental issues of the product	Environmental aspects of the product over the whole life cycle

2.3.7 *Lee's Corporate Response Framework*

Lee (2012) based his research mainly on the typology-based models, emphasising the strategic choices made by the firm. It was noted that some firms may choose incremental

changes across all areas of their business activity, other firms may focus on larger changes in only a few specific areas, and other firms may yet choose to focus on a single radical change (Lee, 2012:34). Therefore, a multi-dimensional, categorical framework was produced via a cluster analysis carried out on the sample. The cluster analysis yielded six types of strategies employed by these firms with regards to carbon emissions. They are briefly described in Table 4.

Table 4. Summary of carbon management activities and the corporate response typologies (adapted from Lee, 2012:38).

Carbon management strategy	Cluster					
	Wait & see observer	**Cautious reducer**	**Product enhancer**	**All-round enhancer**	**Emergent explorer**	**All-round explorer**
Emission reduction commitment	L	M	L	H	L	H
Product improvement	L	M	H	VH	L	H
Process & supply improvement	L	M	L	H	L	H
New market & business development	L	M	L	L to M	VH	VH
Organisational involvement	L	M	L	H	L	H
External relationship development	L	M	L	H	L	H

NOTE: VL = very low, L = low, M = moderate, H = high, VH = very high.

Some qualitative remarks on each typology are provided (Lee, 2012:41-42) as well:

1. Wait-and-see observer - does not take climate change seriously.
2. Cautious reducer - moderate at all activities, usually in the initial stages such as setting emission targets or implementing emission reduction measures for specific processes. They are less concerned about emissions in new businesses or markets.
3. Product enhancer - low on almost all carbon management activities, but focused strongly on product market competitiveness by developing less carbon-intensive or more energy-efficient products/processes. They are concerned about carbon labelling.
4. All-round enhancer - highest scores on all activities, except for new markets and businesses. They exhibit a strong focus on both maintaining and enhancing their competitive position in the market. The constantly monitor and analyse how climate issues can affect their business, and make adjustments. They also set clear and specific emission reduction targets, and had implemented measures to achieve them.

5. Emergent explorer - only focus on new market and businesses, and not on current scope. They have clear and specific plans to enter new businesses, especially in renewable industries and disruptive technologies.
6. All-round explorer - high on all activities, but especially on new markets and new businesses. They emphasise new business opportunities, but also prioritise their competitiveness in existing business. They encompass the strategies of both emergent explorers and all-round enhancers in one.

Lee (2012) also found that the corporate response that was chosen was related to the type of industry that the corporate was involved in, as well as to its size.

Previous research had identified a number of carbon management activities (i.e. content dimensions) that can be used to score the corporate strategies, and these have been summarised by Lee with reference to carbon management strategies (see Table 5).

Table 5. Carbon management activities and related research (Lee, 2012:35).

Carbon management activity	Specific practices and related research
Emission reduction commitment	Greenhouse gas reduction target setting (Jeswani et al., 2008; Hoffman, 2005)
	Internal transfer of emission reduction (Kolk and Pinkse, 2005)
Product development	Product development (Kolk and Pinkse, 2005)
	Designed for environment products (Boiral, 2006)
	Designing new products that emit less CO_2 or improving existing products to be more carbon free during their production and use (Weinhofer and Hoffmann, 2010)
Process and supply improvement	Energy efficiency enhancement (Hoffman, 2005; Dunn, 2002)
	Process improvement and supply chain measures (Kolk and Pinkse, 2005)
	Investment in plant retrofit projects and new plants (Schultz and Williamson, 2005)
	Better housekeeping, change in process technology and GHG inventory (Jeswani et al., 2008)
	Developing new production processes that emit less CO2 or improving existing processes to be carbon free (Weinhofer and Hoffmann, 2010)
New market and business development	New market and product combinations (Sprengel and Busch, 2010; Kolk and Pinkse, 2005)
	Developing new products and technology solutions (Hoffman, 2005)
	Firms' awareness of opportunities for achieving energy efficiency and the impact of their activities on climate change, management involvement in climate change initiatives and the encouragement of employees to take initiatives (Jeswani et al., 2008)
External relationship development	Emission trading and the CDM (Jeswani et al., 2008; Dunn, 2002; Boiral, 2006; Kolk and Pinkse, 2005; Schultz and

Carbon management activity	Specific practices and related research
	Williamson, 2005; Hoffman, 2005)
	Participation in voluntary programs (Jeswani et al., 2008) or in the political process (Sprengel and Busch, 2010; Hoffman, 2007)
	Making GHG data publicly available (Sprengel and Busch, 2010; Jeswani et al., 2008)

2.3.8 *Development of the corporate strategy model*

This section describes the literature that contributed to the development of a bespoke corporate strategy model for use in this research. The major issues that required clarification included:

1. The framework type had to be decided, i.e. whether the strategy model should be:
   a) A continuum (which allows for a sustainability score to be calculated), such as that proposed by Winsemius and Guntram (1992).
   b) A typology framework that yields categories as determined by the dimensions chosen, such as that proposed by Levy and Kolk (2002).
   c) A categorical framework yielded by a cluster analysis, such as that proposed by Lee (2012).
2. The content dimensions across which the strategies are measured needed to be determined.

2.3.8.1. Framework type

Previous studies have proposed a wide range of environmental strategy models for classifying the environmental activities of firms. These frameworks were grouped into two main approaches: continuum-based and typology-based models (Azzone et al., 1997; Kolk and Mauser, 2002). Typology models emphasise the firms strategic choice, whereas continuum models can provide a quantitative score that differentiates between relatively shallow (mundane) and deep (profound) approaches (Jeswani et al, 2008:48-49; Lee, 2012:38). One-dimensional continuum models are used by environmental management system (EMS) standards, such as BS 7750, EMAS, and ISO14001 (Jeswani et al, 2008: 49).

Multi-dimensional categorical models have been claimed to be more difficult to operationalise within an environmental management framework (Jeswani et al, 2008). This was attributed to the following (Hass, 1996:96):

1. The companies do not fall neatly into the categories of any model without some overlap. Although a model with mutually-exclusive categories can be conceptualised, it does not necessarily reflect reality.
2. Collapsing a multi-dimensional construct into a linear rating scale leads to difficulties in classification.
3. The models that have been used were intended to be heuristic devices that help managers to conceptualise the "greening" process in companies, and not as rigorous academic constructs.
4. A narrow focus on certain constructs results in classification systems that are not robust. For example, if only implementation and structural content dimensions are investigated, then only those models that deal with the implementation of these structures can be expected to emerge.
5. These models have no obvious linkage to the overall business strategy of the firm, resulting in environmental strategies being considered in isolation of the firm's overall business strategy. The advantage gained by forming qualitative strategic categories can therefore be questioned in such cases.

These difficulties with categorical frameworks are absent with continuum or progression frameworks. Nevertheless, some continuum frameworks do provide arbitrary categories along the continuum, which are intended to simply describe the progression along the continuum that the company has reached. A summary of some earlier one-dimensional or continuum frameworks are presented in Table 6.

Table 6. Continuum environmental strategy models or typologies (Hass, 1996:61)

Source	Model stages or categories				
Hunt and Auster (1990:9) [Putnam, Hayes, and Bartlett]	Stage 1: beginner	Stage 2: fire-fighter	Stage 3: concerned citizen	Stage 4: pragmatist	Stage 5: proactivist
Greeno (1993:17) [Arthur D. Little]	Stage 1: problem solving		Stage 1: managing for compliance		Stage 1: managing for assurance
Newman (1993:32) [Booz-Allen and Hamilton]	Reactive		proactive		innovative
Miiller and Koechlin (1992:166-172)	Inactive ignore (ostriches)	Reactive respond (chicken lickens)	Proactive anticipate (green hornet)		Hyperactive provoke (Robin Hoods)
Roome (1992:18)	Non-compliance	compliance	Compliance plus	Commercial and environmental excellence	Leading edge

2.3.8.2. Content dimensions

The corporate strategies employed can be scored along several content dimensions, and a wide choice is faced with which management activities to measure. Some of these have been summarised already (see Table 3 and Table 5). The content dimensions chosen for this study are described in detail in Section 6.4.2.1.

2.4 Corporate culture and environmental sustainability

A number of authors suggest that organisational culture is vitally important for nurturing sustainability (Lacy et al., 2009; Morsing and Oswald, 2009; Rimanoczy and Pearson, 2010). These authors focus on the development of the knowledge and competencies related to the adoption of sustainability practices, but do not discuss the cultural characteristics that nurture these attributes, or about how to motivate employees to become practitioners of a sustainability philosophy (Smith and Sharicz, 2011: 80). Whenever an organisation responds to external changes, culture and sub-cultures play a critical role in this process, resulting in resistance to the required change (Schein,1996:326). There has been little work carried out with regards to understanding the relationship between corporate culture and the strategies developed to meet the environmental sustainability challenge. In order to address those gaps, it is necessary to understand what is meant by corporate culture, what are the characteristics of each type, and how such information can be used to result in greater performance. A short introduction to corporate culture will therefore be provided for clarity.

2.4.1 *Introduction to corporate culture*

Although there is no clear consensus of a universal definition for corporate culture (Zammuto, Gifford, and Goodland, 2000), culture has been defined as (Schein, 1990:111):

(a) a pattern of basic assumptions, that is
(b) invented, discovered, or developed by a given group,
(c) as it learns to cope with its problems of internal integration and external adaptation,
(d) that has worked sufficiently well in the past and present to be considered valid, and therefore
(e) is to be taught to new members of the group as the
(f) correct way to perceive, feel, and think in relation to those problems.

Many researchers in the area have adopted Schein's (1990) three dimensional view of organisational culture – consisting of artefacts, values, and assumptions (Jones, Nerina and Griffiths, 2005:363). This can be depicted schematically, as shown in Figure 3.

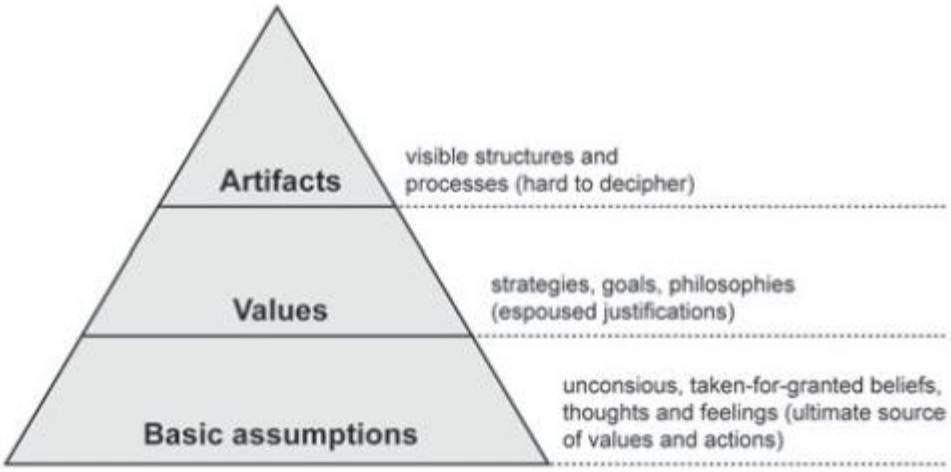

Figure 3. Schematic of Schein's levels of organisational culture (adapted from Baumgartner, 2009).

These are three different fundamental levels at which culture manifests itself, and can be described as (Schein, 1990,111-112):

1. Artefacts: These are the shallowest level of cultural manifestation, and include the visible symbols (that arise from the deeper levels of culture). Although artefacts contain a large amount of information regarding the culture, and are easy to observe and measure, they are the most difficult to decipher. Symbols are ambiguous, and their true meaning can only be known by those who are part of the culture. They include elements such as
   - The employees behaviour, dress style, and language.
   - The organisations work processes and structures, systems, methods of communication, and procedures.
   - The organisation's physical aspects, such as decor, space arrangements, and noise levels.
2. Values: These are deeper artefacts, and inform the employee as to the behaviour that is required. The values that become embodied in an ideology serves as a way of dealing with uncertainty when events are difficult or uncontrollable (Schein, 2004: 9).
3. Basic assumptions: This is the deepest level of corporate culture, and the most difficult to see or measure. It includes the *critical assumptions* which are unconscious, and cannot be challenged. The human mind needs cognitive stability, and any challenging of a basic assumption releases anxiety and defensiveness. It is very difficult, if not impossible, to diagnose an organisation's culture at this level because (Cummings and Worley, 2009: 525):

- People take cultural assumptions for granted, rarely speak of them, and may not even be aware of them. The members of a culture have been shown to be unaware of their own culture until they encounter a different one (Schein, 1996:236).
- The values that are espoused may have nothing to do with those that people really follow. The real critical assumptions underlying the idealised portrayals of their culture are difficult to determine, and people are reluctant to admit this discrepancy.
- There may be several cultures operating in a large and diverse organisation, including sub-cultures and counter-cultures. Basic assumptions may not be widely shared, may change with time, and this can present sampling difficulties when diagnosing an organisation's culture.

Values are more reliable than artefacts, and more accessible than basic assumptions (Howard, 1998: 232), resulting in an assessment of values as being the most likely approach for success. Values are the deepest level of culture that is still visible, and can therefore provide information that is both decipherable and measurable. The Competing Values Framework (CVF) provides such an instrument (Linnenleuke and Griffiths, 2010), and is described in the literature as a method for diagnosing and changing corporate culture (see Section 2.4.2). Although it does not offer a way to analyse the comprehensive phenomena of all cultures, it does provide a practical way to capture much of them.

The dividing line between basic assumptions and values is often crossed as an organisation develops or matures. Basic assumptions can often initiate as values. As they endure time and elicit success for the organisation, they are eventually taken for granted. They are no longer questioned, and they become progressively less open to discussion (Schein, 1990, 112).

2.4.2 *The Competing Values Framework (CVF)*

The corporate culture of companies that must meet the environmental sustainability challenge will be assessed using the Competing Values Framework (CVF). The CVF has been the preferred framework in previous studies because:

- Although no single culture framework can capture all relevant aspects, the CVF was empirically derived, has been validated numerous times in previous research, and captures most of relevant aspects of corporate culture (Linnenleuke and Griffiths, 2010).
- The CVF has previously been employed in numerous studies on culture change (Zammuto, Gifford and Goodland, 2000 in Linnenleuke and Griffiths, 2010).

- The CVF aligns well with the way that people think, process information and how they organise their values and ideologies (Barley and Kunda, 1992).
- It has been validated in cross-cultural research (Yu, 2009:40).
- It is parsimonious and succinct, with few dimensions but with broad implications (Yu, 2009:40).

In using the CVF to investigate the effect of organisational culture on environmental sustainability interventions, it is necessary to briefly discuss the framework first.

The CVF was determined empirically using a multivariate approach to the problem of clarifying the construct of organisational effectiveness (Quinn and Rohrbaugh, 1981). It is essentially a meta-theory that focuses on the tensions and competing conflicts inherent in human systems (Denison and Spreitzer, 1991:3). It organises the different patterns of shared values, assumptions and interpretations that defines an organisation's culture. This is accomplished by plotting the organisational culture along two main dimensions along which the CVF is based. These two *competing values dimensions* are (Denison and Spreitzer, 1991:3):

1. The internal/external dimension, which reflects whether the organisation is focused on the external environment or on its own internal dynamics. It reflects the conflicting demands created by internal organisation and the external environment.
2. The flexibility/control dimension, which a reflects whether the organisation has a preference for structured control, or for flexibility. This axis reflects the competing demands for change and stability, or between organic and mechanistic forms of organisational culture. It has also been described as the competing dimensions of decentralisation and centralisation (Helfrich, 2007:2).

Juxtaposing the content within the above two *competing values dimensions* results in a four-cell framework which is most easily described graphically (see Figure 4). The four cells house the four basic cultural archetypes described in the CVF, with each cultural archetype exhibiting characteristics determined by the competing values dimensions.

For instance, organisations on the internal end are focused predominantly on the internal dynamics of their business (such as production and day-to-day activities). Organisations on the external end are focused predominantly on their external environment, such as market trends. Similarly, organisations on the flexibility end can exert behavioural compliance and desired outcomes through the use of social coordination (e.g. internalisation of beliefs, training, socialisation, and peer pressure). Organisations on the control end can exert

behavioural compliance and desired outcomes through the use of formal mechanisms of coordination and control. These include written policies, rules, direct supervision, financial planning and budgets (Helfrich et al, 2007; Jones et al, 2005:364; Linnenleuke and Griffiths, 2010:359).

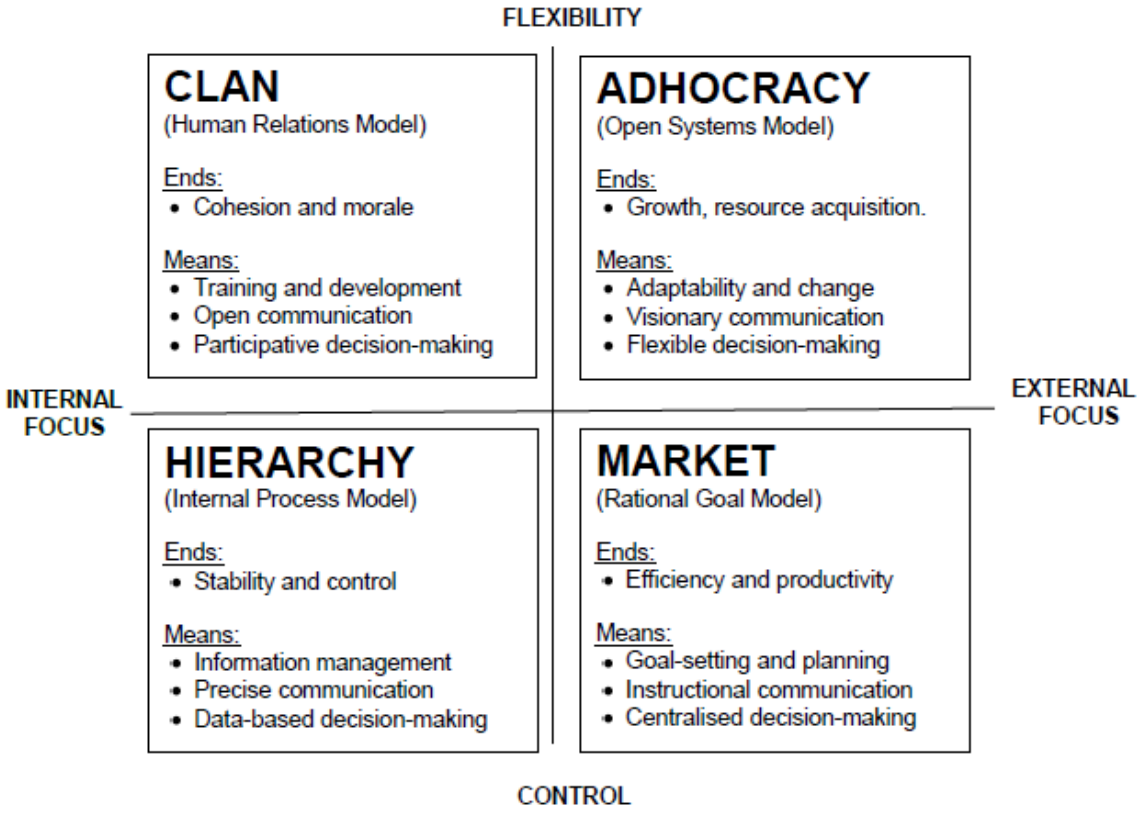

Figure 4. The Competing Values Framework (adapted from Linnenleuke and Griffiths, 2010:359).

The CVF used in most studies used these two dimensions only – the *internal/external* dimension and the *flexibility/control* dimension. Detert (2002) carried out an integrative review of the literature, and identified eight common dimensions along which organisational culture has been measured: the basis of truth and rationality in the organisation, the nature of time and the time horizon, stability versus change or innovation, orientation to work and co-workers, isolation versus collaboration, control versus autonomy, and internal versus external focus. Although the most parsimonious approach has been the two dimensions presented in Figure 4, other dimensions may be useful in other contexts (Yu, 2009:40).

There are a number of issues that arise after scoring an assessment instrument for the CVF, and these will be discussed below:

2.4.2.1. Cultural archetypes

The four culture archetypes will be elaborated on further, with discussion regarding some of their characteristics (Linnenleuke and Griffiths, 2010:359-360):

1. **Clan (Human Relations Model)**: Cultures in the upper left quadrant promote participation, cohesion and morale of employees. These are achieved by techniques such as training, human resources development, participative and decentralised decision-making, open communication and employee involvement. Tradition, trust, and long-term commitment to the organisation are used to gain individual compliance. This cultural type is focused on its internal arrangements. It uses informal structures to align diffusing and conflicting goals, and a diversity of interests, opinions, and motives. It is likely to have a clearly defined corporate ethical position. There might be a tension between creating a business venture and pursuing sustainability when this culture is dominant.

2. **Adhocracy (Open Systems Model):** Cultures in the upper right quadrant place more emphasis on resource acquisition and growth. Informal coordination and control, as well as horizontal communication, are used extensively. Individuals are motivated by the significance and ideological appeal of their tasks. It emphasis moral authority, quality, social integration and employee commitment, and flexibility to manage in turbulent times. It has been proposed that this culture type would lead to a greater emphasis on environmental and social sustainability, and that changes introduced (e.g. to meet sustainability challenges) will cause less tension when this culture type is dominant. The Adhocracy culture has also been described as a temporary institution, which is often dismissed whenever the organisational tasks have ended, and are then reloaded again whenever new tasks emerge (Yu, 2009:38). The Adhocracy culture is often found in such industries as consulting, filming, software development, space flight projects (Yu, 2009:38), and whenever an organisation monitors the external environment in order to expand its domain or renew itself (Yu, 2009:39).

3. **Hierarchy (Internal Process Model):** Cultures in the lower left quadrant ensure stability and control through formal means. It is characterised by conformity, the enforcement of rules, vertical communication, and attention to technical matters. The focus is mainly on economic performance and economic sustainability, with little consideration of the wider organisational environment and on the ecological and social settings within which it resides. These organisations can miss out on business opportunities and sustainability

innovations due to their narrow focus on financial and economic sustainability (Senge and Carstedt, 2001). A strong tension might exist between the existing culture and the need to introduce a change.

4. **Market (Rational Goal Model):** Cultures in the lower right quadrant promote efficiency and productivity. Centralised decision-making, instructional communication, goal setting and planning features strongly in this culture. Competent performance resulting in desired organisational goals are rewarded, providing individual motivation. This culture recognises the importance of the wider environment (external focus), and the need for formalised planning in order to meet external demands. A greater emphasis on resource efficiency will be placed when pursuing corporate sustainability, and can result in greater emphasis on ideals such as waste reduction and costs savings that can be gained through increasing operational efficiency. However, a focus on efficiency might be distorted to result in an excessive focus on cost reductions and simplifications of products and processes, which is insufficient to achieve sustainability. It appears that this culture type may proactively institute corporate sustainability practices that are aimed at reducing waste and costs, and improving efficiencies (Linnenleuke and Griffiths, 2010:361).

2.4.2.2. Cultural archetypes and sustainability

It has been proposed that the cultural archetype exhibited by a company may have an effect on whether an organisation will be sustainability-oriented, although none of the culture archetypes are purposefully sustainability-oriented (Linnenleuke and Griffiths, 2010:359). However, it has been argued that the ideological underpinnings of corporate culture can affect the orientation and understanding of corporate sustainability by the employees. This can influence how corporate sustainability is implemented, as well as the outcomes that can be achieved (Linnenleuke and Griffiths, 2010:359).

It has been argued that room for flexibility, learning and change is necessary in order for innovative products, services and business models to be implemented (Dunphy, Griffiths, and Benn, 2003). If so, then we could extrapolate this idea from *innovation* to the *changes required to meet the sustainability challenge*. We would then expect it to be easier to implement sustainability interventions to the organisational culture models in the upper half of the CVF (i.e. flexibility-oriented) rather than to those at the bottom half (i.e. more control oriented). Similarly, we would expect it to be easier to implement sustainability interventions

to the cultures on the right side (i.e. focused on external environment) than to those on the left side (i.e. focused on internal processes).

If so, then the organisational culture that would be most conducive to introducing sustainability interventions should be the *Adhocracy* (Open Systems Model), and the least conducive should be the *Hierarchy* (Internal Process Model). Valencia, Valle and Jimenez (2010) compared the *Hierarchy* and *Adhocracy* cultures and their effect on product innovation. Their findings were that the *Adhocracy* culture could enhance the development on new services and products, whilst the *Hierarchy* culture tended to inhibit this. Their study did not investigate the effects of the *Clan* and *Market* cultures, though. It is possible that this trend, found in the realm of *product innovation*, would be the case as well in the context of environmental sustainability.

2.4.2.3. Cultural Strength

Cultural strength has been defined as the number of points awarded to a specific culture type (Cameron and Quinn, 2006:72). The larger the number of points, the more dominant that cultural type is. A high cultural strength has been shown to be associated with clear focus, homogeneity of effort, and resulting in higher performance where unity and common vision is required (Cameron and Quinn, 2006:72).

