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The Practice of Corporate Entrepreneurship and Lean Six Sigma in the South African Financial Sector

By

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A dissertation submitted in partial fulfilment for the Degree of Masters in Strategic Management

In Business Management

Faculty of Management
UNIVERSITY OF JOHANNESBURG

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I would like to thank those that have supported me during my masters. I am forever grateful.

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• My family – my mom, dad and sisters.
• My wife Deborah for all her dedication and endless support.
• My daughter Sophia for all her distractions.
• My work colleagues for all your advice and assistance.
DECLARATION

I certify that the minor dissertation submitted by me for the degree Master’s of Commerce (Strategic Management) at the University of Johannesburg is my independent work and has not been submitted by me for a degree at another university.

MALCOLM GOLDSMITH
ABSTRACT

The main objective of the study is to measure the relationship between the practices of corporate entrepreneurship and lean six sigma within the South African financial sector. Although studies on these management styles are prevalent in the literature, few of them provide a direct comparison of the styles. There is a further gap in the literature that addresses the South African context. The study design included anonymously submitted questionnaire data on the levels of corporate entrepreneurship, lean six sigma and organisational performance from employees at South African banks. 248 potential participants were contacted, with a snowball sampling method being utilised. The final response rate was 41% (102 completed surveys), and this is the number used in the study. Respondents were employees at South African banking institutions. Likert scales were used to score the various constructs of corporate entrepreneurship and lean six sigma. The study looked to determine if there are statistically significant relationships between these constructs. In addition, the relationship between organisational performance, corporate entrepreneurship and lean six sigma was reviewed. The findings were that there are low-level practices of entrepreneurship and lean six sigma in the South African financial institutions. The main findings showed that in general the elements of corporate entrepreneurship had a correlation to the elements of lean six sigma, as evidenced in four out of the six possible correlations. This being said; the correlations were weak to slightly moderate in nature. As for the correlation to organisational performance, four out of the five potential correlations were statistically significant, all be it either weak or almost moderate. There was a positive direction to the correlation in all instances. The main implications of the findings