However, several researchers advanced the contingency approach of the culture-performance relationship, arguing that strong organisational cultures are only related to high levels of performance if there is a fit between the corporate culture and the corporate strategy, and can adapt to changing environmental conditions (Sørensen, 2002). In volatile environments, the strength of the culture can be a weakness if it impedes creativity (Cummings and Worley, 2009:523), or if it is not appropriate to the new situation. Other researchers have noted that an over-emphasis on any particular culture archetype can result in a dysfunctional organisation (Gifford, Zammuto, Goodman and Hill, 2002:18).

Whether a strong/dominant culture or a mixed, eclectic culture is best may therefore depend on the individual needs of the situation.

2.4.2.4. Cultural congruency

Cultural congruency refers to the degree of alignment between the various aspects of the organisation's culture. For example, if an organisation shows a strong Hierarchy culture to

the aspect of leadership, but a strong Clan culture to the reward system used, then the cultural congruency is low. The cultural state where all aspects of the culture are aligned has been claimed to result in greater focus, and eliminates the complications, disconnects, and obstacles that impede performance (Cameron and Quinn, 2006:73).

An organisation with a high cultural congruency would therefore exhibit similar organisational values throughout the organisation, leading to less diversity of thought throughout the workplace. The pursuit of a single approach is questioned in the literature (Gifford et al, 2002:18), and it has been shown that a balance of competing organisational values is important in achieving individual well-being and effectiveness (Quinn, 1988). This would require an eclectic mix of cultural archetypes across the various content dimensions that are measured.

2.4.3 *Cultural perspectives*

Organisational culture can be understood from different perspectives, and these are important to understand when interpreting the results of scoring the culture assessment tool. The CVF in its standard form assumes that there is only one culture operating, and which is being scored by the tool. Although it is tempting to consider an organisation as having one single culture, this is usually not the case, particularly in larger organisations where subunits exist (Cameron and Quinn, 2006: 17-18). In addition to there being a number of competing cultures within a large organisation, there can be numerous sub-cultures and even counter-cultures (Cummings and Worley, 2009: 525). The *integrative view* of corporate culture suggests that the values exhibited by top management will automatically be disseminated downwards, and held equally by all members throughout the organisation (Linnenleuke and Griffiths, 2010:363). It therefore assumes that only one culture can be operating. The *differentiation perspective* contests this. Linnenleuke et al (2009) found that employees from a single organisation understand corporate sustainability differently, and that this can be partially explained by differences in their awareness of the organisation's sustainability practices and by the presence of organisational subcultures. The *fragmentation perspective* of corporate culture focuses on lack of consensus amongst individuals, a multiplicity of views, and high complexity in the organisation (Jung et al, 2007:52).

Another model on corporate culture that can explain the multiplicity of cultures within a single organisation has been utilised in the cultural analysis of an Information Technology organisation (Bryson, 2008). It is based on the model proposed by Williams (1980), and views society as being in a state of constant cultural change and negotiation. It views

change as being a constant flux, rather than being merely an interruption to a stable state. This is theorised as a struggle between the dominant, residual and emergent cultures within an organisation, which can be described as (Bryson, 2008:749):

- Dominant cultures are the practices and beliefs which are organised and lived, and are those that organisation members put energy into.
- Emergent cultures are the new beliefs and practices which are continually being created as the organisation progresses. These cultures may or may not be formally incorporated into the organisation (in which case they are described as either alternative or oppositional cultures respectively).
- Residual cultures are those still practiced or believed from an earlier time in the organisation. They are a residue of the previous social formations, and are retained in order to assist in making sense of the present.

A corporate could then be envisaged as consisting of a multiplicity of sub-cultures, existing within the hegemony of the dominant culture. The hegemony of the effective dominant culture is characterised as a multilayered negotiation and re-negotiation of the residual culture and the continuously emerging cultures, relative to the dominant culture (Bryson, 2008:748). The process of culture development and subculture conflict is also discussed in detail by Deshpande and Webster (1989). The Williams model therefore provides a model by which the existence and interaction of multiple cultures within an organisation can be described.

2.4.4 *Considerations in scoring the corporate culture tool*

It is important to understand the implications of the scoring technique used on the outcomes of the culture assessment tool. Some of the issues that require consideration include:

1. The scoring methods by which the respondents score the assessment tool (i.e. using Likert scales, ipsative scales, Q-sort methodologies, etcetera).
2. Whether respondents should be aggregated into groups, or not. If they are aggregated, should it be at the company level, at the business unit level, or at some other level?
3. The content dimensions across which the culture is assessed.

2.4.4.1. Scoring methods

The CVF utilises a scenario approach, where the culture of the organisation is reflected in one of the four quadrants. This is often determined by aggregating the scores of the organisational attributes, where respondents divided 100 points amongst the four scenarios,

depending on similarity to their own organisation (Cameron and Quinn, 2006). The score on each question for the same quadrant were added together, to determine the total score for each of the four quadrants. The higher the score, the more strongly the organisation exhibits that particular culture type. This ipsative scoring mechanism results in a forced choice format of cultural type, as a higher score on one quadrant necessitates a lower score on other quadrants, and correlation-based statistical techniques cannot be used on such data (Kwan and Walker, 2004:27).

Due to this limitation, a Likert-scale instrument was developed in which the four scenario descriptions were translated into a Likert-scale (Quinn and Spreitzer, 1991). Multi-dimensional scaling and multi-trait multi-method analysis (multi-trait refers to the four CVF scenarios) compared the results for the two types of instruments (ipsative and Likert), and the Likert-scale was found to be valid and reliable. Both convergent and discriminant validity was established (Quinn and Spreitzer, 1991). The validity of the competing values framework was further established in the following studies:

- Howard (1998) established the construct validity for the CVF using the Q-sort methodology, showing that it can be used across very different organisations.
- Kalliath, Bluedorn and Gillespie (1999) further supported its validity by using structural equations modelling with a set of Likert-scale instruments.
- Kwan and Walker (2004) established that it can be used for differentiating between institutions.

Lamond (2003) also used a seven-point bi-polar Likert scale where respondents indicated the extent to which they agree with certain statements, in order to determine the organisational culture type. The Cronbach's alpha coefficient for internal reliability for the competing values scale as a whole was 0,89, proving that the instrument has a high construct validity and is a reliable measure of the CVF (Lamond, 2003:54). Multi-dimensional scaling was carried out as a protocol for deriving taxonomies empirically, such as the CVF scenarios. This was carried out by modelling the dimensions and structure of the data set, and is considered to be a tool of choice for research involving the CVF (Lamond, 2003: 53).

2.4.4.2. Aggregating scores

After receiving data from the respondents, it can be debated whether the data should be used as is, or whether respondents from the same company or business unit should be aggregated to form a single response. Considering the complexities of multiple interacting cultures within organisations (see Section 2.4.3), careful consideration should be made

when averaging scores from multiple respondents. If these respondents were exposed to different cultures within the same organisation, then aggregating their scores simply averages out the multiple cultures that are being scored individually. The within-group variances would be reflective of whether different cultures are being assessed within the group.

Kwan and Walker (2004) discuss the controversy of whether aggregated scores should be produced from respondents in studies regarding organisational phenomena. They found that aggregating the data results in an acute reduction in the number of units in the study, given the nested nature of individuals and groups in organisations (Kwan and Walker, 2004:26). This jeopardises the reliability of the statistical analysis carried out on the aggregated data set. It was also shown that this results in an inappropriateness when using aggregated scores without addressing the within-group variances of the aggregated scores (Kwan and Walker, 2004:27).

The question regarding the aggregation of scores will depend on the cultural perspective taken. An *integrative* perspective would require that scores be aggregated to the company level, as it is assumed that the cultural characteristics diffuse throughout the organisation and are equally held by all members. A *differentiation* perspective would require aggregation to some level lower than the company level, such as the business unit level or as determined during the investigation. The *fragmentation* perspective does not assume any consensus amongst members of the organisation at any level, and aggregation would be inappropriate in this circumstance.

2.4.4.3. Content dimensions

The CVF was determined empirically by considering six *content dimensions* of organisational culture, which act as cues in scenarios to enable people to identify the cultural values of the organisation. These six content dimensions are organisational attributes of the company, and are usually listed as (Cameron and Quinn, 2006):

1. Dominant characteristics - what the overall organisation is like.
2. Organisational leadership - the style and approach that permeates the organisation.
3. Management of employees – the style that characterises what the working environment is like, and how employees are treated.
4. Organisational glue – the bonding mechanisms that hold the organisation together.
5. Strategic emphasis – what drives the organisation's strategy.
6. Criteria of success – how victory is defined, and what gets celebrated and rewarded.

Consideration of these content dimensions allows for a diagnostic framework, and allows for the scoring of the corporate culture instrument. The origins of this instrument are unclear, although several sources have been proposed (Helfrich, 2007:2-3). Nevertheless, the model using these content dimensions was first validated using both ipsative and Likert scales in 1991 (Denison and Spreitzer, 1991).

The full complement of six dimensions have not always been used, with several instruments reported in the literature using less dimensions. Instruments using only four of the six dimensions have been used after pilot testing indicated that more than four items contributed little to scale reliability (Helfrich, 2007:4). Other instruments have successfully used only five dimensions (Shortell et al,1995).

2.4.5 *Cultural comprehensiveness*

Cultural comprehensiveness is apparent when a Likert scale is used to score the corporate culture. Since the Likert scale does not use the ipsative (or forced choice) score, a culture which scores high or low on all four cultures is possible. This results in a summated score, which has been termed the "comprehensiveness" of the culture (Quinn and Spreitzer, 1991). The use of the Likert scale can result in either a weak comprehensive culture (where the respondents score all cultural types weakly) or a strong comprehensive culture (where the respondents score all cultural types strongly). This is schematically described in Figure 5.

A strong comprehensive culture is formed when, using a Likert-type scale, the respondents score highly on all the cultural variables available. This would therefore be the combination of various elements:

1. The cultural strength, as a high score is required.
2. The cultural congruency, as a high score is required across all the content dimensions.
3. A balance between the cultural archetypes, as a low score on any of them reduces the cultural comprehensiveness score.

The comprehensiveness of a culture therefore appears to be a summated measure of the cultural strength, congruency, and balance.

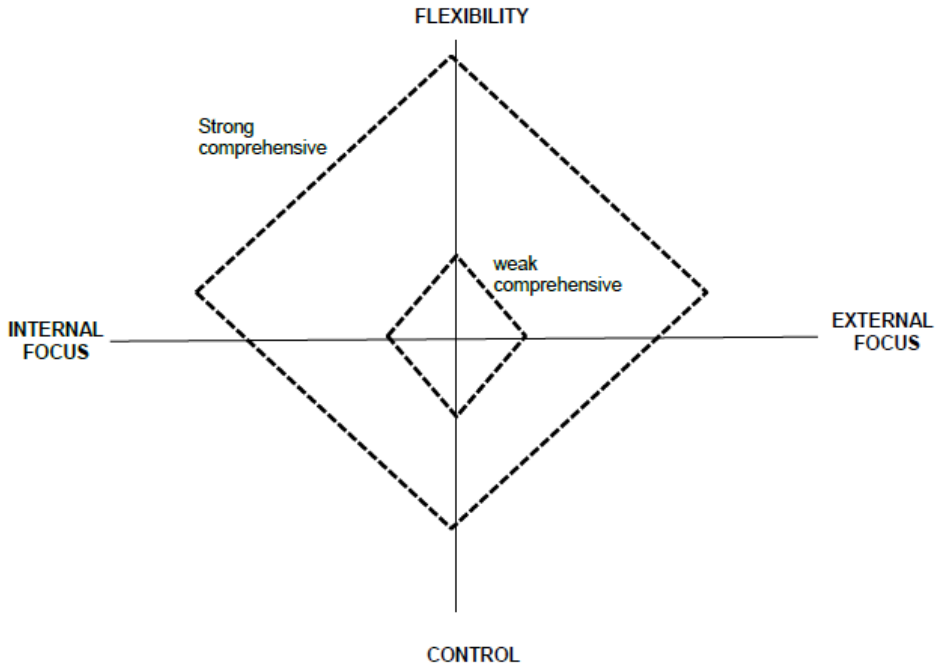

Figure 5. Schematic of the strong and weak comprehensive cultures (adapted from Quinn and Spreitzer, 1991).

The use of the Likert scale allows for the capture of a more realistic culture description of companies (Quinn and Spreitzer, 1991:117). The ipsative scale would forcibly normalise the culture ratings, in that a culture is rated high at the expense of the other culture types. Thus, if one culture quadrant is rated high, the other culture quadrants are forced to be rated low or moderate (Quinn and Spreitzer, 1991:117). An ipsative scale does not allow an organisation to be rated either high or low across all the culture quadrants, whereas a Likert scale allows for independent measures of each culture quadrant. It is then possible for an organisation to be rated high, low or any combination thereof across all four culture quadrants.

It was found that strong and weak comprehensive cultures score differently in certain aspects of organisational issues, suggesting that organisations are seldom characterised by a single cultural type (Quinn and Spreitzer, 1991:134). It has also been claimed that the pursuit of multiple goals would be the norm rather than the exception in a highly competitive environment (Kalliath, Bluedorn and Gillespie,1999). If so, then an ipsative scale that measures one cultural type at the expense of the others would mask an important variable, namely the ability to pursue several goals (and therefore exhibit a number of cultural types) simultaneously in a single organisation.

2.4.6 *The Sustainability Culture*

Research has been carried out on the role of an organisation's culture in either fostering or hindering the implementation of managerial innovations (such as re-engineering and total quality management) or technological innovations (such as flexible manufacturing technologies and enterprise resource planning systems) (Zammuto et al, 2000). The question has therefore been asked as to whether a sustainability-oriented culture can be discerned (Crane, 1995; Linnenleuke, 2010). This culture would permeate and unite corporate members, and foster a sense of commitment and identity to common corporate environmental goals and aspirations (Dodge, 1997). However, several studies have disputed the value of a unified organisational culture, usually on the basis of the untenability of the *integration* perspective on organisational culture (Linnenleuke, 2010:362-363). The *integration* perspective was deemed to be necessary because employees throughout the organisation would have to share similar attitudes towards corporate sustainability, and employees throughout the organisation would be part of the same organisational culture (Linnenleuke, 2010:363). However, the diffusion of a sustainability-oriented culture has been found to be hindered by the presence of various sub-cultures (Harris and Crane, 2002).

Using the Williams Model, it may be possible to implement a sustainability-oriented culture, whilst being fully aware of the hegemony of the dominant culture, as well as the constant re-negotiations of the residual and emerging cultures that would act to either enhance or oppose it. This allows for the development of a "Sustainability Culture" without requiring the *integration* perspective.

2.5 Other considerations

Although this research aimed to find correlations between corporate culture and corporate strategies, the literature describes various other considerations whereby corporate strategy would be influenced. These contextual factors may vary within the sample provided, and therefore needs to be addressed. These have been grouped together to form *contextual variables*, along which the sample could be partitioned and analysed.

The literature provides research where corporate strategies were analysed according to country, sector, size, various drivers and barriers, type of ownership, and stakeholders influence (Jeswani, 2008: 53-57). The literature does not always agree, though. Sprengel and Busch (2011) found that corporate strategies do not relate to individual stakeholder groups, but rather relate to the organisation's level of pollution as measured by its

greenhouse gas (GHG) intensity. The effect of various drivers and barriers and other variables may be important when the sample is split between two very different countries, such as Pakistan and the United Kingdom (Jeswani, 2008), but may be less important when the full sample is within one country only.

The performance of the firm can also have an effect on the corporate strategies employed to meet the environmental sustainability challenge. However, there are various ways to measure the performance of the firm. In one study, the performance of the firm was measured by return on investment (ROI), return on equity (ROE), profit increase and stock price increase (Lee, 2012: 43). The effect of firm performance was not found to be important, with very little difference being noted amongst varied levels of performance (Lee, 2012:43).

A number of control variables were investigated with regards to their effect on the environmental performance of firms (Russo and Fouts, 1997). The contextual variables considered (firm size, firm growth rate and industry growth rate, advertising intensity, capital intensity, and industry concentration) accounted for only a moderate variation in firm performance (Russo and Fouts, 1997:550).

There are numerous variables that can theoretically influence the corporate strategies used to meet the environmental challenge. It is conceivable to take almost any aspect of a firm and include it as a variable, but it is necessary to curtail the list as that was not the intention of this study. Also, the variable must be accurately measured by the perceptions of the respondents. Therefore, only those variables found by the literature to have a consistent effect were included as *contextual variables* in this study. These are discussed below:

2.5.1 *Role of the respondent at work*

It can be expected that the respondent's role at work would have an effect on their perceptions regarding their company's corporate strategies. Three categories were defined for the purpose of this research, following studies that showed that there are three categories of staff in an organisational, each with their own unique sub-culture operating silently within them (Schein, 1996:236-238). Schein (1996) labelled them as:

1. The "Operators": These are the workers and line managers who make and deliver the products and services that fulfil the basic mission of the organisation.
2. The "Engineers": These are the technocrats and core designers in any functional group, and are usually the experts in the core technology of an organisation.

3. The “Executives”: These are the individuals who are accountable for the financial stability of the firm on behalf of the owner-shareholders.

Due to the different outlooks and cultures displayed by these three categories of staff, it is possible that they may have different perspectives with regards to the corporate culture and strategies at their place of work.

2.5.2 *The size of the firm*

The *size of the firm* was found to have an influence on the corporate strategy typology (Lee, 2012: 43) (Jeswani, 2008: 53-57). Also, *firm size* has often been used as a control variable in previous studies as it is an important contextual variable that influences the corporate response to environmental sustainability (Lee, 2012:43). This is has been shown to be true in environmental management (Grant, Jones and Bergesen, 2002; Vachon and Klassen, 2006;).

However, firm size does not always influence the corporate strategies taken. The three largest oil companies (ExxonMobil, British Petroleum, and Shell) developed very different corporate responses to environmental legislation regarding greenhouse gases, despite their similar size and global operational structure (Pulver, 2007:73). The divergent policy approaches were explained as being due to the different scientific networks, as well as different regional and national policy fields, in which their corporate decision-makers were embedded (Pulver, 2007:73).

There can be several definitions as to how company size is defined. One method considered the natural logarithm of the number of the companies employees to be a proxy of firm size (Lee, 2012:43). Other definitions can include market capitalisation, number of branches, full value of Property, Plant, and Equipment (PP&E), number of shares issued, and so on. Due to the numerous and complex ways that the size of firms can be described, a qualitative assessment of the respondents perceptions may be more useful when using firm size as a contextual variable.

2.5.3 *Industry sector type*

It has been suggested repeatedly that the primary sector is generally characterised by higher environmental loads than the other sectors are, and that activities found at the end of the value chain are much less polluting (Behrensa, Giljuma, Kovandab and Nizac, 2007:450). It

is therefore necessary to categorise the industry sectors in terms of the amount of pollution emitted, in order to account for any effect that this would have on the corporate strategies that are undertaken.

The *industry sector type* was found to have an influence on the corporate strategy typology (Lee, 2012:42). Lee categorised the industry type into three sectors – the energy-intensive sector, the general services/manufacturing sector, and the specialised sector.

The categorisation for *industry sector type* in this research was chosen according to its impact on environmental sustainability, following the methodology and guidelines presented in the literature (FTSE, 2006:3) – see Table 7. The industry sector types were divided into three categories in accordance with their impact on the environment – high impact, medium impact, and low-impact polluting.

Table 7. Guidelines from the FTSE good index series: inclusion criteria. Companies are classified as high-, medium- or low-impact, as determined by the environmental footprint of their activities (FTSE, 2006:3).

High impact	Medium impact	Low impact
Agriculture	DIY and building supplies	Information technology
Air transport, airports	Electronics and electrical equipment	Media
Building materials (including quarrying)_	Energy and fuel distribution	Consumer/mortgage finance
Chemicals and pharmaceuticals	Engineering and machinery	Property investors
Construction	Financials not elsewhere classified (see right)	Research and development
Major systems engineering	Hotels, catering, and facilities management	Leisure not elsewhere classified (gyms and gaming)
Fast food chains	Manufacturers not elsewhere classified	Support services
Food, beverages, and tobacco	Ports	Telecoms
Forestry and paper	Printing and newspaper publishing	Wholesale distribution
Mining and metals	Property developers	
Oil and gas	Retailers not elsewhere classified	
Power generation	Vehicle hire	
Road distribution and shipping	Public transport	
supermarkets		
Vehicle manufacture		
Waste		
Water		
Pest control		

2.5.4 *Multi-national companies and country effects*

Multi-national companies (MNC's) have their head offices and usually their early operations based in one country (their home country), but also have operations that extend into several other countries (their foreign subsidiaries). The home country institutional context and resulting conflicting strategic pressures on foreign subsidiaries to preserve the legacy of the home country can create divergent pressures on strategy for MNC's (Levy and Kolk, 2002:280). However, the effect of foreign legislation that MNC's have to contend with may change their stance considerably. It can have implications on the MNC's strategies relevant to the sovereign requirements set out by South African legislation, as foreign subsidiaries of MNC's are known to adapt their political strategies to meet host country conditions (Levy and Kolk, 2002:276).

A study on the strategic responses of oil MNC's to climate change showed that although initial corporate response was influenced mostly by the local (i.e. the home country's) context, convergent pressures became dominant as the issue matured (Levy and Kolk, 2002:275). The shifting balance of divergent and convergent pressures on corporate response to climate change shifts the response of MNC's from strategic heterogeneity to strategic homogeneity because (Levy and Kolk, 2002:281-282):

1. Convergent pressures on MNC's are generated as they have a common industry-level field. Since they refine and sell petroleum products in each other's markets, they are subject to similar sets of regulatory pressures, which delinks MNC's from their home country context. These companies also form a global oligopoly and participate in a common global industry, thereby dissociating global companies from their home country.
2. A global issue that all MNC's must contend with (such as climate change) results in a network of actors across these MNC's forming their own institutions (such as conferences and issue-specific sub-groups). These senior personnel meet and develop common cognitive and normative frames, resulting in convergent views on a topic that they all must face.

Due to the uncertainty involved in whether MNC's have exhibit sufficient convergence with regards to environmental sustainability strategies, or whether home country effects are still significant, it is important to consider this within the contextual variables.

2.6 Summary

The literature highlights the fact that environmental sustainability is an important consideration for society and business today, and that successfully implementing initiatives to ensure environmental sustainability can be a challenge. It is therefore important to choose the correct strategy for ensuring environmental sustainability, and to ensure that the correct organisational culture exists in order to facilitate the implementation of that strategy.

More specifically, the literature highlights the need for those wishing to successfully implement an environmental sustainability intervention to conduct research on the relationship between the corporate response to the environmental challenge and the corporate culture. This is intended to help understand which corporate strategies should occur, or alternatively to understand which organisational culture requirements must be met. Although the mechanics of organisational change has been thoroughly investigated before in sustainability research, limited research has been conducted on the underlying cultural requirements in this context.

However, numerous authors have pointed out the strong effect that organisational culture has on the success of an organisational change. It is therefore expected that organisational culture should have a profound effect on which corporate strategies are adopted to meet the environmental sustainability challenge.

3. Problem statement and research questions

3.1 Introduction

This Section covers the statement of the problem and the research questions that need to be answered in order to solve the research problem. Hypotheses were developed in order to clarify the relationship between the relevant variables.

3.2 Research problem statement

The research problem is that the relationship between corporate culture and the corporate strategies that are made in response to the challenge of environmental sustainability are not well understood.

3.3 Research Objective

The research objective is to understand the correlation between the corporate culture and the strategies utilised to address the environmental sustainability challenge.

3.4 Research questions and hypotheses

Research Question 1: Is there a correlation between the corporate culture archetypes and the corporate strategies undertaken to meet the environmental sustainability challenge?

- H_0: There is no correlation between the corporate culture archetypes and the corporate strategies ($p = 0$).
- H_A: There is a correlation between the corporate culture archetypes and the corporate strategies ($p \neq 0$).

Research Question 2: Do the internally-focused and externally-focused corporate cultures produce a different total sustainability score?

- H_0: The internally-focused and externally-focused corporate cultures produce the same total sustainability score.
- H_A: The internally-focused and externally-focused corporate cultures produce a different total sustainability score.

Research Question 3: Do the flexibility-orientated and control-orientated corporate cultures produce a different total sustainability score?

- H_0: The flexibility-orientated and control-orientated corporate cultures produce the same total sustainability score.
- H_A: The flexibility-orientated and control-orientated corporate cultures produce a different total sustainability score.

Research question 4*:* Is there a correlation between the corporate culture variables and the corporate strategies undertaken to meet the environmental sustainability challenge?

- H_0: There is no correlation between the corporate culture variables and the total sustainability score ($p = 0$ or $pr>0.05$).
- H_A: There is a correlation between the corporate culture variables and the total sustainability score ($p \neq 0$ and $pr<0.05$).

3.5 Summary

In this Section, the research problem is stated in general terms, and followed by the research questions and hypotheses that were developed in order to solve the problem. These are summarised in Table 8.

Each research question will be answered from the findings of study. The next Chapter focuses on research design and how the data of the study will be analysed.

Table 8. Research questions and hypotheses.

RESEARCH QUESTIONS	RESEARCH HYPOTHESES	HYPOTHESES
1. Is there a correlation between the corporate culture archetypes and the corporate strategies?	H_0: There is no correlation between the corporate culture archetypes and the corporate strategies. H_A: There is a correlation between the corporate culture archetypes and the corporate strategies.	H_0: $\rho_1 = 0$. H_A: $\rho_1 \neq 0$.
2. Do the internally-focused and externally-focused corporate cultures produce a different total sustainability score?	H_0: The internally-focused and externally-focused corporate cultures produce the same total sustainability score. H_A: The internally-focused and externally-focused corporate cultures produce a different total sustainability score.	H_0: $\rho_{I-E} = 0$. H_A: $\rho_{I-E} \neq 0$.
3. Do the flexibility-orientated and control-orientated corporate cultures produce a different total sustainability score?	H_0: The flexibility-orientated and control-orientated corporate cultures produce the same total sustainability score. H_A: The flexibility-orientated and control-orientated corporate cultures produce a different total sustainability score.	H_0: $\rho_3 = 0$. H_A: $\rho_3 \neq 0$.
4. Is there a correlation between the corporate culture variables and the corporate strategies?	H_0: There is no correlation between the corporate culture variables and the total sustainability score ($p = 0$ or $pr>0.05$). H_A: There is a correlation between the corporate culture variables and the total sustainability score ($p \neq 0$ and $pr<0.05$).	H_0: $\rho_4 = 0$. H_A: $\rho_4 \neq 0$.

4. Research Methodology

4.1 Research design

This study is **quantitative** and **descriptive** in nature (Zikmund, 2003:55), as it intends to describe the characteristics of a population. Not much is known about the influence that corporate culture has on corporate strategies within this context. This is because the importance of considering the strategies undertaken to meet the challenges of environmental sustainability has not matured yet, following societal pressures and legislation that is currently being implemented (see Section 2.2.2). Although a significant amount of research has been carried out on corporate responses and strategy types within this context, limited work has been carried out on how it is influenced by corporate culture. Hence, current literature has explicitly called for such studies to be done (Lee, 2012; Linnenleuke and Griffiths, 2010).

The objective of this research is to understand the influence of corporate culture on the corporate response due to environmental sustainability challenges. It attempts to do this by integrating an understanding of two constructs:

1) The *corporate strategies* undertaken to meet the environmental sustainability challenges.
2) The *corporate culture* that influenced the corporate response.

Decisions as to whether a study on organisational culture should be qualitative or quantitative (Kwan and Walker, 2004:22) is debated in the literature. A *qualitative* study should be used when organisational culture is considered to be *something that an organisation is*. Deeper or hidden underlying aspects of culture are then intended to be revealed, in order to form a *thick description* of the organisational culture (Kwan and Walker, 2004:22). A *quantitative* study should be used when the organisational culture is considered to be *something that an organisation has*, rendering the culture to be an organisational variable that interacts with other variables within organisations (Kwan and Walker, 2004:22). Since this study intends to determine whether the corporate culture is associated with a particular type of corporate strategy (which is another organisational variable), a quantitative study is most appropriate. Quantitative studies on organisational culture are sometimes criticised as they examine the characteristics of the social system that interests the *researcher*, rather than what interests the *members* of the system (Denison and Spreitzer, 1991:7).

The research type is **descriptive**, as this design produces an accurate representation of situations such as this (Saunders and Lewis, 2012:111). A fuller understanding of the issue at hand is required as a forerunner to explanatory studies (Saunders and Lewis, 2012:112). Explanatory research can take this topic further, and determine why corporate culture affects the corporate strategies used to meet the challenges of environmental sustainability, by establishing causality between the key variables (Saunders and Lewis, 2012:113). This study, however, is intended to simply be a forerunner for further causal research by describing the situation.

The research philosophies adopted were **critical realism** and **pragmatism**. Critical realism argues that the respondents experience perceptions of the constructs in the research, and not the constructs themselves (Saunders and Lewis, 2012:105), leading to the unit of analysis being the perceptions of the respondents. Pragmatism relates to the study of social phenomena with respect to the research questions and objectives, and is guided by what is possible under the circumstances of the research (Saunders and Lewis, 2012:107). This shaped the scope and context of the research. The research philosophy of positivism was not adopted, as control was not exerted over respondents, and causality could not be inferred as a result of that.

The research approach used was **deductive**, as current theories applied in similar contexts are extended into the new context. Hence, frameworks developed elsewhere were used within this research.

The study was **cross-sectional**, in that information from only one period in time was considered (Saunders and Lewis, 2012:123-124). This was necessary in order to gain a “snapshot” of the corporate response at the time period when the environmental sustainability challenge was responded to. The online survey was open from the 11 June 2012 until the 31 July 2012, and the data was downloaded on the 01 August 2012.

4.2 Research methodology

The research methodology consists of the following:

1. A literature review was carried out to determine the appropriate research design and variables required (including the scale to be used for dependent and contextual variables).

2. A questionnaire was drafted, using the information obtained from the literature review. The relevant constructs form the basis of the research questions in the interview guide, and are:

   a) A framework based on Baumgartner and Ebner's (2010) typology for corporate response strategies to ecological sustainability challenges was adapted for use. A questionnaire was developed in order to characterise corporate strategies appropriately. This framework was chosen because it defines a consistent sustainability framework, as the sustainability aspects are based on popular concepts and on numerous other research carried out on sustainability (Baumgartner and Ebner, 2010:78). The corporate strategies were therefore tested along five dimensions - *resource use*, *emissions control*, *biodiversity*, *products*, and *attitude*. A summated composite variable, *total sustainability* was synthesised from these five content dimensions, to provide an overall score.

   b) Cameron and Quinn's (2006) CVF framework (including modifications from Linnenleuke and Griffith, 2010) was used to determine the corporate culture within which the corporate strategies were chosen. The CVF was chosen because of its comprehensiveness, validity, and wide range of applicability to numerous contexts. This may allow for comparison of this study with other studies in other contexts, and contribute to both academic and to business knowledge. The CVF was scored along five content dimensions – *dominant characteristics*, *leadership*, *organisational glue*, *strategic emphasis*, and *criteria of success*.

   c) In order to enhance depth of understanding, additional questions were asked regarding the nature of the environment that the organisation is in. This is important because the context of the business environment (if not captured in the existing frameworks) may have an influence on corporate response.

3) The questionnaire was pre-tested by exposing it to subject-matter experts (i.e. an expert in the field of sustainability, a professional statistician, and a potential respondent). Feedback was used to modify the draft questionnaire appropriately and to form the final questionnaire (see Appendix 2).

4) Primary data was collected by sending the questionnaire to potential respondents who were known to satisfy the criteria required to fall within the required scope. The company where they worked had to be a company that produces a saleable product, and this

specifically excluded consultancies in the sustainability field. Only potential respondents identified as such were sent the questionnaire. The respondents were from separate companies, or from separate business units within the same company. Although attempts were made to gather data from as diverse a population as possible, anonymity of the respondents precluded any investigation into whether multiple respondents from a single company or business unit occurred. Hence, a *fragmentary* perspective on corporate culture (see Section 2.4.3) was assumed.

5) The respondents were asked several questions in order to categorise them according to certain contextual variables:

   a) They were asked to indicate the role that they have in their organisations (see question 1 in Appendix 2), considering the results found from the literature review (see Section 2.5.1). The sample population was split between three groups, namely "leaders/decision-makers", "manager/supervisors", and "subject matter experts". The respondents were asked to determine their role in the company, in order to:
      i) Screen out inappropriate respondents. The respondents who placed themselves in the fourth group ("non-supervisory, non-advisory workers") were removed from the sample, as the inclusion of non-supervisors is detrimental to the internal consistency of the cultural framework (Helfrich et al, 2007).
      ii) To determine whether there is a difference between their perceptions of the corporate culture and corporate strategies as a result of their different roles in the organisation.

   b) The respondents were asked to indicate the business type of their organisations (see question 3 in Appendix 2), considering the results found from the literature review (see Section 2.5.2). The business types were categorised qualitatively according to size and extent, rather than commercial or legal entity types. The categorisation was purposefully qualitative as respondent's perceptions were measured, and also to avoid the numerous definitions of what the size of the organisation means and how to measure it. The sample population was split between four groups, namely small, medium, large, government-owned, and multi-national giants.

   c) The respondents were asked to indicate the industry sector in which their organisation operates (see question 4 in Appendix 2), considering the results found from the literature survey (see Section 2.5.3). The industry sectors were categorised according to the level of pollution that can be expected from organisations operating

in that industry sector, similarly to the guidelines presented in the literature (FTSE, 2006:3). The sample population was split between three groups, namely high-, medium-, and low-polluting (although these terminologies were not made apparent to the respondents in order to eliminate response bias).

d) An Analysis of Variance (ANOVA) was used to determine whether the profiles formed by the *contextual variables* (role at work, business type, and industry sector type) displayed any significant differences between them, in terms of corporate strategy and corporate culture. This was tested using the General Linear Model (GLM) procedure of the SAS system. The GLM procedure uses the least-squares method to fit general linear models. The contextual variables formed the independent variables, whilst the dependent variables were the various dimensions of corporate strategy and corporate culture.

6) The data was collected from SurveyMonkey (a web-based survey tool), collated, and cleaned by rejecting the following responses:
   a) Those that were incomplete.
   b) Those that indicated that the respondent was not in a position to understand both the corporate culture and the corporate strategies present at the company that the respondent worked for.

7) The data was analysed using the following steps:
   a) Aggregation of the scores (to a company or business unit level) was not carried out, as the *fragmentation* perspective was assumed (see Section 2.4.4.2). Each respondent therefore represented an independent data-point.
   b) The influence of the contextual variables were determined by comparing the means for the corporate culture and strategies using an ANOVA procedure.
   c) Internal validity was tested by calculating the Cronbach's alpha for the dimensions of both constructs (corporate culture and corporate strategy), as well as for the total scores for both constructs. Only the dimensions with a sufficiently high Cronbach's alpha ($\alpha \geq 0.63$) were used for further testing.
   d) The data was tested for linearity using a visual examination of scatterplots.
   e) The constructs were further tested for validity using cross-correlation matrices. Pearson's correlation coefficient (ρ) was used, which provides the strength of correlation between variables.
   f) The CORR Procedure of the SAS System was then used to test for correlation between the cultural variables within each content dimension in the CVF with the

corporate strategy content dimensions. This was carried out in order to understand which dimensions of the corporate culture were more strongly correlated with the corporate strategies. Pearson's correlation coefficient (ρ) was used, which provides the strength of correlation between variables.

g) Agglomeration of these results were carried out to determine whether the corporate culture correlates with corporate strategy, at the cultural archetype level.

h) The cultural archetypes were collapsed along the two axes, and the Z-test was used to determine if the different dimensions produce statistically significant differences.

i) The variables of corporate response were correlated with the elements of corporate culture, using.

8) Although an attempt was made to confirm a correlation between the variables of corporate culture and corporate strategies, no attempt was made to infer causality.

4.3 Scope

The Universe of this study was limited to individuals that are knowledgeable about:

- The environmental sustainability issues in the corporate environment in which they currently work.
- The corporate culture at the company.

This scope was chosen because a credible knowledge of corporate strategies and corporate culture was required in this study. It is therefore important that subject-matter experts or decision-makers who are knowledgeable regarding environmental sustainability in their particular corporate context be the respondents, and that others be excluded. Potential respondents were therefore identified using the snowball sampling method, and only these appropriate respondents were sent the survey link. To further ensure integrity of the sample, questions were placed in the first section of the questionnaire in order to screen out unsuitable candidates.

Respondents were identified and included from a large range of industries, business types, and from various pre-determined roles in their organisations in order to avoid selection bias.

The **unit of analysis** is the *perception* that these experts or decision-makers have of the corporate strategies that have been undertaken in response to environmental sustainability challenges, and also of the corporate culture within which these strategies occurred.

4.4 Data gathering

The research instrument was a **survey** using an online **questionnaire**, which was used for gathering primary data. This was chosen because:

- There is no secondary data available that could be used for tying together the two relevant constructs, so **primary data** was sought. Confidentiality was assured through the use of an Internet-based survey which was accessed via a hyperlink in the Consent Letter (see Appendix 2). The questionnaire was filled in online, and the results agglomerated using an proprietary encryption technique to ensure maximal anonymity of respondents.
- Surveys are a common form of data gathering instrument used in quantitative research. It allows for the collection of data from a large number of respondents, regarding the same constructs, in a cost-effective manner (Saunders and Lewis, 2012:116).
- Questionnaires form the most appropriate method for collecting large amounts of primary data for quantitative analysis. The questionnaire was based on frameworks available in the literature, from which the two constructs were analysed.
- The questionnaire was developed online from these questions, and a link sent to potential respondents via a personalised e-mail to improve the likelihood of response rate. Anonymity of the respondents was assured due to the coding and agglomeration of strategies prior to output from the online survey.

4.5 Population and sampling method

The population are employees who are knowledgeable about the corporate response to the environmental sustainability challenges at their place of work in the corporate world. They need to be active in the field, and their opinions and perceptions must be acknowledged as being credible. It has been found that although the competing values framework has high validity and reliability, it shows poor discriminant properties when applied to non-supervisors (Helfrich, Li, Mohr, and Meterko: 2007). Therefore, it is important that the population includes only employees of corporations who are in a position to understand the corporate culture.

The sampling selection is **non-probability**, as there is no complete list of all companies or individuals engaged in environmental sustainability challenges, and hence there is no

sampling frame (Saunders and Lewis, 2012:134). Projecting the data beyond the sample is therefore statistically inappropriate (Zikmund, 3002:380).

The population size is unknown as no sampling frame exists – there is no listing of the population. The population size is expected to be relatively small, as not many individuals or companies are involved in corporate strategies to environmental sustainability challenges. This is also often found in large industrial companies, but is not necessarily exclusive to that.

The sampling technique used was **snowball sampling**, where additional respondents are identified from information provided by the initial respondents (Zikmund, 2003:384). The information regarding additional respondents was obtained via a combination of techniques such as word-of-mouth, queries sent to corporate structures, and through social media (such as the LinkedIn website). Snowball sampling was used because a list of possible respondents does not exist, it is difficult to identify potential respondents, and therefore they had to be identified as the research progressed. It is an ideal method for locating members of a rare population by referrals (Zikmund, 2003:384), which is required in this research due to the quantitative rarity of corporate involvement in environmental sustainability challenges. It is possible that the use of snowball sampling may result in a homogenous group (Saunders and Lewis, 2012:140). This non-probability sample may then include elements of convenience. It could then introduce a sample selection error as the whole population is not taken into account, and the referral from those already in the sample may result in a selection bias (Zikmund, 2003:384).

4.6 Assumptions

The research was based on the following assumptions:

- The Competing Values Framework is an adequate descriptor of corporate culture for this purpose.
- The model that was developed to measure corporate strategies to the environmental sustainability challenge is an adequate descriptor of corporate strategies for this purpose.
- The perceptions of people who are knowledgeable in the field of both the corporate culture as well as the corporate strategies that their employers utilise, are adequate descriptors of these two constructs.

4.7 Research Limitations

Due to the nature of this study, such as time and resource constraints, various limitations have been identified. A list of limitations that could apply to this study were collated from the literature, and are tabulated in Table 9. Possible reasons for the limitations as well as the mitigating strategies used were described.

After consideration of the mitigating strategies used, the following aspects remain as limitations to this study:

1. Although this research proved the suitability of the sample, the non-probability aspect of its selection undermines its external validity.
2. The CVF instrument is not necessarily exhaustive as a descriptor of corporate culture, and other aspects of corporate culture that were not measured may exert an influence on corporate strategies. This could have a detrimental effect on the internal validity of the research.
3. The instrument developed to measure corporate strategies would have its own set of limitations, undermining the internal validity of the research. This is highlighted by the low scale reliability of two of its constructs, with one construct being rejected in the research (see Section 6.3).
4. Three contextual variables were utilised in this research as a result of previous research demonstrating their influence on corporate strategies and/or corporate culture (see Section 5.2 and Section 6.2). Nevertheless, they might not be exhaustive, which could be detrimental to the internal reliability of this research if relevant variables were excluded.
5. The sample contains a wide variety of company types, including multi-national companies, which formed the bulk of the sample. Country effects were eliminated by considering operations within South Africa alone, and it is assumed that an effectively homogenous sample is attained as a result. However, the autonomy or influence of multi-national corporations may compromise this assumption (see Section 2.5.4), which may have a detrimental effect on the internal validity of this research if true.
6. Although efforts were made to obtain a diverse sample of respondents, there may still have been multiple respondents from similar business units or groupings, thereby skewing the data-set. This could not be measured due to anonymity assurances.
7. Although this research intended to test only the corporate strategies with respect to environmental sustainability, other aspects of sustainability (such as economic and social considerations) would be important for both academic and business research.

Further research should consider investigating the same topic across all three sustainability areas, as they are not mutually exclusive and independent of each other.

8. The research does not have a causal design, and provides measures of correlation only. This truncates the research at the descriptive level.
9. The research is context-specific, having relevance to South Africa during 2012.

Table 9. Screening the limitations of the study, with possible reasons provided, as adapted from literature (Saunders and Lewis, 2012:125-128) (Cooper and Schindler, 2006).

LIMITATION	REASON
1. **Internal Validity:** Does the research instrument enable resolution of the research problem?	
a) **Content validity**: the extent to which the data collection tool provides enough data to answer the research questions and meet all objectives.	• **Subject selection** (where respondents are unrepresentative of the research population): The total size of the population is unknown, and snowball sampling was used to identify potential respondents, introducing an element of convenience and potential bias. Autonomy of multi-nationals may compromise the homogeneity of the sample with regards to country effects.
	• **History** (where specific events in the history of the project which have an important effect on the findings): This was a cross-sectional study, and results could be different if applied at another point in time.
	• **Testing** (where distortion is introduced by the testing process itself): Although difficult to measure, it is assumed that the high completion rate of the survey (83%) indicates that this was not problematic (see Section 6.1).
	• **Mortality** (involving the loss of respondents during the research): This is irrelevant in this research.
	• **Causal Ambiguity** (confusion about causal direction: which is the cause and which is the effect?): This research did not have a causal design, and therefore does not assume any causality, only correlations.
b) **Construct validity**: the extent to which the questions asked actually collect data about what they are intended to measure.	• **CVF**: Literature on construct validity of CVF is provided for ranking and rating questions (see Section 6.4.3). The same questions were used as found in the literature. The Cronbach's alphas were tested (see Section 5.3 and Section 6.3). Cross-correlation and non-parametric tests were carried out as well (see Section 5.4.3).
	• **Corporate strategies**: An instrument was synthesised from the literature, as discussed in Section 2.3. The Cronbach's alphas were tested (see Sections 5.3 and 6.3). Cross-correlation tests were carried out as well (see Section 5.4.2).
2. **External Validity**: the extent to which conclusions can be generalised to other research settings.	
a) Sample limited to a particular setting.	• Although respondents were chosen from a diverse set of industries and business types, they were all limited to the South African context. It cannot be extrapolated to other

LIMITATION	REASON
	country contexts. • Since the study is cross-sectional, it is limited to the temporal context at which the research was carried out. It cannot be extrapolated to other **time** contexts.
3. **Reliability of the measuring instrument**: Consistent findings:	
a) The measures used will produce the same result if used on another occasion. b) Other researchers using the same methodology will produce similar findings. c) Clarity in how conclusions were derived from data/findings.	• **Subject error** (distortion caused by subject's subjectivity, measurement being affected by environment): In order to minimise subject error, respondents were identified according to possible suitability (see Sections 4.3 and 4.5), tested for suitability, and unsuitable respondents were discarded (see Section 5.1). • **Subject bias** (subjects providing unreliable information for political reasons): In order to minimise subject bias, respondents were assured of anonymity (see Section 4.4). It is not known how effective this was in relieving respondent's fears. The fact that personalised e-mails were used as a vehicle to obtain primary data, whilst improving the response rate, may have unsettled some respondents. However, completion of the survey was not mandatory and the gross response rate was only 32.6% (see Section 5.1). It is therefore unlikely that unsettled respondents formed part of the sample. • **Observer error** (distortion caused by observer subjectivity with regards to questions asked): In order to minimise observer error in the final results, a large and diverse sample was obtained. The sample was sufficiently large to carry out parametric statistical analysis, allowing for a "smoothing out" of observer error. Nevertheless, respondent's perceptions were the unit of analysis in the study, and no attempt was made to correlate this with other data. • **Observer bias** (distortion caused by observer subjectivity with regards to interpreting data): in order to minimise observer bias, the respondents were tested across several contextual variables to determine whether perceptions differed accordingly (see Section 5.2 and 6.2). Although these contextual variables were selected from literature (see Section 2.5), there is no evidence that the list is exhaustive.

5. RESULTS

This Chapter presents the results from the research that was undertaken. The format will be to:

1. Present data regarding the sample in terms of the respondents, the demographics regarding the contextual variables, and the demographics of the corporate cultures throughout the sample.
2. Present the descriptive statistics in order to understand the sample, and to test for internal reliability of all the constructs and dimensions used.
3. Present the inferential statistics whereby the correlation of corporate culture and corporate strategy can be determined. The main findings will then be summarised diagrammatically.

5.1 Introduction and response rate

In order to ensure that credible results are obtained from the respondents, the questionnaire was sent only to individuals who are involved in or around the issue of environmental sustainability at their work.

A total of 258 personalised e-mails carrying the link to the questionnaire were sent out for completion, and a total of 84 questionnaires were received back. This represents a gross response rate of 32.6%. Upon reviewing the responses, a total of 73 completed questionnaires could be used in the analysis of the data, as 11 questionnaires were removed from the data (see Section 4.1) as they did not meet the necessary criteria for inclusion. The final response rate was therefore 28.3%, with a completion rate of 87%.

5.2 Sample description

The demographics of the sample was checked to determine the heterogeneity of the sample across selected contextual variables. These contextual variables were selected based on the literature (see section 2.5), using only those that have been shown to have an effect on corporate culture and/or corporate strategies to the environmental challenge (Jeswani et al, 2008; Lee, 2012). The sample was analysed across three contextual variables – the *respondents role in the company* where they are employed, the *type of business* it is (in terms of a qualitative description of size and extent), and the *industry sector type* that it is in

(categorised according to degree of polluting activities employed). Finally, the demographics of the corporate culture within the sample was determined.

5.2.1 *The respondents role in the company*

The demographic split of the sample is presented in Figure 6. It can be seen that the majority of the respondents were subject-matter experts (47.9%), followed by leaders/decision-makers (32.9%), with managers/supervisors forming the smallest group (19.2%).

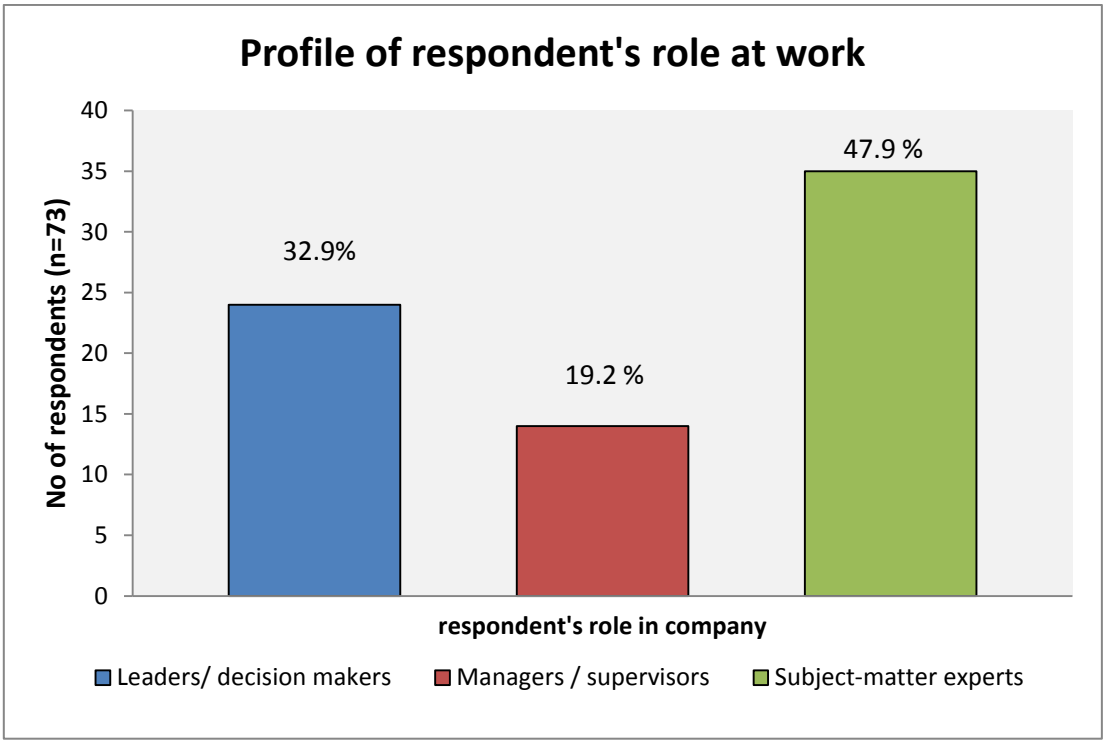

Figure 6. Profile of the role that respondents play at their place of work (n=73).

5.2.2 *The business type*

It can be seen that just over half of the respondents were from multi-national giants, with "large" businesses (with limited international presence) being the next largest group. Thus, the sum of those two business types equates to 82.2%, which forms the bulk of the sample.

Only 12% of the sample was from the government-owned group, and the small- and medium-sized companies formed an insignificant proportion of the sample (2.7% each). The influence of company size would therefore be negligible with this sample.

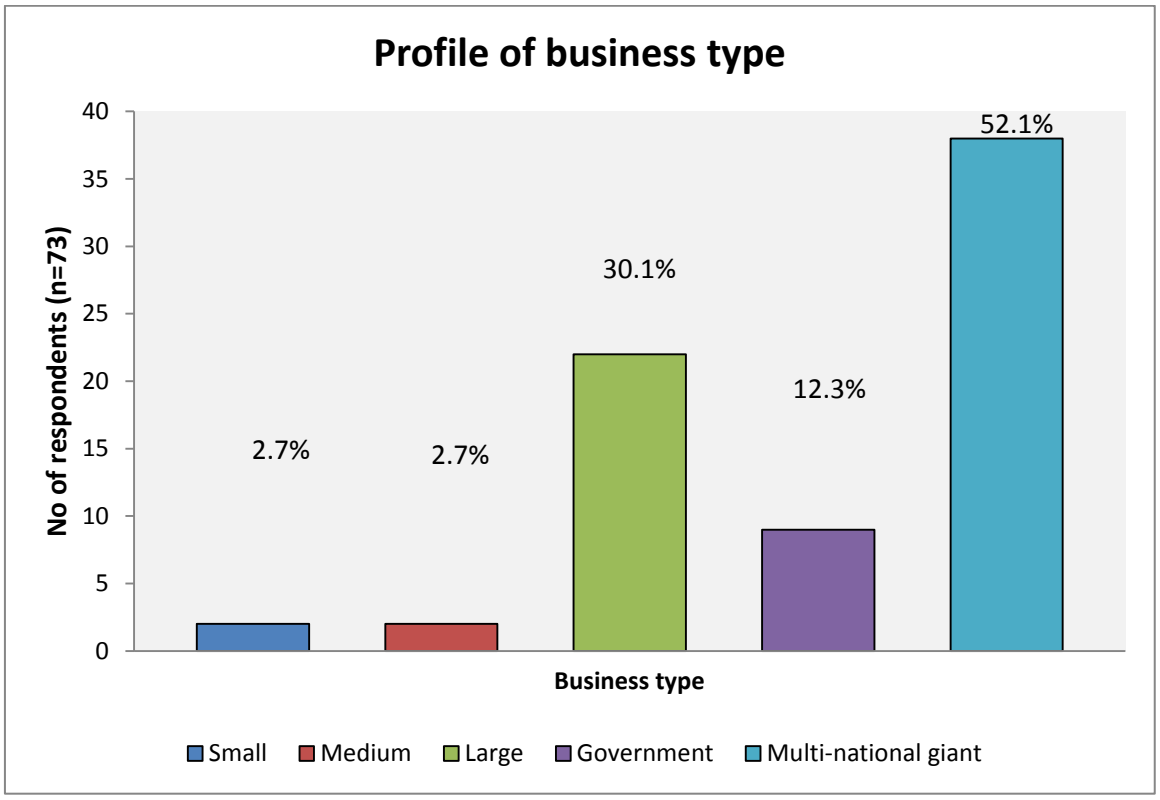

Figure 7. Profile of business type amongst the respondents (n=73).

5.2.3 *The industry sector*

Figure 8 depicts the demographic spread of the respondents according to this industry sector classification.

It can be seen that 64.4% of the respondents were from high polluting industry sectors, which formed the largest group. The respondents were therefore predominantly from highly polluting industry sectors, with respondents from the low- and medium-polluting industry sector type forming 16.4% and 19.2% of the sample respectively.

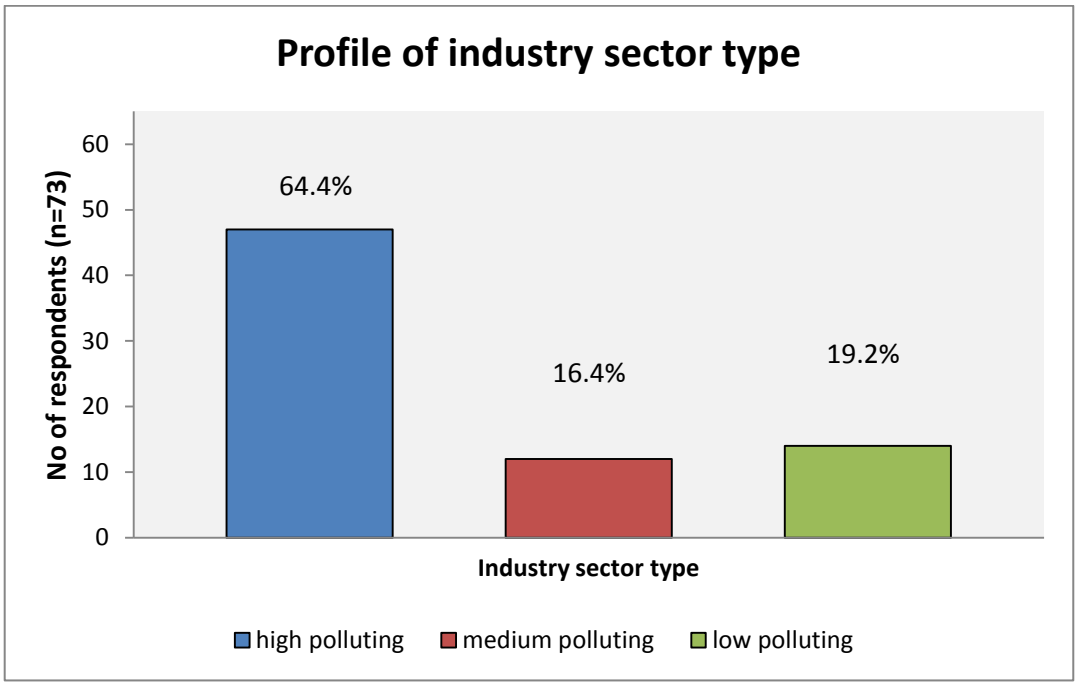

Figure 8. Profile of industry sector type, categorised according to pollution levels expected from that sector (n=73).

5.2.4 *Analysis of variance for the contextual variables*

An Analysis of Variance (ANOVA) was carried out to determine whether the contextual variables had an influence on the corporate strategies and corporate culture. These ANOVA tables are presented in Table 10 and Table 11. The means and standard deviations are presented in Appendix 3 and Appendix 4.

Table 10. Analysis of variance table for the contextual variables with respect to corporate strategies.

	N	DF	F-Value	Probability	Semi-partial eta-square
Emission control					
Business type	**73**	1	15.84	**0.0002**	**0.1623**
Industry sector type	**73**	1	10.80	**0.0016**	**0.1107**
Role at work	**73**	2	5.48	**0.0062**	**0.1122**
Biodiversity					
Business type	**73**	1	0.10	0.7470	0.0015
Industry sector type	**73**	1	0.22	0.6418	0.0032
Role at work	**73**	2	0.20	0.8156	0.0060
Products					
Business type	**73**	1	1.12	0.2927	0.0153
Industry sector type	**73**	1	2.93	0.0917	0.0399
Role at work	**73**	2	0.51	0.6053	0.0138
Attitude					
Business type	**73**	1	0.54	0.4651	0.0076
Industry sector type	**73**	1	2.90	0.0933	0.0408

	N	DF	F-Value	Probability	Semi-partial eta-square
Role at work	**73**	2	0.03	0.9708	0.0008
Total sustainability					
Business type	**73**	1	0.10	0.7483	0.0015
Industry sector type	**73**	1	0.06	0.8145	0.0008
Role at work	**73**	2	0.19	0.8314	0.0054
N is the sample size. **DF** is the degrees of freedom. **Probability** measures statistical significance, where Null hypothesis (e.g. H_0: μ_1- μ_2 = 0) is rejected if p<0.05. **Semi-partial eta-square** measures the practical difference between the two groups, i.e. the effect size. A rule of thumb is: **Small is 0.001-0.05, medium is 0.06-0.14, large is >0.15.**					

Table 11. Analysis of variance table for the contextual variables with respect to corporate culture.

	N	DF	F-Value	Probability	Semi-partial eta-square
Clan					
Business type	**73**	1	0.01	0.9402	0.0001
Industry sector type	**73**	1	0.40	0.5270	0.0059
Role at work	**73**	2	0.12	0.8853	0.0036
Adhocracy					
Business type	**73**	1	1.20	0.2768	0.0169
Industry sector type	**73**	1	0.66	0.4182	0.0093
Role at work	**73**	2	0.22	0.8064	0.0061
Market					
Business type	**73**	1	0.24	0.6240	0.0033
Industry sector type	**73**	1	0.78	0.3804	0.0106
Role at work	**73**	2	1.80	0.1725	0.0491
Hierarchy					
Business type	**73**	1	0.10	0.7504	0.0014
Industry sector type	**73**	1	2.49	0.1191	0.0338
Role at work	**73**	2	1.11	0.3349	0.0301
Total culture					
Business type	**73**	1	0.31	0.5789	0.0045
Industry sector type	**73**	1	0.14	0.7071	0.0021
Role at work	**73**	2	0.36	0.6963	0.0105
N is the sample size. **DF** is the degrees of freedom. **Probability** measures statistical significance, where Null hypothesis (e.g. H_0: μ_1- μ_2 = 0) is rejected if p<0.05. **Semi-partial eta-square** measures the practical difference between the two groups, i.e. the effect size. A rule of thumb is: **Small is 0.001-0.05, medium is 0.06-0.14, large is >0.15.**					

It can be seen that the Null Hypothesis (indicating no significant difference between groups) could not be rejected, except for the corporate strategy dimension *Emission control*, where the Null Hypothesis could be rejected across all three contextual variables.

Thus, the only dimension where the contextual variables was noted to have an effect was on *Emission control*, which are the strategies undertaken to reduce emissions to the environment. The effect of the contextual variables with respect to *Emission control* was as follows:

1. Role at work: The three original categories were left intact. The *leaders/decision-makers* exhibited the lowest estimation of the strategies taken to reduce emissions to the environment. Manager/supervisors seemed to exhibit the highest estimation of these strategies, with subject-matter experts being in-between. The effect size is moderate (as measured by the semi-partial eta squared).

   The difference between the three groups for the contextual variable *role at work* was confirmed using Duncan's Multiple Range Test (see Appendix 5). This test controls the Type I comparison-wise error rate, not the experiment-wise error rate. It was confirmed that the group *leader/decision-makers* exhibited a significantly lower mean (2.47) for *Emission control* than either *subject-matter experts* (2.69) or *manager/supervisors* (2.77). Thus, the difference was due to responses by the *leaders/decision-makers*.

2. Business type: The categories were collapsed into two groups – the original multi-national companies group, and a group synthesised by adding the other three groups together. This was carried out due to the low sample size of the small-, medium-, and government-owned groups. These small groups were combined with the large group, and compared against the multi-national group. The multi-national companies exhibited a significantly higher mean (2.75) for *Emission control* than the combined group comprised of *small, medium,* and *government-owned companies* (2.51). The effect size is noted to be large (as measured by the semi-partial eta squared).

3. Industry sector type: The groups were collapsed into two groups – the *high*-polluting group, and a combined group consisting of the *low*- and *medium*-polluting group. This was carried out due to the low sample size of the *low*-polluting group. *High-polluting* industry sectors exhibited a lower mean (2.57) than the combined group comprised of *medium*- and *low-polluting* industry sectors (2.76). This indicates that they perceive themselves to be doing less to control emissions than the other groups perceive is being done. The effect size is moderate (as measured by the semi-partial eta squared).

The corporate culture was unaffected by any of the contextual variables. This indicates that a diversity of cultures were spread throughout the sample, without stratification being present due to the contextual variables.

5.2.5 *Demographics of corporate culture*

The respondents were asked several questions to determine the corporate culture characteristics of the company where they work. Most respondents showed a dominant culture archetype, whilst several respondents demonstrated a combination of two or more culture types. The distribution of corporate culture archetypes within the sample is presented in Figure 9. The majority of the sample was from the *Market* archetype, with the *Hierarchy* archetype being the second most common form. Various combinations of the four culture archetypes were also noted amongst 23.3% of the respondents, where there was no single dominant culture archetype.

This trend indicates that the sample consisted predominantly of respondents working for companies where desired outcomes are perceived to be exerted through formal control (the *Market* and *Hierarchy* cultures) mechanisms, rather than through social coordination. The *Adhocracy* and *Clan* cultures formed the smallest demographic groups, and are common to those on the *flexibility* end of the spectrum. These culture archetypes rely on social coordination to achieve their desired outcomes.

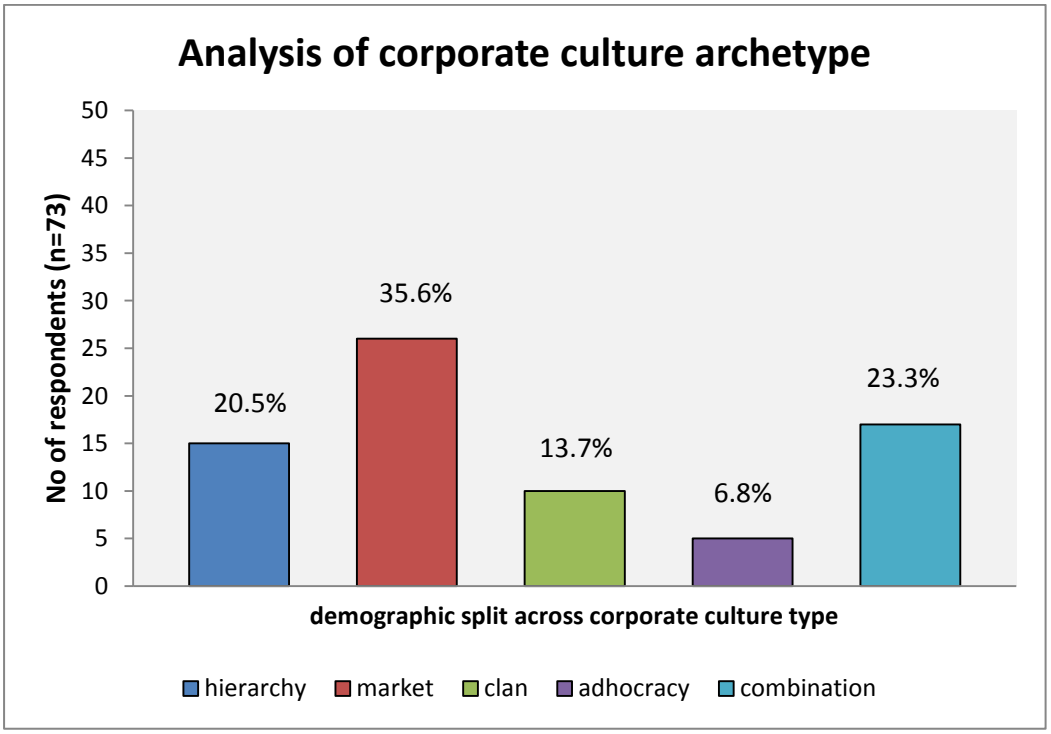

Figure 9. The distribution of corporate culture types according to the CVF (n=73).

The sample was therefore collapsed along the *control-flexibility* axis of the CVF to determine the level of dominance of the *control* end of the spectrum (see CVF in Figure 4). The results

are shown in Figure 10. It can be seen that the majority (61.6%) of the respondents are working in companies that exert behavioural compliance and achieve desired outcomes through formalised procedures, rather than through social coordination.

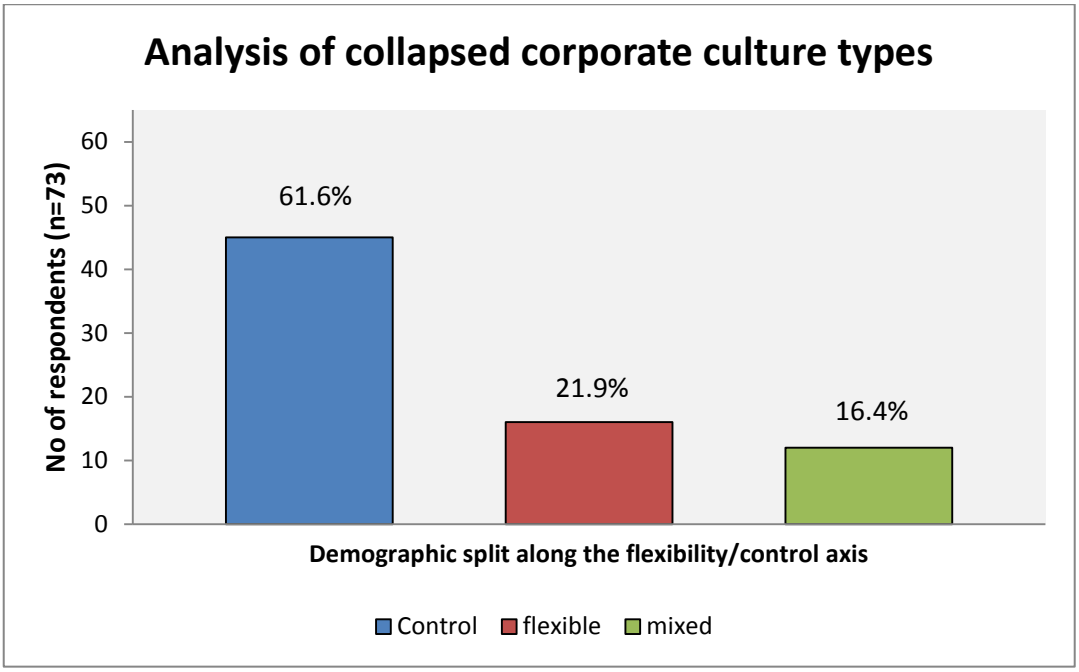

Figure 10. The demographic split of the sample into cultures that exhibit flexibility (Clan and Adhocracy) and control (Market and Hierarchy).

5.3 Scale reliability

The scale reliability for the two constructs (corporate strategies and corporate culture) found in the sample were measured using Cronbach's α, as shown below in Table 12. Each construct was sub-divided into its individual dimensions, and each dimension was then tested independently for internal reliability.

It can be seen that the majority of the dimensions for the corporate strategies had Cronbach's alpha scores above 0.70, with the exception of the dimensions *Resource use* and *Attitude*. The lowest score was *Resource use* (0.56), whilst *Attitude* displayed a border-line value (0.63).

The summated constructs (*Total sustainability* and *Total culture*) both exhibited high Cronbach's alpha scores, of 0.89 and 0.90 respectively.

Table 12. Reliability scale for each dimension of the two constructs that were tested.

Dimension	Cronbach's alpha (raw)	Cronbach's alpha (standardised)	No. of items
Corporate strategies			
Resource use	**0.56**	**0.56**	3
Emission control	0.80	0.80	3
Biodiversity	0.73	0.76	3
Products	0.87	0.87	3
Attitude	**0.63**	**0.63**	3
Total sustainability	0.89	0.89	15
Corporate culture			
Clan	0.91	0.91	5
Adhocracy	0.83	0.82	5
Market	0.77	0.78	5
Hierarchy	0.71	0.71	5
Total culture	0.90	0.90	20
Internal	0.87	0.87	10
External	0.84	0.84	10
Flexible	0.92	0.92	10
Control	0.76	0.76	10

The individual variables of the two constructs *Resource use* and *Attitude* were investigated in more depth (see Table 13), to determine the cause of the poorer internal consistency found with these two content dimensions. It can be seen that variable 6 caused the problem for *Resource use*, whilst variable 18 caused the problem for *Attitude*. The details of these variables are presented in Table 13. It can be seen that:

1. Variable 6 in *Resource use* did not correlate well with the construct as a whole, indicating divergent properties with the other two variables of *Resource use*.
2. Variable 18 in *Attitude* correlated well with the other two variables, but exhibited a lower mean.

Table 13. The means, correlations, and alphas of each variable with the *resource use* and *attitude* constructs.

Deleted variable	Raw variable			Questions wording
	Mean	Correlation with total	alpha	
Resource use				
v6 (R)	3.27397	**0.260217**	0.647991	Only economical and technical criteria are considered when determining resource use.
v7	3.39726	0.343725	0.496334	Recycled and/or renewable sources of material and energy are utilised.
v8	3.61644	0.536133	0.200986	Resource management strategy is aligned with sustainability principles
Attitude				
v18 (R)	**2.84932**	0.445703	0.510695	Addressing ecological issues are viewed as a "grudge expense" (an unavoidable cost of doing business).
v19	3.57534	0.457524	0.501392	Ecological issues are viewed as a chance to do the right thing.
v20	3.08219	0.405555	0.569837	Addressing ecological issues are viewed as being potentially a source of further profit, (e.g. we can make money out of this).

Note: (R) refers to reverse scoring.

.

5.4 Descriptive statistics

5.4.1 *Visual examination of the data*

The visual examination was used to determine potential issues with the linearity of the data, as well as to determine the spread and general trend of the data.

5.4.1.1. Linearity

Visual examination of the data was carried out to determine the distribution of the data prior to inferential statistics being carried out. Scatterplots showing the data distribution between the two constructs are necessary, as statistical correlation coefficients assume linearity of the data, which may not be the case in reality (Anscombe, 1973). Therefore, correlation coefficients cannot replace visual examination of the data as a summary statistic.

The first scatterplot compared the total sustainability score and the total culture score (see Figure 11). These two variables were constructed by simply summing up their individual dimensions. The axes of the data were chosen to provide the maximum and minimum values allowed by the 5-point Likert scale. The total culture was obtained by summing up four questions over five dimension, providing a possible minimum of 20 and a possible maximum of 100. The total sustainability score was obtained by summing up three questions over five dimension, providing for a possible maximum of 75 and a possible minimum of 15. Plotting the data within these axes allows for the identification of the location of the data. It was found that:

1. There is only one data-point in the first quartile of the corporate culture scale, with most of the data being present in the third quartile. This may indicate possible bias towards the “agree” side. The corporate strategy scale (as measured by *total sustainability*) exhibited a similar bias.
2. The data appears to be linear, indicating a high degree of normality.
3. Although outliers are present, they do not exhibit a high degree of distance from most of the data, and were included in the data-set.
4. A curvilinear relationship does not appear to exist.

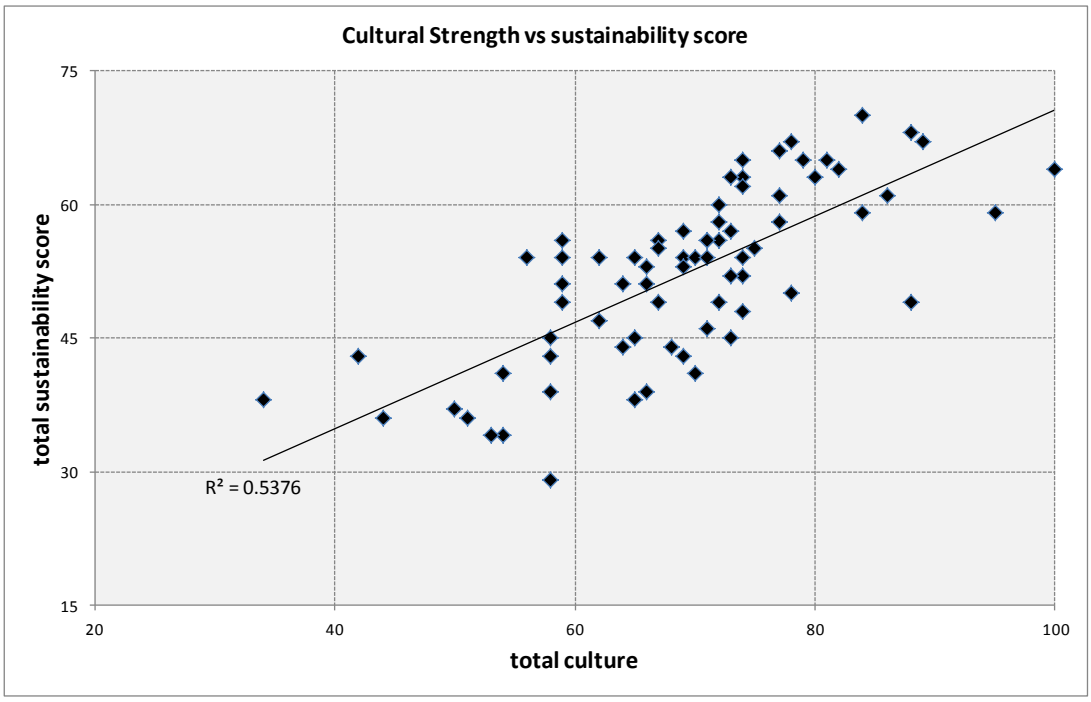

Figure 11. Scatterplot of the total culture score and the total sustainability score.

Similarly, scatterplots of the various culture types versus the corporate strategy dimensions were carried out and are presented in the Appendix (see Appendix 6). These were developed in order to determine the distribution of the data in accordance with Anscombe's quartet (Anscombe, 1973). This test determines whether the data is approximately normally distributed, if any outliers distorted the data significantly, or if curvilinear relationships were present. It was found that:

1. The data was approximately normally distributed, the data was not significantly skewed by outliers, and no curvilinear relationships were present.
2. The data for *Emission Control* was well spread, indicating a high degree of diversity in the sample with regards to emissions control.
3. The data for *Biodiversity* was located mostly in the upper two quadrants, with no data-point present in the first quartile. This indicates a bias towards strong attention being paid to *Biodiversity* in the sample.
4. The data for the *Market* and *Hierarchy* cultures were located mostly in the last two quartiles, with only one data-point in the first quartile. This indicates a bias towards strong *Market* and *Hierarchy* cultures in the sample.

5.4.1.2. General trend of the data

Another important observation is the strong correlation between *Total culture* and *Total sustainability* (see Figure 11). Thus, the higher the respondents scored on their overall corporate culture tool, the higher they scored on the corporate strategies tool as well.

5.4.2 *Construct validity: corporate strategy*

A corporate strategies model was synthesised from the literature, and the results and final form of the model is presented below. The model is then tested for internal validity and reliability.

5.4.2.1. Development of the corporate strategies model

There were several considerations required in constructing a bespoke corporate strategies model for use in this study:

1. Scale: For this study, a Likert scale was chosen due to its ease of use and applicability in surveys.
2. Typology: Considering it's wide application and ease of carrying out quantitative assessments and correlations, a **one-dimensional continuum** was chosen for this study. A summated composite dimension, termed the "*Total sustainability*", was included. This follows the methodology provided by the Dow Jones Sustainability Index (DJSI, 2007:7).
3. Content dimensions: For the purposes of this study, the framework used by Baumgartner and Ebner (2010) was chosen due to its various advantages (see Section 2.3.6). Several modifications were made to that model for the purpose of this study (see Section 6.4.2.1). The corporate strategies to meet environmental sustainability challenges were therefore scored along five content dimensions (*Resource use, Emissions control, Biodiversity, Products*, and *Attitude*) - see questions 6 to question 20 of Appendix 2.

5.4.2.2. Internal consistency of bespoke model

The correlations between the dimensions within the corporate strategies construct were cross-correlated with each other. The results are provided in Table 14.

Table 14. Cross-correlation matrix of the dimensions of the corporate strategies construct using Pearson's correlation coefficient and associate d p-values.

Pearson Correlation Coefficients, N = 73 Prob > |r| under H0: Rho=0				
	Emission control	**Biodiversity**	**Products**	**Attitude**
Emission control	1.00000	0.44595 p < 0.0001	0.39831 p = 0.0005	0.64362 p <0 .0001
Biodiversity	0.44595 p < 0.0001	1.00000	0.60586 p < 0.0001	0.48640 p <0 .0001
Products	0.39831 p = 0.0005	0.60586 p <0.0001	1.00000	0.31501 p = 0.0066
Attitude	0.64362 p < 0.0001	0.48640 p < 0.0001	0.31501 p = 0.0066	1.00000

Table 14 is a summary of pair-wise correlations for the different dimensions used for corporate strategy. It can be seen that the Null hypothesis (ρ = 0) can be rejected for all of the dimensional cross-correlations (at α=0.05) for corporate strategy. Therefore, the various dimensions of the corporate strategies are not independent from each other. The Pearson's correlation coefficients were either strong or medium in all cases. This provides strong evidence that there is an underlying construct that is being measured by all the dimensions. The corporate strategy dimensions correlated positively with each other in all cases, with *Attitude-Emission control* showing the strongest correlation (ρ=0.64362), and *Attitude-Products* showing the weakest correlation (ρ=0.31501).

5.4.3 *Construct validity: corporate culture*

The construct validity of the corporate culture framework was tested using a cross-correlation matrix as well as non-parametric tests.

5.4.3.1. Cross-correlations

The correlations between the dimensions within the corporate culture construct were tested with each other. The results are provided in Table 15.

Table 15. Cross-correlation matrix of the dimensions of the corporate culture construct using Pearson's correlation coefficient and associate d p-values.

Pearson Correlation Coefficients, N = 73 Prob > |r| under H0: Rho=0				
	Clan	**Adhocracy**	**Market**	**Hierarchy**
Clan	1.00000	0.73982 p <0 .0001	0.27799 p = 0.0173	0.53313 p < 0.0001
Adhocracy	0.73982 p < 0.0001	1.00000	0.48750 p < 0.0001	0.31385 p = 0.0069
Market	0.27799 p = 0.0173	0.48750 p < 0.0001	1.00000	0.28329 p = 0.0152
Hierarchy	0.53313 p < 0.0001	0.31385 p = 0.0069	0.28329 p = 0.0152	1.00000

Table 15 is a summary of pair-wise correlations for the different dimensions used for corporate culture. It can be seen that the Null hypothesis (ρ = 0) can be rejected for all of the dimensional cross-correlations (at α=0.05) for corporate culture. Therefore, the various cultural types are not independent of each other. This provides evidence that there is an underlying construct that is being measured by all the dimensions, although certain cultures correlated more weakly with others. The Pearson's correlation coefficients were weakest for the *Clan-Market* (ρ =0.27799) and *Hierarchy-Market* (ρ =0.28329) culture cross-correlations, but were nevertheless statistically. The strongest correlation was between the *Clan-Adhocracy* (ρ =0.73982) cultures, indicating poor discriminant properties between these two cultures. The corporate cultures correlated positively with each other in all cases, with no negative correlations being found.

5.4.3.2. Non-parametric tests

Non-parametric tests were carried out on the means of the four culture archetypes, to determine if the sample demonstrates a statistically significant difference between them. This would determine whether the practice of dividing respondents into these cultural archetypes is statistically valid with this sample. The Friedman two-way analysis of variance test was used as an initial screening test, and results are presented in Table 16.

Table 16. The results from the Friedman two-way analysis of variance

Variable	Friedman two-way ANOVA		
	Mean	**Std deviation**	**Rank sum**
Clan	3.2219	0.9525	160.0
Adhocracy	3.1589	0.8165	144.5
Market	3.7479	0.6464	217.5
Hierarchy	3.6849	0.6100	208.0
Friedman test statistic = 31.44, and p < 0.001.			
Assumption: degrees of freedom = 3. (P_{crit} = 0.05 at 95% confidence)			
Kendall coefficient of concordance = 0.1436			

The probability is below the critical probability level (p=0.05) for the Friedman test statistic within the sample, indicating that the difference between at least two of the corporate culture archetypes are statistically significant. Multiple comparisons were then carried out to determine exactly which corporate cultures could be differentiated from the others. The results are shown in Table 17.

Table 17. Friedman multiple comparisons test between the four culture types.

Comparisons	Friedman multiple comparison test		
	Z_{stat}	Δ_{mean}	SE
Clan – adhocracy	**0.99**	15.50	15.60
Clan – market	3.69	-57.50	15.60
Clan – hierarchy	3.08	-48.00	15.60
Adhocracy – market	4.68	-73.00	15.60
Adhocracy – hierarchy	4.07	-63.50	15.60
Market – hierarchy	**0.61**	9.50	15.60
With 4 groups at n=73, Z_{crit} = **2.39** at alpha = 0.10, and Z_{crit} = **2.64** at alpha = 0.05 (significance at 5% level). Null hypotheses is rejected when $Z_{stat} > Z_{crit}$.			
Δ_{mean} is the difference between the means of the two cultures.			

It can be seen that the cultures that lie on the same side of the *control-flexibility* axis, namely *Market-Hierarchy* and *Clan-Adhocracy*, could not be properly differentiated from each other in this sample. This provides some evidence that the four cultural archetypes can be collapsed along the flexibility/control axis into two culture types:

1. *Flexible cultures* = *Clan* + *Adhocracy*
2. *Control cultures* = *Market* + *Hierarchy*

5.5 Inferential statistics, research questions, and hypotheses

Inferential statistics were carried out using the SAS System, using Pearson's correlation coefficient to determine correlation strength. In order to interpret these results, it was necessary to first have an understanding of how to evaluate the strength of correlation considering the constructs being evaluated against each other.

Interpretation of the strength of correlation was provided by comparing the correlation coefficients from the study with those from guidelines found in the literature, as presented in Table 18 below (Buda and Jarynowski, 2010), (Cohen, 1988):

Table 18. Interpretation of correlation strength using Pearson's correlation coefficient.

Correlation strength	Negative	Positive
None	0-(-0.09)	0 to 0.09
Weak	-0.1 to -0.3	0.1 to 0.3
Moderate	-0.3 to -0.5	0.3 to 0.5
Strong	below -0.5	More than 0.5

5.5.1 *Corporate culture archetypes and corporate strategies correlation*

The influence of the corporate cultures on the corporate strategies undertaken by the company in order to meet the environmental challenge was tested using Pearson correlation coefficient. The results are presented in Table 19. It can be seen that:

1. The Null hypotheses (H_0: ρ = 0) could not be rejected for any of the inter-construct correlations (at α=0.05), with the exception of the correlation between *Hierarchy* and *Attitude* (probability = 0.1886).
2. All correlations were positive, and no negative correlations (anti-correlations) were found.
3. The *Total Culture – Total Sustainability* correlation was the strongest correlation found (ρ =0.73322).
4. The strongest correlation between a single cultural type and a single corporate strategy dimension was the *Clan-Biodiversity* correlation (ρ=0.56560), followed by the *Adhocracy-Biodiversity* correlation (ρ=0.51104). The *Clan-Attitude* (ρ=0.50928) and *Adhocracy-Attitude* correlations (ρ=0.50337) followed close by. The corporate strategy dimension that appeared to be most sensitive to changes in corporate culture is *Attitude*. It correlates strongly with both the *Clan* (ρ≈0.51) and *Adhocracy*

(ρ≈0.50) cultures. It correlates weakly with both the *Market* (ρ≈0.26) and *Hierarchy* (ρ≈0.16) cultures.

5. The *Flexible* culture types correlated with *Total Sustainability* much more strongly than the *Control* culture types did. The *Flexible* culture types were strongly correlated (ρ>0.5) with all dimensions of the corporate strategies, and were stronger than those of the *Control* culture types in every instance.
6. The difference between the correlations of the *Internal* and *External* culture types with all dimensions of corporate strategy were small, but would still need to be tested for statistical significance.

Table 19. The correlation between the dimensions for the corporate culture and for the corporate strategies.

Pearson Correlation Coefficients, N = 73 , alpha = 0.05. **Prob > |r| under H_0: Rho=0**					
	Emission control	**Biodiversity**	**Products**	**Attitude**	**Total sustain.**
Clan	0.49798 p < 0.0001	**0.56560** p < 0.0001	0.47999 p < 0.0001	**0.50928** p < 0.0001	**0.69400** p < 0.0001
Adhocracy	0.46190 p < 0.0001	**0.51104** p < 0.0001	0.49253 p < 0.0001	**0.50337** p < 0.0001	**0.67757** p < 0.0001
Market	0.27163 p = 0.0201	0.28305 p = 0.0152	0.33954 p = 0.0033	0.25583 p = 0.0289	0.39732 p = 0.0005
Hierarchy	0.28288 p = 0.0153	0.37592 p = 0.0010	0.39503 p = 0.0005	**0.15562** **p = 0.1886**	0.41423 p = 0.0003
Total culture	0.51026 p < 0.0001	0.58200 p < 0.0001	0.56138 p < 0.0001	0.49187 p < 0.0001	**0.73322** p < 0.0001
Internal	0.46943 p < 0.0001	**0.55736** p < 0.0001	**0.50665** p < 0.0001	0.42091 p = 0.0002	0.66307 p < 0.0001
External	0.43709 p = 0.0001	0.47466 p < 0.0001	0.49158 p < 0.0001	0.45579 p < 0.0001	0.64059 p < 0.0001
Flexible	**0.51584** p < 0.0001	**0.57916** p < 0.0001	**0.52061** p < 0.0001	**0.54287** p < 0.0001	**0.73562** p < 0.0001
Control	0.34584 p = 0.0027	0.40955 p = 0.0003	0.45741 p < 0.0001	0.25857 p = 0.0272	0.50614 p < 0.0001

5.5.2 *Collapsed corporate culture forms*

The data presented in Table 19 shows results for collapsed cultural forms as well, namely:

1. Cultures that are collapsed along the *internal/external* focus axis:
    a. *Internal* culture, which is the *Clan* and *Hierarchy* culture archetypes summed together.
    b. *External* culture, which is the *Adhocracy* and *Market* culture archetypes summed together.
2. Cultures that are collapsed along the *flexibility/control* orientated axis:
    a. *Flexibility* culture, which is the *Clan* and Adhocracy cultures summed together.
    b. *Control* culture, which is the *Hierarchy* and *Market* cultures summed together.

The difference between the Pearson's correlation coefficients were tested for statistical significance using the *Z*-test. The results are shown in Table 20.

Table 20. Results of the Z-test showing significance of the differences in Pearson correlation coefficients between the collapsed cultures and the total sustainability score.

Correlations	Z-test statistic	Result
Internal/external-focus axis		
$\rho_{Internal}$ (0.66307) - $\rho_{External}$ (0.64059) = 0.02248	0.3105	Not significant (cannot reject Null hypothesis H_0)
Flexibility/control-orientated axis		
$\rho_{Flexibility}$ (0.73562) - $\rho_{Control}$ (0.50614) = 0.22948	3.595	Significant (can reject Null hypothesis H_0)
At $\alpha = 0.05$, Zcrit = 1.96. If Z < Zcrit, then cannot reject Null hypothesis (H_0: $\rho_1 - \rho_2 = 0$)		

It can be seen that the difference in total sustainability scores for the cultures across the *internal/external* focus axis was small and statistically insignificant. However, the difference in total sustainability scores for the cultures across the *flexibility/control* axis was an order of magnitude larger, and was statistically significant.

5.5.3 *Corporate culture variables and corporate strategies correlation*

Although the correlation between the corporate culture types and corporate strategies can be seen in Table 19, the individual elements of those cultures may have a greater or lesser

effect than others on the corporate strategies. The poor discriminant properties of the corporate cultural archetypes (see section 5.4.3) indicates that investigation into the individual variables that produce the cultural archetype should be investigated. Corporate culture was scored by testing the cultures across five dimensions, without summing up the variables. The corporate strategies were investigated at the content dimensions only. The corporate culture has been shown to have strong correlations with corporate strategies in some cases, and weak correlations with corporate strategy in other cases. The results are presented in Appendix 7. The following information regarding the elements of corporate culture can be found by considering the strength (and probability) of the Pearson's correlation coefficient:

1. Dominant characteristics:
    a. The *Clan* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    b. The *Adhocracy* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    c. The *Market* culture exhibited weak correlations with *products* and *biodiversity*, and not at all with *emission control* and *attitude*.
    d. The *Hierarchy* culture exhibited weak correlations *biodiversity* and *products*, moderately with *emission control*, and not at all with *attitude*.
    e. Both the *Clan* and *Adhocracy* cultures correlated strongly with *total sustainability*. Both the *Market* and *Hierarchy* cultures correlated moderately with *total sustainability*.

2. Leadership:
    a. The *Clan* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    b. The *Adhocracy* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    c. The *Market* form of leadership could not be shown to correlate with any of the strategy dimensions.
    d. The *Hierarchy* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    e. The *Clan, Adhocracy* and *Hierarchy* cultures correlated strongly with *total sustainability*. The *Market* culture did not correlate at all with *total sustainability*.

3. Organisational glue:
    a. The *Clan* culture exhibited moderate correlations with all the strategy dimensions, with no outliers being noted.
    b. The *Adhocracy* culture did not exhibit correlations with any of the strategy dimensions, with perhaps a weak correlation with *products*.
    c. The *Market* culture exhibited a weak correlation with *emission control*, a moderate correlation with *products*, and no correlation with either *biodiversity* and *attitude*.
    d. The *Hierarchy* culture exhibited a weak correlation with *products*, and no correlation with the other strategy dimensions.
    e. With *total sustainability*, the *Clan* culture exhibited a strong correlation, the *Adhocracy* culture exhibited a weak correlation, the *Market* culture exhibited a moderate correlation, and the *Hierarchy* culture exhibited no correlation.

4. Strategic emphasis:
    a. The *Clan* culture exhibited a moderate correlation with *products*, but strong correlations with the other strategy dimensions.
    b. The *Adhocracy* culture exhibited strong correlations with all the strategy dimensions.
    c. The *Market* culture exhibited a weak correlation with *products*, but no correlations with the other strategy dimensions.
    d. The *Hierarchy* culture exhibited no correlations with any of the corporate strategy dimensions.
    e. With *total sustainability*, the *Clan* and *Adhocracy* cultures exhibited strong correlations, the *Market* culture exhibited a weak correlation, and the *Hierarchy* culture exhibited no correlation.

5. Criteria for success:
    a. The *Clan* culture exhibited a strong correlation with *biodiversity*, and moderate correlations with the other strategy dimensions.
    b. The *Adhocracy* culture exhibited weak to moderate correlations with all the strategy dimensions.
    c. The *Market* culture exhibited moderate correlations with *biodiversity* and *attitude*, and weak correlations with *emission control* and *products*.
    d. The *Hierarchy* culture exhibited no correlations with any of the strategy dimensions.

e. With *total sustainability*, a strong correlation was exhibited with the *Clan* culture, a moderate correlation with the *Adhocracy* and *Market* cultures, and no correlation was found with the *Hierarchy* culture.

A composite picture of how each cultural variable within each content dimension affects *total sustainability* was attained by synthesising a Sustainable Culture diagram from the findings above.

5.5.4 *Constructing the Sustainability Culture*

A rigorous approach was taken by plotting the normalised Pearson's correlation coefficients for each cultural variable with the *Total sustainability* composite dimension (see Appendix 7) onto a radar-diagram for each content dimension. These values were normalised within each content dimension to synthesise a Sustainability Culture. The normalised values added up to 100 for each content dimension. This produced a culture scoring that mimics that which could be received from an ipsative scale. This was carried out to avoid distortions that may arise from the "*Total culture*" composite measure. The Sustainability Culture, showing results for each content dimension that was tested, is presented in Figure 12.

The overall sustainability culture is presented in Figure 13, where the five content dimensions have been agglomerated to show only the overall corporate culture. The general skewness towards *Clan* and *Adhocracy* cultural archetypes is clearly noted.

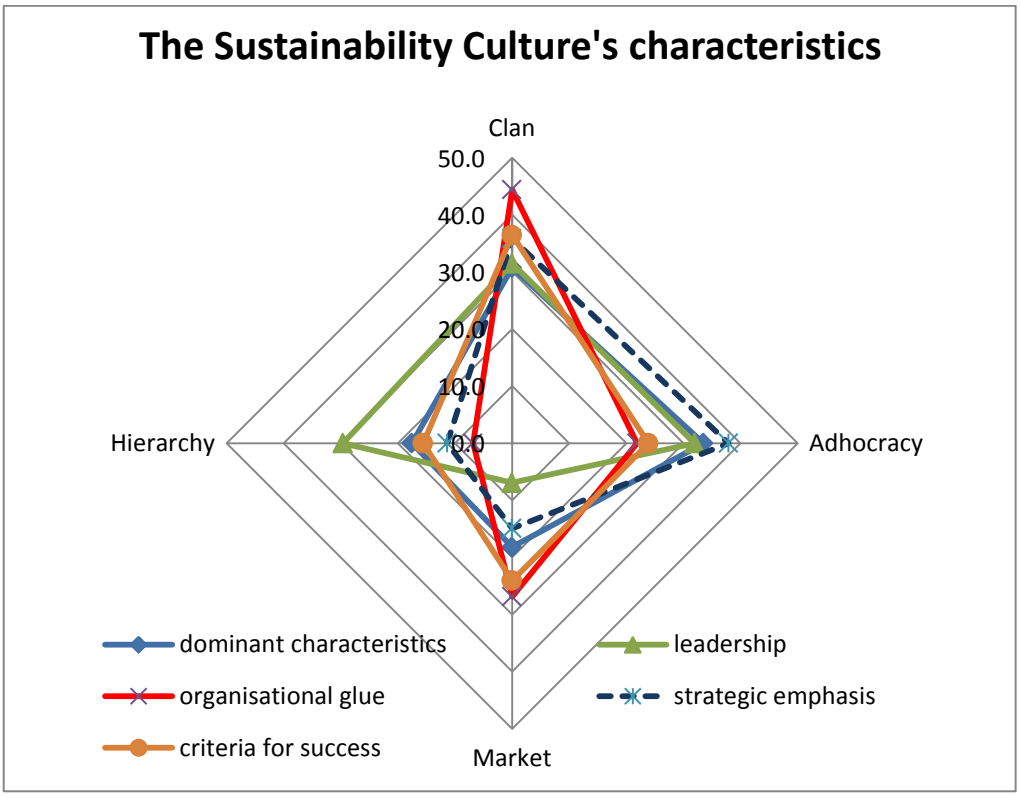

Figure 12. Radar-diagram of the sustainability culture, showing the detail regarding the characteristics that were tested.

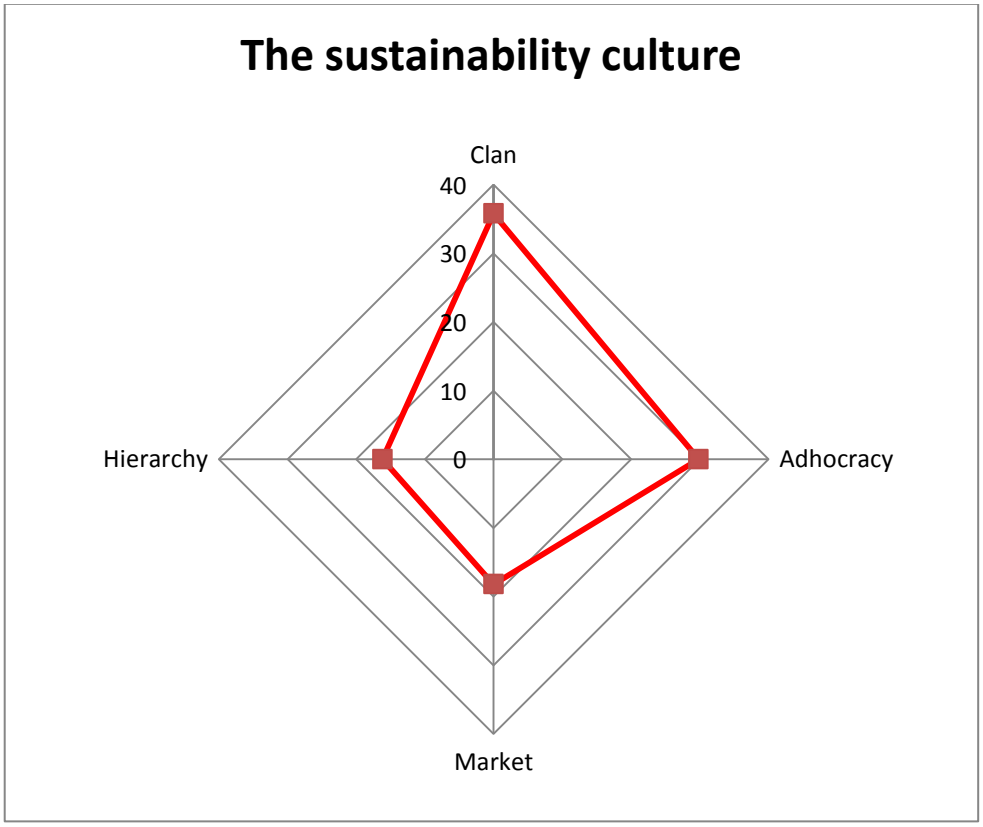

Figure 13. Radar-diagram of the sustainability culture, as determined from the results of this study.

5.6 Summary of findings with respect to hypotheses tested

A summary of the results with respect to the hypotheses that were tested is presented in Table 21. The following was found:

1. **Research question 1**:
   a. Correlations between the individual constructs for corporate culture and the corporate strategies could not be rejected, except in one case.
   b. The summated corporate culture variable *Total culture* correlated with all the corporate strategy constructs.
2. **Research question 2:** The collapsed flexibility-orientated and control-orientated corporate cultures did not produce a different summated sustainability score (*Total sustainability*), as the Null Hypothesis could not be rejected.
3. **Research question 3:** The collapsed flexibility-orientated and control-orientated corporate cultures did produce a different summated sustainability score (*Total sustainability*), as the Null Hypothesis could be rejected.
4. **Research question 4:**
   a. Three of the corporate cultural variables could not be shown to correlate with certain corporate strategy variables, as the Null Hypothesis could not be rejected.
   b. The remainder of the corporate cultural variables could be shown to correlate with certain corporate strategy variables, as the Null Hypothesis could be rejected in those cases.
   c. The corporate culture variables proved to correlate in all cases with the summated corporate strategy construct *Total sustainability*, as the Null Hypothesis could be rejected in all of these cases.
   d. A Sustainability Culture was therefore synthesised from the correlations between the corporate culture variables and *Total sustainability*.

Table 21. Summarised findings of statistical analysis.

Hypothesis	Null sub-hypotheses	Result (correlation coefficient, probability)	Reject / do not reject
Research question 1			
H_0: There is no correlation between the corporate culture archetypes and the corporate strategies (p = 0 or pr>0.05). H_A: There is a correlation between the corporate culture archetypes and the corporate strategies (p ≠ 0 and pr<0.05).	ρ (C↔E) = 0	ρ = 0.49798 , pr < 0.0001	reject
	ρ (C↔B) = 0	ρ = 0.56560 , pr < 0.0001	reject
	ρ (C↔P) = 0	ρ = 0.47999 , pr < 0.0001	reject
	ρ (C↔At) = 0	ρ = 0.50928 , pr < 0.0001	reject
	ρ (C↔TS) = 0	ρ = 0.69400 , pr < 0.0001	reject
	ρ (A↔E) = 0	ρ = 0.46190 , pr < 0.0001	reject
	ρ (A↔B) = 0	ρ = 0.51104 , pr < 0.0001	reject
	ρ (A↔P) = 0	ρ = 0.49253 , pr < 0.0001	reject
	ρ (A↔At) = 0	ρ = 0.50337 , pr < 0.0001	reject
	ρ (A↔TS) = 0	ρ = 0.67757 , pr < 0.0001	reject
	ρ (M↔E) = 0	ρ = 0.27163, , pr < 0.0201	reject
	ρ (M↔B) = 0	ρ = 0.28305 , pr < 0.0152	reject
	ρ (M↔P) = 0	ρ = 0.33954 , pr < 0.0033	reject
	ρ (M↔At) = 0	ρ = 0.25583 , pr < 0.0289	reject
	ρ (M↔TS) = 0	ρ = 0.39732 , pr < 0.0005	reject
	ρ (H↔E) = 0	ρ = 0.28288 , pr < 0.0153	reject
	ρ (H↔B) = 0	ρ = 0.37592 , pr < 0.0010	reject
	ρ (H↔P) = 0	ρ = 0.39503 , pr < 0.0005	reject
	ρ (H↔At) = 0	ρ = 0.15562, pr = **0.1886**	Do not reject
	ρ (H↔TS) = 0	ρ = 0.41423, pr = 0.0003	reject
	ρ (TC↔E) = 0	ρ = 0.51026, pr < 0.0001	reject
	ρ (TC↔B) = 0	ρ = 0.58200, pr < 0.0001	reject
	ρ (TC↔P) = 0	ρ = 0.56138, pr < 0.0001	reject
	ρ (TC↔At) = 0	ρ = 0.49187, pr < 0.0001	reject
	ρ (TC↔TS) = 0	ρ = 0.73322, pr < 0.0001	reject
Research question 2			
H_0: The internally-focused and externally-focused corporate cultures produce the same total	ρ (I↔TS) - ρ	Z_{stat} = 0.3105 Z_{crit} = 1.96	Do not reject

Hypothesis	Null sub-hypotheses	Result (correlation coefficient, probability)	Reject / do not reject
sustainability score. H_A: The internally-focused and externally-focused corporate cultures produce a different total sustainability score.	(E↔TS) = 0	$Z_{stat} < Z_{crit}$	
Research question 3			
H_0: The flexibility-orientated and control-orientated corporate cultures produce the same total sustainability score. H_A: The flexibility-orientated and control-orientated corporate cultures produce a different total sustainability score.	ρ (F↔TS) - ρ (K↔TS) = 0	Z_{stat} = 3.595 Z_{crit} = 1.96 $Z_{stat} > Z_{crit}$	reject
Research question 4			
H_0: There is no correlation between the corporate culture variables and the total sustainability score (p = 0 or pr>0.05). H_A: There is a correlation between the corporate culture variables and the total sustainability score (p ≠ 0 and pr<0.05).	ρ (v21↔TS) = 0	ρ (v21↔TS) = 0.52761, pr <.0001	reject
	ρ (v22↔TS) = 0	ρ (v22↔TS) = 0.57448 , pr <.0001	reject
	ρ (v23↔TS) = 0	ρ (v23↔TS) = 0.31202 , pr = 0.0072	reject
	ρ (v24↔TS) = 0	ρ (v24↔TS) = 0.30066 , pr = 0.0097	reject
	ρ (v25↔TS) = 0	ρ (v25↔TS) = 0.59636 , pr <.0001	reject
	ρ (v26↔TS) = 0	ρ (v26↔TS) = 0.60592 , pr <.0001	reject
	ρ (v27↔TS) = 0	ρ (v27↔TS) = **0.13114** , pr = **0.2688**	Do not reject
	ρ (v28↔TS) = 0	ρ (v28↔TS) = 0.56124 , pr = <.0001	reject
	ρ (v29↔TS) = 0	ρ (v29↔TS) = 0.58575 , pr <.0001	reject
	ρ (v30↔TS) = 0	ρ (v30↔TS) = 0.28869 , pr = 0.0132	reject
	ρ (v31↔TS) = 0	ρ (v31↔TS) = 0.35446, pr = 0.0021	reject
	ρ (v32↔TS) = 0	ρ (v32↔TS) = **0.09025** , pr = **0.4477**	Do not reject
	ρ (v33↔TS) = 0	ρ (v33↔TS) =0.64988 , pr <.0001	reject

Hypothesis	Null sub-hypotheses	Result (correlation coefficient, probability)	Reject / do not reject
	ρ (v34↔TS) = 0	ρ (v34↔TS) = 0.68825 , pr <.0001	reject
	ρ (v35↔TS) = 0	ρ (v35↔TS) = 0.27047 , pr = 0.0206	reject
	ρ (v36↔TS) = 0	ρ (v36↔TS) = **0.20618**, pr = **0.0801**	Do not reject
	ρ (v37↔TS) = 0	ρ (v37↔TS) = 0.62614, pr <.0001	reject
	ρ (v38↔TS) = 0	ρ (v38↔TS) = 0.41004, pr = 0.0003	reject
	ρ (v39↔TS) = 0	ρ (v39↔TS) = 0.41330, pr = 0.0003	reject
	ρ (v40↔TS) = 0	ρ (v40↔TS) = 0.26779, pr = 0.0220	reject

Note:

1. The corporate culture archetypes are abbreviated as follows: Clan (C), Adhocracy (A), Market (M), Hierarchy (H), Flexibility culture (f), Control culture (K), Internal culture (I), External culture (X), total culture (TC).
2. The corporate strategies are abbreviated as follows: Emission control (E), biodiversity (B), products (P), attitude (At), total sustainability (TS).
3. The corporate cultural variables are numbered according to their position in the questionnaire. See Appendix 7 for details. Only the correlations with total sustainability was used when considering the individual cultural variables.
4. The corporate culture variables in Table 21 refer to the following:

Variable	Description (Culture – Content dimension)	Variable	Description (Culture – Content dimension)
V21	Clan – Dominant characteristics	V31	Market - Organisational glue
V22	Adhocracy - Dominant characteristics	V32	Hierarchy - Organisational glue
V23	Market - Dominant characteristics	V33	Clan – Strategic emphasis
V24	Hierarchy - Dominant characteristics	V34	Adhocracy - Strategic emphasis
V25	Clan - Leadership	V35	Market - Strategic emphasis
V26	Adhocracy - Leadership	V36	Hierarchy - Strategic emphasis
V27	Market - Leadership	V37	Clan – Criteria for success
V28	Hierarchy - Leadership	V38	Adhocracy - Criteria for success
V29	Clan – Organisational glue	V39	Market - Criteria for success
V30	Adhocracy - Organisational glue	V40	Hierarchy - Criteria for success

6. DISCUSSION OF RESULTS

6.1 Introduction and response rate

The size of the population of respondents to this research numbered 258 with a completion rate of 87% (see Section 5.1). On this basis, the sample was large enough to carry out a parametric statistical analysis. The high completion rate indicates that the research instrument did not present a challenge to the respondents.

The relatively good gross response rate of 32.6% indicates that personalised e-mails to potential respondents was worthwhile. The e-mails were addressed to them by name, and quoted their work description and the company that they worked for. The background research needed to identify and pursue potential respondents resulted in this response rate.

The questionnaire was only sent to employees in South Africa, at operations within South Africa. This constraint was imposed in order to avoid any “country” effects. These could include effects resulting from different legislation in different countries, resulting in different corporate strategies to the environmental challenge.

Since all respondents were working in South Africa, the findings are limited to the South African context. A variety of respondents, from different companies and work roles, were requested to participate in the survey, in order to sample as widely as possible within the South African context.

6.2 Sample description

The sample is described from the perspective of the contextual variables, and the demographics of the corporate cultures.

6.2.1 *The respondent’s role in the company*

The majority of the respondents categorised themselves as being subject-matter experts, as shown in Figure 6. There were more leaders/decision-makers than managers/supervisors in the sample, but the difference between the groups in terms of numbers did not appear to be material. Further analysis was therefore carried out with the three groups intact.

6.2.2 *The business type*

Since the bulk of the respondents in this sample were from either large companies with some international presence or from multi-national companies (MNC's), as shown in Figure 7, it was not possible to keep the groups intact for further statistical analysis. The number of small and medium-sized businesses was too small. The groups that were not MNC's were therefore collapsed into one group, and MNC's remained as the other group.

The demographics of the sample in terms of company size is probably reflective of that in South Africa, where the economy is dominated by large multi-national mining houses and multi-national petrochemical companies. This, however, raises the question of whether limiting the sample selection to companies in South Africa to avoid country effects was effective or not. Arguments that can be raised in order to prove that country effects due to the presence of MNC's were not active are:

1. Convergence of strategies due to climate change and the subsequent homogeneity of strategy has been shown in previous studies in the oil industry (Kolk and Levy, 2002), as described in Section 2.5.4. The extrapolation of this situation to other aspects of environmental sustainability may be feasible.
2. The heightened strategies demonstrated by MNC's in emission control (see section 5.2.4) indicates that the more lax enforcement of regulations in South Africa did not result in lowered standards, and international (or first-world host country) standards were maintained. However, this was not the case in the other aspects of environmental sustainability strategies.
3. There was no difference between MNC's and non-MNC's with regard to corporate culture (see Table 11), which would have been expected if the legacy of the home country had been retained.

6.2.3 *The industry sector type*

Figure 8 shows that the sample consisted mostly of companies involved in highly polluting activities. This can be expected, as snowball sampling would produce a list of respondents that work at companies where environmental sustainability would be an issue.

6.2.4 *Analysis of variance for the contextual variables*

The contextual variables appeared to have no material effect on any of the dimensions of corporate strategies, except for one dimension of corporate strategy, namely *Emission control* (see Table 10 and Table 11). The effect of the contextual variables on *Emission control* is discussed below:

1. Role at work: The leader/decision-makers responded with lower estimations of their companies emission control than either the managers/supervisors or subject-matter experts. It is possible that this is the result of leader/decision-makers having less operational knowledge than personnel more actively involved in operations.

2. Business type: The strongest effect was seen in the difference between MNC's and other company types on *Emission control*. The MNC's rated their efforts to reduce emissions to the environment more highly than the other companies did. This may be because the MNC's are comprised mostly of companies that are present in South Africa for the purpose of mineral extraction (e.g. in mining), and therefore may be more conscious of emission control. Other company types, such as the government-owned or smaller companies, are probably less involved with activities that require high investments into controlling emissions to the environment.

   The results also indicate that MNC's may have converged to a strategy that emphasises emission control due to their activities in a number of host countries, as well as the regulations from their home country. It is interesting to note that their perceptions regarding their activities were higher than those of non-MNC's, possibly indicating that international pressure on MNC's have resulted in a higher standard being adopted by them on emission control. This was not, however, noted in the other sustainability strategy constructs.

   It should also be noted that the small sample sizes of the *small*- and *medium*-sized groups necessitated merging them with the *large*-sized group, thereby possibly undermining the interpretation of this analysis beyond an understanding of MNC's versus non-MNC's. A more rigorous investigation of the effect of other business types on corporate culture and sustainability practices would only be possible with a more representative sample.

3. Industry sector type: It was noted that *highly*-polluting industries rated their efforts to control emissions to the environment more poorly than *low*- and *moderate*-polluting industries did. One would expect *highly*-polluting companies to exert a greater effort to control their emissions to the environment. Possible explanations for their poor rating of their efforts could be that:
   a) The high standards dictated by MNC's with origins in developed economies could result in emission control activities already being designed in to their activities, leading to lowered awareness of effort in that area.
   b) Respondents from highly polluting industries may under-estimate their emission control activities due to a lack of knowledge. This is not a likely explanation, though, as the respondents were selected on the basis of their knowledge of their companies environmental sustainability practices. However, the low scores would have originated mostly from the *leaders/decision-makers*, who may not have the operational knowledge that *subject-matter experts* have.
   c) The awareness of respondents from *highly*-polluting companies on what should be done to control emissions may not compare well with what is actually being carried out, resulting in a lowered estimation of their activities.

None of the other dimensions of corporate strategy exhibited any effect due to these contextual variables. Their effect on influencing the correlations between corporate culture and corporate strategies was therefore evaluated as being small when the summated constructs *Total sustainability* is evaluated. We conclude that further inferences regarding correlations between corporate culture and corporate strategy occur on the summated strategy dimension only.

No effect was found for any of the contextual variables on corporate culture. We conclude that the corporate culture is independent of the contextual factors utilised in this study.

6.2.5 *Demographics of corporate culture*

It can be seen from Figure 9 that the respondents were predominantly from organisations that displayed cultural preferences for the *Market* type, and secondly from those of the *Hierarchy* type. This indicates that most of the companies in the sample show dominant *Market* and *Hierarchy* cultural archetypes.

The *Market* and *Hierarchy* cultures are similar in that they are both on the *control* end of the flexibility-control axis. Figure 10 shows that the demographic split between the cultures on

the *control* end (*Market* and *Hierarchy*) and the *flexible* end (*Clan* and *Adhocracy*) is markedly in favour of those on the *control* end (61.6% of the sample). This may be reflective of the overall corporate culture in South Africa, or it may simply be the cultural preference within those companies in South Africa for whom environmental sustainability is a concern.

The least numerous respondents were from organisations that displayed cultural preferences for the *Adhocracy* type. This indicates a low level of entrepreneurship and innovation behaviour in South Africa amongst companies for whom environmental sustainability would be a concern.

The Friedman multiple comparisons test was used to determine whether the corporate culture types were demographically distinct from each other within the sample (see section 5.4.3.2). It can be seen that the four culture types could generally be differentiated from each other in the non-parametric test, except for the cultures that lie on the same side of the *flexibility/control* axis. Thus, the *Clan* and *Adhocracy* cultures had cultural type scores that were not statistically different from each other, and the *Market-Hierarchy* cultural types had scores that were not statistically different from each other. Therefore, if grouping the sample into cultural archetypes must occur, it would be just as valid to collapse the corporate cultures along the *flexibility-control* axis, and simply use them as *flexible* cultures and *control* cultures.

6.3 Scale reliability

The scale reliability was determined by calculating Cronbach's alpha for each of the dimensions used in the study (see Table 12). Cronbach's alpha reliability coefficient normally ranges between 0 and 1 (Gliem and Gliem, 2003: 87). The closer Cronbach's alpha coefficient is to 1.0, the greater is the internal validity of the items in the scale. The calculation of Cronbach's alpha uses the formula $\alpha = rk / [1 + (k - 1)r]$, where:

k is the number of items considered, and

r is the mean of the inter-item correlations.

Hence, the size of Cronbach's alpha is determined by both the *number of items* in the scale and the *mean inter-item correlations*. The following rule of thumb has been provided in the literature (George and Mallery 2003; 231):

$\alpha > 0.9$ = Excellent, $\alpha > 0.8$ = Good, $\alpha > 0.7$ = Acceptable, $\alpha > 0.6$ = Questionable, $\alpha > 0.5$ = Poor, and $\alpha < 0.5$ = Unacceptable.

The two constructs that exhibited the lowest Cronbach's alpha's were:

1. *Resource use* (α = 0.56): This is a well-established content dimension for environmental sustainability strategies (Baumgartner and Ebner, 2010).
2. *Attitude* (α = 0.63): This content dimension was well-established in earlier research (Baumgartner and Ebner, 2010; Winsemius and Guntram, 1992).

Considering the rule of thumb presented above, a Cronbach's alpha of **0.65** is often accepted as being the cut-off limit for acceptable internal reliability. Thus, the corporate strategy dimensions of *Resource use* was rejected as an independent construct (although it was retained for use in the *Total sustainability* construct). The construct named *Attitude* was accepted as being a construct that could be used independently, because:

1. The Cronbach's alpha is very close to the cut-off limit (0.63 ≈ 0.65) found in some literature. It has also been suggested that a Cronbach's alpha > 0.5 is acceptable (Helmstadter, 1964).
2. The *number of items* was low (at only three), so a lowered Cronbach's alpha can be expected.
3. A diversity of business types, industry sectors and respondent's role at work was sought for the sample population. This diversity could result in lower *mean inter-item correlations*, resulting in lowered Cronbach's alpha values and a change in the values used for the rule of thumb provided by the literature.

These were the only two content dimensions which had a question each that used reverse scoring. This is usually used to detect response bias, where a respondent simply ticks the "agree" or "strongly disagree" box without thinking properly about the response. Reverse scoring will detect this, and show an unusually low mean for that answer if response bias of this type occurred. Consideration of the data presented in Table 13 shows that the reverse scored questions provided the trouble in both constructs. Question 6 presented a low correlation with the other questions within the *Resource use* construct, which may be due to that question measuring a different construct than what the other two questions measure. Hence, the content dimension *Resource use* was not used as an independent construct. Question 18 presented a lower mean than the other questions within the *Attitude* dimension, but correlated well with the other questions. This may simply be the result of response bias, where an "agree" response provided a low score due to reverse-coding.

The other dimensions for corporate strategy, and all the dimensions for corporate culture, had sufficiently high Cronbach's alphas to use independently as constructs. The scale was therefore considered to be reliable.

6.4 Descriptive statistics

6.4.1 *Visual examination of the data*

6.4.1.1. Linearity

Although correlation coefficients are often used to show the direction and magnitude of correlation between two variables, it is always necessary to visually examine the distribution of the data first (Anscombe, 1973:17). This is carried out in order to ensure an appropriate understanding of the correlation coefficients, as presented most eloquently by the following graphs (Anscombe, 1973):

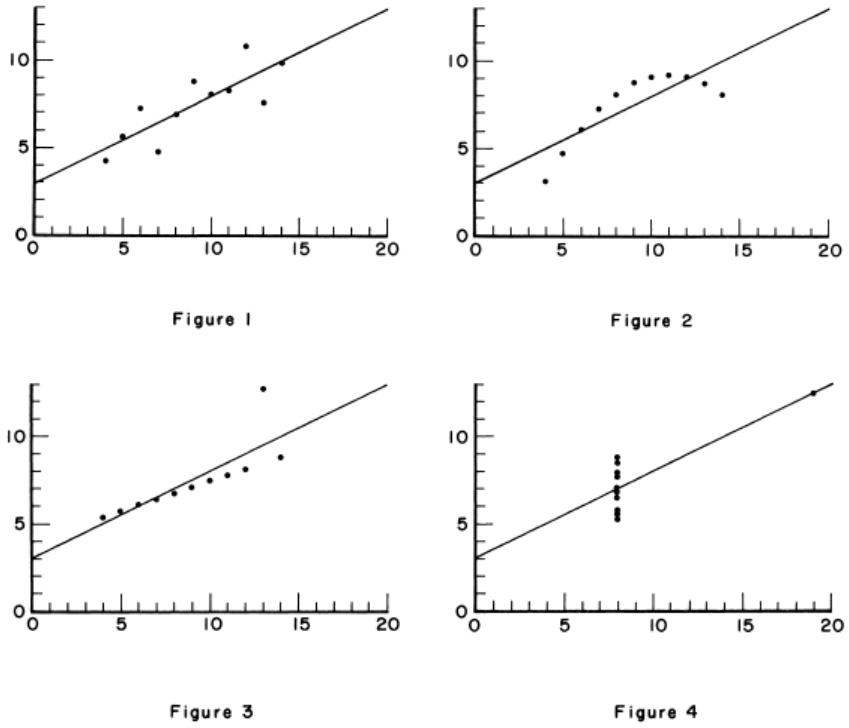

Figure 14. Different data distributions with the same simple summary statistics.

In the graphs shown above, the correlation coefficients, linear regression line, means (of both x and y values) and variances are all the same, but the distributions are very different. It was therefore important to ensure that the data was:

1. Approximately normally distributed (see figure 1 of Figure 14).
2. Not affected by any obvious curvilinear relationship (see figure 2 of Figure 14).

3. Not following a different regression line, which is offset by the one outlier which exerts enough influence to alter the true regression line (see figure 3 of Figure 14).
4. Not affected by an outlier which is sufficient to produce a high correlation coefficient, even though the relationship is non-linear (see figure 4 of Figure 14).

Visual examination of the data (see Appendix 6) indicates that the data was approximately normally distributed, as in figure 1 of Figure 14. Distinct outliers and curvilinear relationships were not noted. We conclude that the data satisfies the linearity criterions, and that Pearson's correlation coefficient can therefore be used to correlate between two variables along a straight line.

Furthermore, the data consisted of 73 respondents, indicating that the central limit theorem should be reliable in this study.

6.4.1.2. General trend of the data

An important finding was the linear relationship between *Total culture* (cultural comprehensiveness) and *Total sustainability*. This is discussed further in Section 6.5.1, where further evidence of cultural comprehensiveness from the statistical analysis is presented. It is concluded that a linear relationship exists between *Total culture* and *Total sustainability*.

6.4.2 *Construct validity: corporate strategy*

The concepts used in the bespoke corporate strategy model are discussed, as well as the findings of the internal consistency tests for this model.

6.4.2.1. Development of the corporate strategies model

A framework for evaluating and scoring the corporate strategies was developed from the literature (see Section 2.3.8). Various issues were considered in order to develop this framework, and these are discussed below:

1. A **one-dimensional continuum** was chosen over the multi-dimensional typologies for the following reasons:
   1.1. Simplicity - a one-dimensional continuum provides for a more parsimonious description of corporate strategy.

1.2. There are numerous multi-dimensional typologies described in the literature, which may be due to differing contexts in each study. The value in choosing one particular typology over another could therefore be questionable.

1.3. The study does not focus on characterising the sample into various sustainability categories, and therefore typologies are not relevant.

1.4. Multi-dimensional typologies assume that the individual dimensions are independent of each other, thereby avoiding a summed-rating scale. A one-dimensional typology assumes that environmental sustainability must be comprehensive.

1.5. Quantitative analysis is more easily carried out on a one-dimensional continuum (Hass, 1996).

2. The **five dimensions** chosen along which to score these strategies are discussed below:

2.1. *Resource use* – the strategies used by the company to ensure the sustainability of its resources. This dimension is provided by the Institute of Chemical Engineers model (see Figure 2), and was also used by Baumgartner and Ebner (2010) – see Table 3. It measures the strategic posture adopted by the company, rather than material balances.

2.2. *Emissions control* – the strategies used by the company to control its emissions to the environment. The strategic posture adopted by the company was measured, rather than compliance to emission standards to air, water and ground. The three management activities of emissions to air, water and ground were collapsed into one content dimension – *Emissions control*. The emission of hazardous waste was included into that content dimension as well. This was previously carried out by Lee (2012) as shown in Table 5, and also by Winsemius and Guntram (1992) as shown in Table 2. Collapsing these into one content dimension has the advantage of avoiding the variation introduced by industries that have different emission profiles.

2.3. *Biodiversity* - the strategies used by the company to ensure that its activities affect the ecological biodiversity in a sustainable manner. This construct measures the strategic posture adopted by the company with regards to the effect of their production activities on the ecology. This dimension is provided by the Institute of Chemical Engineers model (see Figure 2), and included into Baumgartner and Ebner's (2010) model – see Table 3

2.4. *Products* - the strategies used by the company to ensure that its products sold affect the ecology in a sustainable manner. This construct was chosen as product

stewardship represents a more holistic view of sustainability beyond the company's battery limits, extending its influence into the larger ecological value chain (Hart, 1997:71).

2.5. *Attitude* - the strategic perspective undertaken by the company with regards to environmental sustainability. It was incorporated due to the results shown in various studies where attitudes varied according to the sustainability maturity levels of an organisation (Baumgartner and Ebner, 2010; Winsemius and Guntram, 1992), and was utilised in other studies such as by Levy and Kolk (2002). It refers to the psychological approach taken by the corporate to environmental sustainability, and was included in order to complement the management activities reported by the corporate. Furthermore, a study dedicated to analysing the causes in the environmental behaviour of firms, found that firm environmental behaviour is not motivated solely by economic interests (Pulver, 2007:73). It was found that environmental behaviour is also motivated by perceptions of profit opportunities which are generated by policy fields and social networks in which the firm managers are embedded. Thus, the attitude taken by management towards environmental sustainability issues was determined to be an important variable, and which should be included for completeness.

2.6. *Total sustainability* - The level at which the company undertakes strategies to ensure the sustainability of these five dimensions can be summed up to provide a total sustainability score (DJSI, 2007:7).

6.4.2.2. Internal consistency of the bespoke strategy model

The Null hypothesis could be rejected in all the cross-tabulations for corporate strategy, all the dimensions used in the corporate strategy construct correlated positively with each other, and the dimensions all correlated to a moderate or strong degree in all cases (see Table 14). This indicates poor discriminant properties between the different content dimensions, which could be the result of:

1. Response bias: This can be expected in the case of environmental sustainability, where a respondent can feel to be under pressure to provide the "morally right" answer. Upon answering the first question in a way that presents their company's strategy in a good light, the respondents may wish to continue this practice throughout, thereby providing for high cross-correlations.

Reverse scoring was therefore utilised to eliminate this response bias, and was applied to one question in the dimension *Resource use*, and also to one question in the dimension *Attitude* (see question 6 and question 20 respectively). It should be noted that these two dimensions scored the lowest Cronbach's alpha in the study, with *Resource use* being sufficiently low that it was rejected as a separate dimension. This indicates that a response bias was most probably present in the sample. Nevertheless, the dimension *Attitude* provided the strongest correlation with the dimension *Emission control*, which did not have any reverse score questions. This indicates that the high cross-correlation cannot be explained by response bias alone.

2. Consistently lined preferences: It is entirely feasible that the respondents who demonstrated a strong response with one content dimension of corporate strategy would also demonstrate a strong response with the other content dimensions too. A company that must meet environmental legislation in one area will almost certainly need to meet it in another area. This could explain why the dimensions of the corporate strategy are not independent, but correlate strongly with each other.

   This justifies the formation of a composite measure termed *Total sustainability,* where the individual content dimensions were summed up to form a total score. The construct "corporate strategy" could therefore be presented as a straight-line continuum, as scored by the composite measure *Total sustainability*. A weighting of one was attached equally to the individual dimensions when transforming them to *Total sustainability*. This dimension can therefore be used to determine the overall tendency for respondents to show compliance with environmental issues.

The strongest correlation (or poorest discriminant property) was shown between *Attitude* and *Emission control.* This could be the result of organisations implementing emission control techniques as a result of their intentions to be environmentally sustainable, rather than as a normal course of business. The weakest correlation (or strongest discriminant property) was shown between *Attitude* and *Products*. This could be because the sustainability aspects of products sold into the market are determined by short-term market forces, rather than the intention to be environmentally sustainable.

It is concluded that internal consistency was sufficiently high when considering the summated dimension *Total sustainability*.

6.4.3 *Construct validity: corporate culture*

The construct validity of the corporate culture framework was evaluated by considering the discriminant properties between the cultural archetypes, and the results are discussed below:

6.4.3.1. Cross-correlation matrix

The Null hypothesis could be rejected in all the cross-correlations for corporate culture, and all the dimensions used in the corporate culture construct correlated positively with each other (see Table 15). The *Adhocracy* culture correlated moderately with both the *Market* culture (ρ =0.48750) and with the *Hierarchy* culture (ρ =0.31385). It appears therefore, that the *Adhocracy* was most easily distinguished from other cultures in the sample. This may also be the result of organisations with *Market* or *Hierarchy* cultures (which formed the bulk of the sample) displaying little behaviour associated with that of an *Adhocracy* (such as entrepreneurship and innovation) in this sample. This may result when MNC's have foreign subsidiaries, who exist to satisfy shareholders in the home countries. It can be expected that a *Market* culture would exist in such a case, with little room for innovation being allowed to the foreign subsidiary. It may also be due to the fact that companies displaying strong *Adhocracy* cultures were the least numerous in this sample, resulting in a distortion within the sample selection.

The strongest correlation found was between the *Clan* and *Adhocracy* cultures (ρ =0.73982), which indicates that cultures may not be easily differentiated across the *internal/external* axis. A similar finding has been reported in the literature, where a more parsimonious two-factor solution was found to have greater construct validity than the traditional four-factor solution obtained by the CVF (Helfrich, 2007:11). The two-factor solution was dubbed the "humanistic" culture and the "prescriptive" culture, which parallels with the "*Flexible*" and "*Control*" cultures of this study.

Although the *Adhocracy* and *Clan* cultures displayed poor discriminant properties in the cross-correlation matrix, the *Market* and *Hierarchy* cultures exhibited higher discriminant properties (as measured by the weaker cross-correlation of ρ = 0.27799, which was the lowest cross-correlation in the sample). Therefore, the effect of the *internal-externa*l focus axis could not simply be eliminated on the basis of cross-correlation.

6.4.3.2. Non-parametric tests

The non-parametric tests show that the culture archetypes can generally be differentiated from each other in the sample, with two exceptions: the *Clan* and *Adhocracy* cultural archetypes could not be differentiated from each other, and neither could the *Market*- and *Hierarchy* archetypes (see Table 17). Both pairs of cultures are together along the flexibility/control axis. This seems to indicate that a more parsimonious solution would be to simply categorise the corporate cultures into two groups – *flexible* and *control* cultures.

It can be seen from the demographic split of the cultural archetypes that the majority of the sample are either *Market* or *Hierarchy* cultures (see Figure 10). The sample is therefore disproportionally split along the *flexibility/control* axis. This imbalance in the sample might influence any inferences made between the two collapsed cultures (i.e. between the *Flexible* and *Control* cultures).

Furthermore, the weakest cross-correlation was found between the *Market* and *Hierarchy* cultures, which formed the bulk (61.6%) of the sample. The strongest cross-correlation was between the *Adhocracy* and *Clan* cultures, which formed the smallest group in the sample (21.9%). It is possible that the large discrepancy in the two sample sizes would undermine any inference made between them in non-parametric tests.

Thus, the corporate cultures were retained in their original four-cell solution. However, the poor discriminant properties indicated by the cross-correlations and non-parametric tests indicate that forcing the corporate cultures neatly into the four cultural archetypes does not appear to be valid (perhaps due to a multiplicity of cultures within organisations – see Section 2.4.3). It was therefore concluded that corporate culture would be considered from a cultural archetype perspective, from a collapsed cultural form perspective, and also from a reductionist perspective where individual cultural variables are considered. The reductionist approach considers the cultural variables themselves as independent variables, rather than aggregating them to form a cultural archetype. This formed the basis by which an eclectic corporate culture was constructed, by considering each cultural variable independently (see Section 5.5.3 and Section 5.5.4).

6.5 Inferential statistics, research questions, and hypotheses

Inferential statistics were carried out once the visual examination of the data indicated that the data was appropriate for such analysis. Correlations were found between corporate culture and corporate strategies (see Table 19).

6.5.1 *Corporate culture archetypes and corporate strategies correlation*

The findings regarding the Pearson's correlation coefficients presented in Table 19 are discussed below:

1. All corporate cultures were found to have a positive correlation with almost all of the corporate strategies, highlighting the importance of **cultural comprehensiveness**. Anti-correlations were not present, despite the fact that the Competing Values Framework consider values that compete with each other, and therefore should have opposite effects if present in opposing diagonals. Further support can be found by the fact that the highest correlations found for almost all corporate strategies were those with the composite dimension *Total culture* (see Table 19). It correlated slightly more strongly with *Total sustainability* ($\rho = 0.73322$) than either the *Clan* or *Adhocracy* cultures, and much more strongly than both *Hierarchy* and *Market* cultures. This seems to indicate some value in cultural comprehensiveness, even if it means the inclusion of *Hierarchy* and *Market* cultures.

   The meaning of what cultural comprehensiveness is and why it has a positive effect on the sustainability strategies of firms, is less clear. It's scoring would arise from the fact that respondents who score high on one cultural archetype would also score high on the others (when using a Likert scale) across all content dimensions. This could be due to response bias, where the respondents exhibit a bias towards the "agree" response on all questions without paying too much attention to their responses. It could also be the result of a real condition in the working place. One possibility could be that some companies may exhibit very low activity in terms of introducing management policy of any type, whereas others may introduce a plethora of various management policies. It is sometimes assumed that a single organisation would gravitate towards a single cultural archetype (Cameron and Quinn, 2006), but the Williams culture model (see Section 2.4.5) provides an explanation of how several cultural archetypes can exist simultaneously within a single organisation. It would probably be necessary for an

appreciation for diversity of thought to exist, in order for multiple cultures to exist in a well-performing organisation.

2. The ***Clan*** and ***Adhocracy*** cultures consistently provided the highest correlations with the sustainability strategies. Change resistance has been shown to be low when a participative and supportive culture was present, which are characteristics that are consistent with the *Clan* culture (Burnes and James, 1995). Thus, the internal focus of the *Clan* culture can be helpful in reducing resistance to change in this case (Jones et al, 2005:380).

   The *Adhocracy* culture has shown to not improve readiness for change or the success of a change implementation in one instance (Jones et al, 2005:380). This was thought to be the result of the change being incompatible with the way in which work was done in their division. In this research, the *Adhocracy* archetype was strongly correlated with the sustainability strategies, indicating that the respondents did not view the change required to be incompatible with the work carried out in their division. This was true regardless of whether the respondent was a *subject-matter expert* in sustainability, a *leader/decision-maker*, or a *manager/supervisor*.

   Environmental sustainability is currently a variable in the external environment of firms in South Africa, which has been legislated now and is expected to have financial consequences to companies that do not comply to the legislation. An externally-focused culture, such as the *Adhocracy*, should therefore consider this topic to be important in this environment, and not as being incompatible with their work. This could explain why the *Adhocracy* culture was positively correlated with environmental sustainability in this study.

6.5.2 *Collapsed corporate culture forms*

The influence of the two axes can be shown by considering the results in Table 20. The *flexibility/control* orientated axis played a significant role in determining the strength of the correlation, whereas the *internal/external* focus axis played no role.

The *flexibility* cultures utilise social coordination (rather than formal procedures) to achieve their desired outcomes. They are well-known for their positive relationship with employee's evaluations of whether their organisation is ready to cope with change events (Eby et al, 2000). Since the implementation of a corporate strategy to meet the environmental

sustainability challenge would be a change from the past activities, it should not be surprising that the *Flexible* cultures provided the highest correlations with sustainability strategy in this study.

The correlations with the *Flexible* cultures were particularly pronounced with the strategy dimension of *Attitude*. This indicates that the nature of the *Flexible* cultures were particularly important in determining the positive attitude that was taken towards environmental sustainability. Other strategies may have been implemented anyway, due to legislative or societal pressures, none of which exist with *Attitude*.

6.5.3 *Corporate culture variables and corporate strategies correlation*

Due to the poor discriminant properties regarding some of the corporate cultural archetypes, the individual cultural questions were investigated as well without any attempt to agglomerate them into a particular cultural archetype. The results can be found in Appendix 7, where the Pearson's correlation coefficient is shown with regards to each corporate strategy dimension, as well as with the summated composite variable "*Total sustainability*".

Due to the complexity of relating the correlations of several variables to each other along several dimensions, a diagrammatical method is more appropriate. This is discussed below, where the strength of cultural variables with *Total sustainability* was presented diagrammatically to form the idealised Sustainability Culture.

6.5.4 *Constructing the Sustainability Culture*

The results from this study were used to construct a culture that would most easily facilitate environmental sustainability considerations. Two approaches were taken:

1. A rigorous approach utilising the Pearson's correlation coefficients derived from this study resulted in a spatial mapping of a corporate culture profile. The correlation coefficients were used as weighting factors for each cultural variable, normalised to form a sum of 100, and the resulting number was plotted onto a radar-diagram. The correlation coefficients were thus used as weighting factors for each cultural dimension, such that their value in the synthesised culture is proportional to its correlation with positive environmental sustainability strategies. This cultural profile is shown in Figure 12 and the overall culture in Figure 13, and demonstrates the cultural profile excluding effects resulting from the comprehensiveness of the culture.

2. A qualitative approach was then taken to determine which cultural variables were correlated with a high sustainability score. The cultural variables were categorised according to correlation strength, resulting in a guideline by which a corporate culture could be created (see Table 22). This allows for a user-friendly guide that management could use as a benchmark when considering their own corporate cultures.

Some important characteristics of the Sustainability Culture, derived by considering Figure 12, can be explained as follows:

1. The dominant characteristics are skewed towards the *Adhocracy* culture, and away from the *Market* and *Hierarchy* cultures. This may be related to the fact that environmental sustainability is fairly new in the South African context, and organisations whose dominant characteristics are towards the *Hierarchy* and *Market* cultures (i.e. control-oriented mechanistic forms) are slow to adapt to new changes in their external environment. Organisations that are more entrepreneurial in nature, and are searching for new resources and opportunities, need to consider the new focus on environmental sustainability. Therefore, the *Adhocracy* culture features more strongly in the Sustainability Culture than the organisations that require stability and control.

2. The leadership is skewed away from the *Market* culture, with an equal emphasis on the other three cultural archetypes. The *Market* form of leadership ("a no-nonsense, aggressive, results-oriented focus") can thus be expected to result in low environmental sustainability outcomes. Board members who are excessively focused on short-term financial results for shareholders, who may flee at the sight of any financial downturn, might want to avoid internalising the environmental costs of their activities. They can be expected to externalise these costs away from their financial statements and towards the environment. The lack of skewness away from the *Hierarchy* culture for leadership indicates that there is in fact a place for mechanistic forms in corporate culture. It is at the leadership level, where leadership needs to exemplify a co-ordinating, organising, and smooth-running role.

3. The organisational glue is skewed towards the *Clan* culture, and away from the *Hierarchical* culture. This shows that an organisation which keeps itself together through an emphasis on teamwork, consensus, and participation (as with the *Clan* culture), should show less resistance to implementing environmental sustainability strategies. Conversely, an organisation that keeps itself together through an emphasis on security

of employment, stability, predictability, and conformity (as with the *Hierarchy* culture), seems to not show any reduction in organisational resistance to these strategies. This indicates that an organisation that keeps itself together through organic methods rather than through mechanistic methods would be better at avoiding resistance to environmental sustainability strategies.

4. The strategic emphasis is skewed towards both the *Adhocracy* and *Clan* cultures, and away from the *Hierarchy* culture. This indicates that a strategic emphasis on both human development as well as on opportunities in the external market is important in avoiding organisation resistance to environmental sustainability strategies. It also indicates that permanence, stability and control, when viewed as strategic goals, seems to not reduce resistance to environmental sustainability strategies.

5. The criteria for success is skewed towards the *Clan* culture, and away from the *Hierarchy* culture. This indicates that organisation that defines success on the basis of human resources development, teamwork, employee commitment, and concern for people reduces resistance to environmental sustainability changes. An organisation that defines success on the basis of efficiency, smooth scheduling, and low cost production does not reduce internal resistance to environmental sustainability changes. Nevertheless, the cultural spread for *criteria for success* is more symmetrical than for any of the other content dimensions, indicating that variation in this content dimension probably did not have a major influence on the environmental sustainability strategies, relative to the other content dimensions. It can also be seen that the results are not skewed towards the *Market* culture. This may indicate that the value of economic competitiveness (as measured by the *Market* culture) is not viewed as a driver for environmentally sustainable behaviour within the context of this research. This may be in contradiction of the findings of Porter and van der Linde (1995), who suggest that competitiveness in the market can drive environmentally sustainable behaviour.

It was therefore concluded that the reductionist approach of considering cultural variables independently added value to the practice of aggregating them to cultural archetypes and collapsed cultural forms.

6.6 Summary

This chapter discussed the findings of this research. The structure of the sample was explained, and reasons provided to help understand the sample characteristics. The models used for the two constructs that had been tested against each other (i.e. corporate culture and corporate strategies) were tested for internal consistency and reliability, with any deviations being explained by the data presented in the previous chapter.

The reasons for both maintaining the original four-cell solution to the Competing Values Framework was explained, along with the value derived from collapsing the cultural archetypes along the *flexibility-control* axis. The reductionist practice of examining each cultural variable in relation to the summated corporate strategy construct was carried out and the findings were discussed.

These findings resulted in a Sustainability Culture being synthesised and described. A Management Guide was also developed from the findings of this research (as shown in the next Chapter.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Main findings – addressing the burning platform

It was hoped that this study would introduce an awareness of how corporate culture correlates with the strategies that a company would utilise in order to meet the environmental sustainability challenge, and that continued studies into this topic would ultimately result in a substantial address of the environmental sustainability challenge see Section 1.4.1). Toward this end, the following key findings of this research were:

1. The influence of the contextual variables studied did not show any significant overall effect. Only one corporate strategy construct exhibited variation with the contextual variables that were tested, which must be noted, but the overall effect would be diluted.

2. There is a correlation between the corporate culture archetypes and the corporate strategies undertaken to meet the environmental sustainability challenge. However, there were two main concerns for the findings regarding the corporate cultural archetypes. Firstly, the discriminant abilities of the archetypes were questionable, as shown by cross-correlation and non-parametric tests (see section 6.4.3). Secondly, the issue regarding cultural comprehensiveness appeared to blur the results found for the cultural archetypes (see Section 6.5.1.). It was found that cultural comprehensiveness had strong implications for the corporate strategies that were implemented within the sample. As a result, two approaches were taken in order to interrogate the results further:
    1. The corporate cultural archetypes were collapsed along each axis, in order to determine which dimension of the Competing Values Framework was responsible for producing a difference.
    2. Each individual cultural variable was examined for correlation with the corporate strategies, without aggregating the variables in cultural archetypes.

The findings for these two approaches are described below:

3. Collapsing the cultural archetypes along two dimensions produced the following results:
    a) The focus of an organisation, whether on its own internal dynamics or on the external environment, does not appear to significantly exhibit different correlations with the total sustainability score.

b) The flexible/organic cultural forms produce a significantly higher total sustainability score than the control/mechanistic cultural forms do.

4. Interrogating the individual cultural variables provides a richer description of how the corporate culture correlates with the corporate strategies that are undertaken. It allows for detailed examination of the cultural variables and their correlations with overall environmental sustainability strategies. The correlation coefficients were used as weightings, in order to synthesise a corporate culture (termed the "Sustainability Culture") that reflects the cultural variables according to the extent with which they correlate with stronger environmental sustainability strategies. The findings from this Sustainability Culture have direct implications for corporate control, and can provide recommendations for board members who wish to analyse or change their corporate culture.

7.2 Business considerations – recommendations to corporate board members

The findings from this research may provide the following value to corporate boards:

1. Corporate culture must be included as a major variable when deciding on the strategic response to meet the environmental sustainability challenge.

2. Cultural comprehensiveness correlates strongly with an improved corporate strategy score in the environmental sustainability context. This may indicate that the implementation of a diversity of culture and thought, as opposed to intolerant dogma, is helpful in reducing internal resistance to the implementation of environmental sustainability strategies.

3. Organic, flexibility-oriented cultures that focus on social coordination to achieve outcomes (rather than fixed procedures and rules) correlate much more strongly than mechanistic cultures do with positive environmental sustainability strategies. This is regardless of whether the organisation is internally or externally focused.

4. Top management in corporate companies can compare their corporate cultures with the Sustainability Culture derived from this research. This can indicate gaps or developmental areas in their company's corporate culture, which can be rectified by

considering culture change practices. Towards this end, a Management Guide was constructed from the data found by considering the Sustainability Culture. It is presented in Table 22, and contains some guidelines as to how the corporate culture can be managed in order to reduce the internal resistance to environmental sustainability strategies.

7.3 Academic consideration - research implications

This research has indicated the complexity involved in analysing corporate culture as well corporate strategies.

Research in corporate culture attempts to find a single framework by which corporate culture can be assessed, with the Competing Values Framework (CVF) being perhaps the most popular method. Although highly efficient and succinct, no framework can be expected to capture all the elements of culture. In this research, the effect of cultural comprehensiveness was observed to play a large role, but its meaning in the workplace is still problematic. The CVF measures a single culture, but when applied to an organisation where numerous cultures may be present, the result would probably be more of an "averaging out" of all the cultures present. Integrating the CVF with a model that identifies cultural multiplicity, such as the Williams Model, should be considered in forming a more general model with which to analyse corporate culture.

Research into the corporate strategies used to meet the environmental sustainability challenge has resulted in numerous frameworks being presented into the literature, with few of them finding any general use. Therefore, a bespoke framework had to be formed from existing frameworks, in order to suit the requirements of this study and its context. The low internal consistency measures for two of the five content dimensions indicates that further work is still required, before a more general framework can be considered.

The context was limited to environmental sustainability, although the other forms of sustainability (economic and social) must be considered too. In particular, the interaction between the three sustainability constructs would be important in order to fully understand the effect that corporate culture has on sustainability as a whole.

Table 22. Management Guidelines to the formation of a "Sustainability Culture", considering the learnings obtained from this study.

Definitely implement	Consider implementing	Less important
Dominant characteristics		
Let work be a personal place, where people can share a lot of themselves and take risks.	Be results- and achievement-oriented, competitive. Get the job done. Ensure control and structure, and formalise work procedures.	A highly controlled and structured workplace with inflexible procedures.
Leadership		
The leadership in the organisation must exemplify entrepreneurship, innovation, risk-taking, but also mentoring and facilitating.	The leadership must play a coordinating and organising role, ensuring smooth running efficiency.	A leadership that is no-nonsense, aggressive, and results-oriented.
Organisational glue		
Bond your company through teamwork, consensus, and participation.	Bond your company by rewarding competitiveness and achievement, without sacrificing risk-taking, innovation, freedom, and uniqueness.	Bond your company by promising security of employment, stability, predictability, and conformity.
Strategic emphasis		
Openly allow, nurture, and reward risk-taking, innovation, and prospecting for opportunities as part of the company's strategy.	Rewards competitive actions, achievements hitting stretch targets, and winning in the marketplace.	Define the company's strategy by seeking permanence, stability, efficiency, control, and smooth operations.
Criteria for success		
Define success by creating metrics for human resources development, along with teamwork, employee commitment, and concern for people's well-being.	Define success by creating metrics for competitive market leadership, product leadership, and innovation.	Defining success by creating metrics for efficiency, dependable delivery, smooth scheduling, and low cost production.

7.4 Recommendations for future research

The main academic recommendations arising out of this work, in examining the relationship between corporate culture and sustainability, are:

1. The CVF should be integrated with a cultural model that considers a multiplicity of cultures within the organisation. The Williams Model appears to be most ideal for this, whereby the values can be measured along the dominant, emerging, and residual cultures in a distinct manner. This may allow for a much richer analysis of corporate culture, an explanation of what cultural comprehensiveness is, and with more practical implications for culture change practitioners. It should be noted, however, that greater analysis such as this will be more time-consuming, will place a greater load on respondents, and may not be practical for surveys such as this where control over respondents is absent.

2. The corporate strategy framework for environmental sustainability should be improved, such that a greater internal consistency is achieved. This may include re-wording of questions, or a change in the content dimensions.

3. A more comprehensive corporate strategy model can be produced, within which all elements of sustainability (environmental, social and economic) are integrated. An example would be that used by Baumgartner and Ebner (2010), with possible modifications. This too would increase the load placed on respondents.

4. A comprehensive list of contextual variables should be developed and utilised, to ensure that no relevant variables are excluded in further research. There are a huge number of such contextual variables available, however, and their importance is highly specific to the context in which the research is carried out. This research indicated that one contextual variable played a role in this case. This would expand the scope of the study.

5. Once the above-mentioned frameworks have been improved, studies such as this should be replicated in numerous contexts, including developed countries and in emerging economies.

Finally, the primary recommendation arising from this study is for corporate firms to participate in further studies investigating this topic, as the greater research load expected will require buy-in from top management.

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9. APPENDICES

Appendix 1. Letter of consent

Good day,

I am currently studying for a Masters in Business Administration (MBA) degree at the Gordon Institute of Business Science (GIBS) with the University of Pretoria. A research dissertation is a partial requirement for this, and I am therefore conducting research to understand corporate culture and strategy during environmental sustainability interventions.

To that end, you are asked to please complete a survey regarding this topic. This will help us to better understand corporate culture and strategies to the environmental challenge, and should take no more than 20 minutes of your time. Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential. The survey is carried out online where the results are agglomerated, thereby ensuring anonymity for the respondents. By completing the survey, you indicate that you voluntarily participate in this research. The survey can be accessed by clicking on the following link:

https://www.surveymonkey.com/s/TFC66S6

If you have any concerns, please contact me or my supervisor. Our details are provided below.

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Appendix 2. Survey questionnaire

No.	QUESTION	SCALING INSTRUMENT
1.	**Respondent demographics**	
Thank you for completing this survey, which will help us to understand corporate culture and strategy during environmental sustainability interventions! It is only two pages long (after this introductory page), and requires no typing at all on your part only a few clicks of the mouse. Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential. The survey is carried out online where the results are agglomerated, thereby ensuring anonymity for the respondents. By completing the survey, you indicate that you voluntarily participate in this research. Please answer the following to the best of your knowledge. Approximations are fine, only perceptions are being measured, and there are no wrong answers!		
1	Your role in the company that you work for is best described as:	1- Leader, decision-maker 2- Manager, supervisor 3- Subject matter expert, professional, advisor, engineer or scientist, 4- Non-supervisory, non-advisory worker, or none of the above.
2	Are you in a position to have some knowledge of your companies sustainability policies?	1- Yes 2- Probably 3- I don't know 4- No
3	Choose amongst the following which best describes the company that you work for:	1- SME-type business in one town only. 2- Medium sized business, with perhaps some branches in various towns, for instance. 3- Large business, with some limited international presence. 4- Parastatal, Government, or State-owned business. 5- Multi-national giant
4	Choose amongst the following groups which best describes the sector that your company works in:	1- Mining, metallurgical, power industry, oil, chemical/petrochemical production, cement production. 2- Manufacturing, light industrial, workshops, transportation, Laundromat and cleaning, telecommunications, construction, pharmaceuticals. 3- Consulting, government, research, retailing / wholesale, electronics/IT, banking/ financial, trades or other.
5	Please describe the economic development of	1- Emerging (or developing, third-world etc.)

No.	QUESTION	SCALING INSTRUMENT
	the country where you work:	2- Developed (e.g. First world)
2. Corporate strategy/response		
Please indicate the level of your agreement/disagreement with the following statements regarding the practices at your work at the decision-making (or corporate) level. We are only measuring perceptions, and there are no wrong answers.		
6	Only economical and technical criteria are considered when determining resource use.	5-point Likert scale (reverse scale)
7	Recycled and/or renewable sources of material and energy are utilised.	5-point Likert scale
8	Resource management strategy is aligned with sustainability principles	5-point Likert scale
9	Best Available Technology (BAT) is used to minimise emissions.	5-point Likert scale
10	Emission reduction goals are defined.	5-point Likert scale
11	Mostly clean technology (e.g. non-polluting alternatives) is used.	5-point Likert scale
12	Impacts on the ecology (and/or biodiversity) due to our production/process activities have been identified. This can include the use of impact and risk registers, EMP's, etc.	5-point Likert scale
13	Impacts on the ecology and/or bio-diversity (as identified in the impact and risk registers, EMP's, etcetera) are considered in our processes, policies, and strategies.	5-point Likert scale
14	The company goes to exceptional efforts to implement activities that will diminish its impact on the ecology (and/or bio-diversity).	5-point Likert scale
15	The ecological impact of the products that the company sells have been identified.	5-point Likert scale
16	Reduction methods for the ecological impact of these products have been identified.	5-point Likert scale
17	Optimisation of the ecological performance of these products within the supply chain is being implemented.	5-point Likert scale
18	Addressing ecological issues are viewed as a "grudge expense" (an unavoidable cost of doing business).	5-point Likert scale (reverse scale)
19	Addressing ecological issues are viewed as a chance to do the right thing.	5-point Likert scale
20	Addressing ecological issues are viewed as being potentially a source of further profit, (e.g. we can make money out of this).	5-point Likert scale
3. Corporate culture (competing values framework)		
Please indicate the level of your agreement/disagreement with the following statements, regarding how your company		

No.	QUESTION	SCALING INSTRUMENT
operates at the decision-making (or corporate) level. We are measuring perceptions only, and there are no wrong answers!		
21	The organisation is a very personal place. It is like an extended family. People share a lot of themselves.	5-point Likert scale
22	The organisation is very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.	5-point Likert scale
23	The organisation is results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented.	5-point Likert scale
24	The organisation is very controlled and structured. Formal procedures govern what people do.	5-point Likert scale
25	The leadership in the organisation is considered to exemplify mentoring, facilitating, and nurturing.	5-point Likert scale
26	The leadership in the organisation is considered to exemplify entrepreneurship, innovation, and risk-taking.	5-point Likert scale
27	The leadership in the organisation is considered to exemplify a no-nonsense, aggressive, results-oriented focus.	5-point Likert scale
28	The leadership in the organisation is considered to exemplify coordinating, organising, and smooth running efficiency.	5-point Likert scale
29	The glue that holds the organisation together is the emphasis on teamwork, consensus, and participation.	5-point Likert scale
30	The glue that holds the organisation together is the emphasis on individual risk-taking, innovation, freedom, and uniqueness.	5-point Likert scale
31	The glue that holds the organisation together is the emphasis on hard-driving competitiveness, high demands, and achievement.	5-point Likert scale
32	The glue that holds the organisation together is the emphasis on security of employment, stability, predictability, and conformity.	5-point Likert scale
33	The organisation emphasises human development - high trust, openness, and participation persist.	5-point Likert scale
34	The organisation emphasises novelty - new resources, creating new challenges, trying new things and prospecting for opportunities.	5-point Likert scale
35	The organisation emphasises competitive actions and achievements. Hitting stretch targets.	5-point Likert scale

No.	QUESTION	SCALING INSTRUMENT
	Winning in the marketplace is dominant.	
36	The organisation emphasises permanence and stability. Efficiency, control, and smooth operations are important.	5-point Likert scale
37	The organisation defines success on the basis of human resources development, teamwork, employee commitment, and concern for people.	5-point Likert scale
38	The organisation defines success on the basis of having the most unique or newest product. It is a product leader and innovator.	5-point Likert scale
39	The organisation defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is the key.	5-point Likert scale
40	The organisation defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low cost production are critical.	5-point Likert scale

Appendix 3. Summary statistics for the contextual variables with respect to corporate strategy.

	N	Emission control		biodiversity		products		attitude		Total sustainability	
		Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}
Role at work	**73**										
Leaders / decision-makers	24	**2.47**	0.36	3.85	0.61	3.39	0.61	3.15	0.65	3.42	0.50
Managers / supervisors	14	**2.77**	0.33	4.00	0.73	3.33	0.83	3.24	0.78	3.54	0.56
Subject matter experts	35	**2.69**	0.43	3.93	0.84	3.65	0.98	3.15	0.83	3.50	0.75
Business type	**73**										
Not multi-national giant	**35**	**2.51**	0.45	3.93	0.83	3.58	0.83	3.14	0.83	3.46	0.72
Multi-national giant	**38**	**2.75**	0.32	3.89	0.60	3.43	0.87	3.19	0.69	3.49	0.56
Industry sector type	**73**										
Highly polluting	47	**2.57**	0.40	3.94	0.69	3.62	0.71	3.06	0.74	3.47	0.63
Low- and medium-polluting	26	**2.76**	0.39	3.87	0.83	3.28	1.03	3.36	0.76	3.49	0.66
N is the sample size. σ_{n-1} is the sample standard deviation.											

Appendix 4. Summary statistics for the contextual variables with respect to corporate culture.

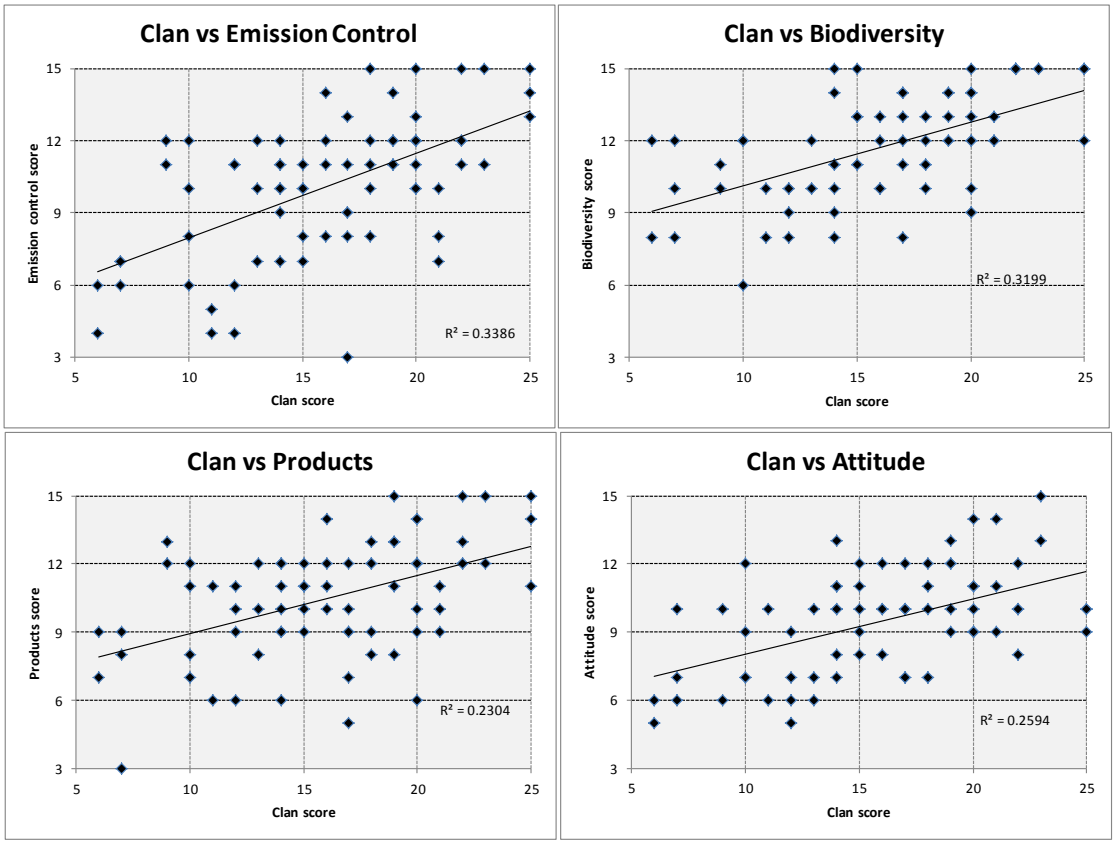
	N	Clan		Adhocracy		Market		Hierarchy		Total culture	
		Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}	Mean	σ_{n-1}
Role at work	**73**										
Leaders / decision-makers	24	3.15	0.80	3.14	0.77	3.62	0.67	3.57	0.67	3.37	0.56
Managers / supervisors	14	3.24	0.99	3.30	0.67	4.04	0.50	3.56	0.77	3.54	0.54
Subject matter experts	35	3.26	1.05	3.11	0.91	3.72	0.66	3.82	0.48	3.48	0.63
Business type	**73**										
Not multi-national giant	**35**	3.24	1.00	3.29	0.77	3.81	0.54	3.69	0.65	3.51	0.58
Multi-national giant	**38**	3.21	0.92	3.04	0.85	3.70	0.73	3.68	0.58	3.40	0.60
Industry sector type	**73**										
Highly polluting	47	3.17	0.93	3.07	0.84	3.68	0.68	3.78	0.53	3.42	0.58
Low- and medium-polluting	26	3.32	0.99	3.32	0.76	3.88	0.57	3.52	0.72	3.51	0.61
N is the sample size. σ_{n-1} is the sample standard deviation.											

Appendix 5. Results from the Duncan Multiple Range test, for the dimension *Emission Control*.

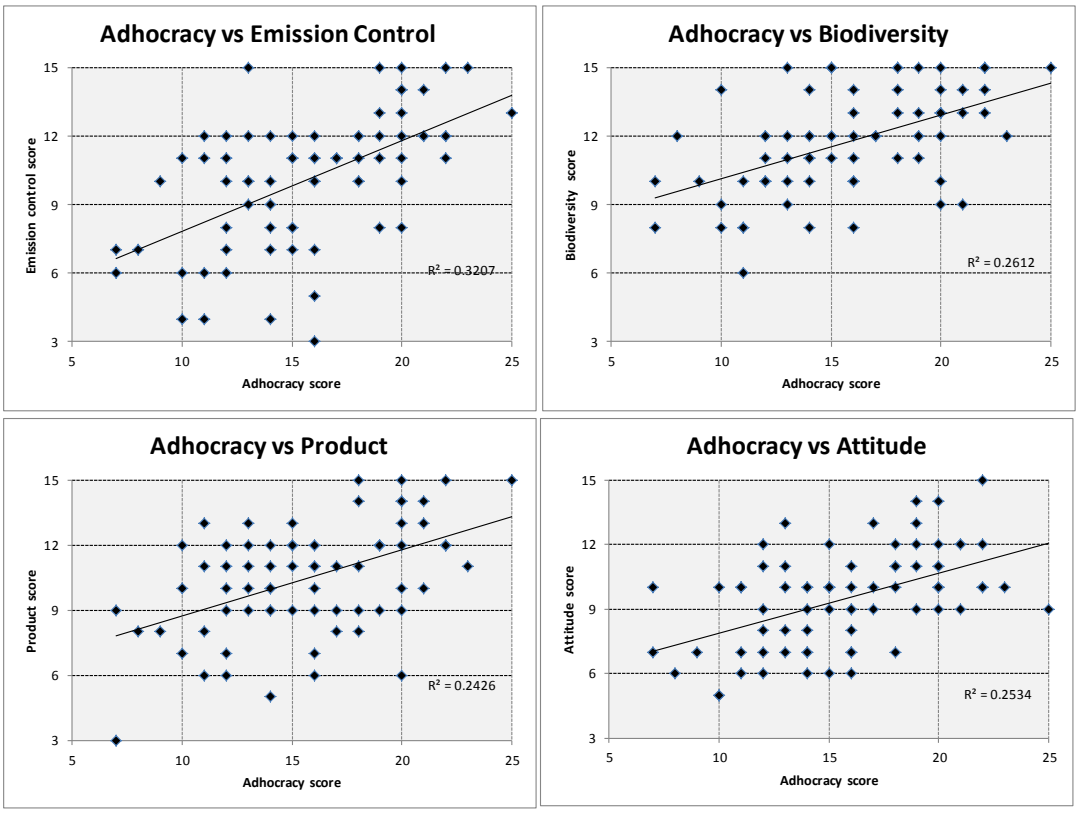
Duncan Grouping	Mean	N	Grouping
A	2.7698	14	2 – Manager/supervisors
A	2.6921	35	3 – subject matter experts
B	**2.4676**	24	1 – leader/decision-makers
Alpha		0.05	
Error Degrees of Freedom		68	
Error Mean Square		0.119814	
Harmonic Mean of Cell Sizes		21.17647	
Number of Means	**2**	**3**	
Critical Range	.2123	.2233	

Appendix 6. Scatterplots for visual examination

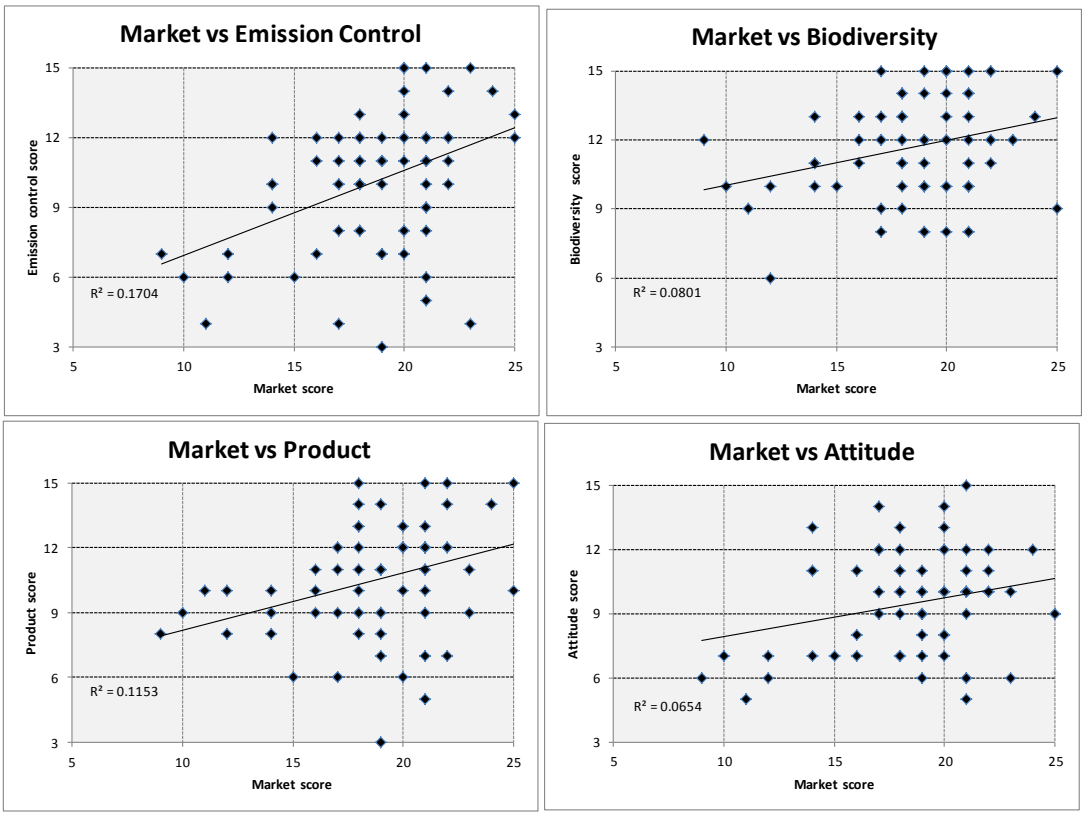
1. Clan corporate culture versus the dimensions of corporate strategy.



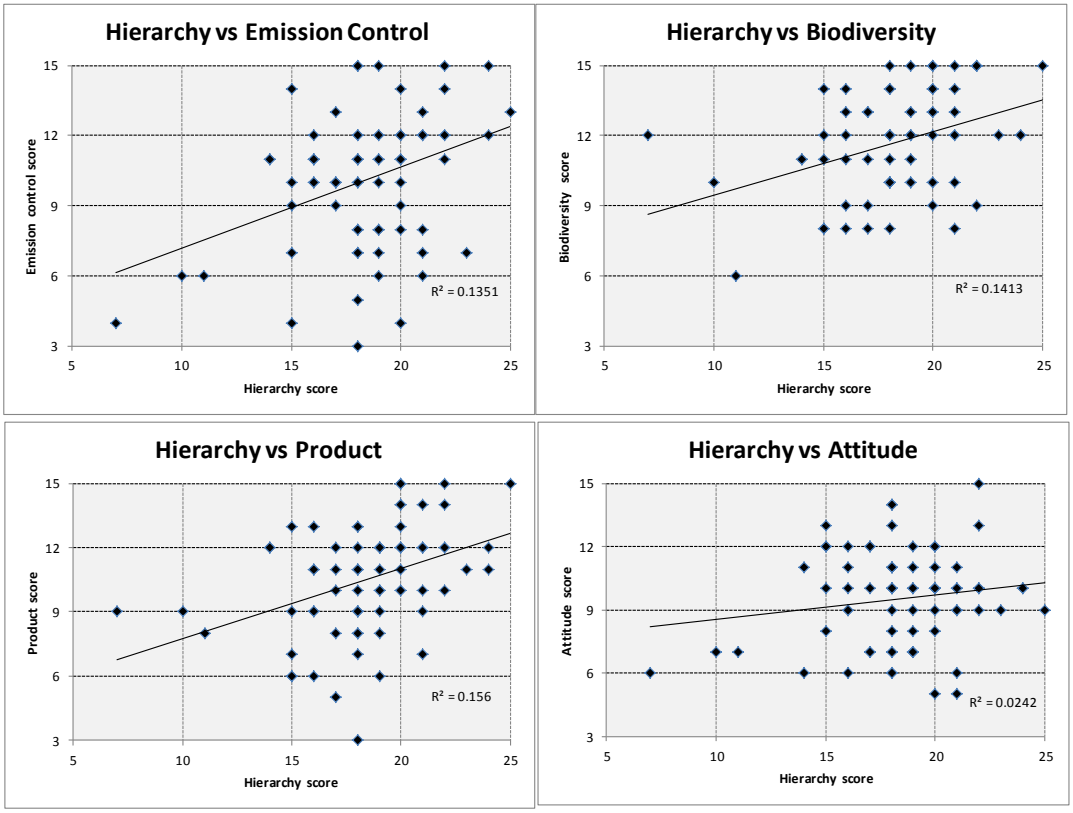
2. Adhocracy corporate culture versus the dimensions of corporate strategy.



3. Market corporate culture versus the dimensions of corporate strategy.



4. Hierarchy corporate culture versus the dimensions of corporate strategy.



Appendix 7. The correlation of individual elements of corporate culture with the dimensions of corporate strategy.

Pearson Correlation Coefficients, at N = 73 Prob > |r| under H_0: Rho=0					Normalised score
Emission control	**biodiversity**	**products**	**Attitude**	**Total sustainability**	
V21: The organisation is a very personal place. It is like an extended family. People share a lot of themselves. (Clan) (Dominant characteristics)					
0.39532 0.0005	0.43417 0.0001	0.34263 0.0030	0.32976 0.0044	0.52671 <.0001	30.7
V22: The organisation is very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks. (Adhocracy) (Dominant characteristics)					
0.43204 0.0001	0.48625 <.0001	0.38244 0.0008	0.45144 <.0001	0.57448 <.0001	33.5
V23: The organisation is results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented. (Market) (Dominant characteristics)					
0.15133 **0.2012**	0.28264 0.0154	0.26487 0.0235	**0.21345** **0.0698**	0.31202 0.0072	18.2
V24: The organisation is very controlled and structured. Formal procedures govern what people do. (Hierarchy) (Dominant characteristics)					
0.31288 0.0070	0.27273 0.0196	0.28593 0.0142	**0.10014** **0.3992**	0.30066 0.0097	17.5
V25: The leadership in the organisation is considered to exemplify mentoring, facilitating, and nurturing. (Clan) (leadership)					
0.43712 0.0001	0.46634 <.0001	0.43600 0.0001	0.43599 0.0001	0.59636 <.0001	31.5
V26: The leadership in the organisation is considered to exemplify entrepreneurship, innovation, and risk-taking.					32.0

(Adhocracy) (leadership)					
0.37856 0.0010	0.46222 <.0001	0.49581 <.0001	0.45301 <.0001	0.60592 <.0001	
V27: The leadership in the organisation is considered to exemplify a no-nonsense, aggressive, results-oriented focus. (Market) (leadership)					6.9
0.15925 **0.1784**	**-0.01397** **0.9066**	**0.14311** **0.2271**	**0.09817** **0.4087**	**0.13114** **0.2688**	
V28: The leadership in the organisation is considered to exemplify coordinating, organising, and smooth running efficiency. (Hierarchy) (leadership)					29.6
0.36971 0.0013	0.49089 <.0001	0.43145 0.0001	0.34755 0.0026	0.56124 <.0001	
V29: The glue that holds the organisation together is the emphasis on teamwork, consensus, and participation. (Clan) (organisational glue)					44.4
0.37680 0.0010	0.48185 <.0001	0.48374 <.0001	0.41797 0.0002	0.58575 <.0001	
V30: The glue that holds the organisation together is the emphasis on individual risk-taking, innovation, freedom, and uniqueness. (Adhocracy) (organisational glue)					21.9
0.14929 0.2075	0.18992 0.1075	0.23850 0.0422	0.21120 0.0729	0.28869 0.0132	
V31: The glue that holds the organisation together is the emphasis on hard-driving competitiveness, high demands, and achievement. (Market) (organisational glue)					26.9
0.27142 0.0202	**0.22260** **0.0584**	0.32015 0.0058	**0.13628** **0.2503**	0.35446 0.0021	
V32: The glue that holds the organisation together is the emphasis on security of employment, stability, predictability, and conformity. (Hierarchy) (organisational glue)					6.8

0.01266 **0.9153**	**0.11489** **0.3331**	0.25188 0.0316	**-0.12595** **0.2884**	**0.09025** **0.4477**	
V33: The organisation emphasises human development - high trust, openness, and participation persist. (Clan) (strategic emphasis)					
0.55779 <.0001	0.54203 <.0001	0.33192 0.0041	0.52805 <.0001	0.64988 <.0001	35.8
V34: The organisation emphasises novelty - new resources, creating new challenges, trying new things and prospecting for opportunities. (Adhocracy) (strategic emphasis)					
0.55136 <.0001	0.49250 <.0001	0.45277 <.0001	0.48536 <.0001	0.68825 <.0001	37.9
V35: The organisation emphasises competitive actions and achievements. Hitting stretch targets. Winning in the marketplace is dominant. (Market) (strategic emphasis)					
0.18052 **0.1264**	**0.21874** **0.0630**	0.25226 0.0313	**0.17016** **0.1501**	0.27047 0.0206	14.9
V36: The organisation emphasises permanence and stability. Efficiency, control, and smooth operations are important. (Hierarchy) (strategic emphasis)					
0.09452 **0.4264**	**0.21602** **0.0664**	**0.17100** **0.1480**	**0.09984** **0.4007**	**0.20618** **0.0801**	11.4
V37: The organisation defines success on the basis of human resources development, teamwork, employee commitment, and concern for people. (Clan) (criteria for success)					
0.38266 0.0008	0.50968 <.0001	0.45917 <.0001	0.48278 <.0001	0.62614 <.0001	36.5
V38: The organisation defines success on the basis of having the most unique or newest product. It is a product leader and innovator. (Adhocracy) (criteria for success)					23.9

0.23183 0.0484	0.29914 0.0101	0.29424 0.0115	0.30462 0.0088	0.41004 0.0003	
V39: The organisation defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is the key. (Market) (criteria for success)					24.1
0.23339 0.0469	0.37815 0.0010	0.27571 0.0182	0.34007 0.0032	0.41330 0.0003	
V40: The organisation defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low cost production are critical. (Hierarchy) (criteria for success)					15.6
0.18991 **0.1076**	**0.19305** **0.1018**	**0.19424** **0.0996**	**0.13694** **0.2480**	**0.26779** **0.0220**	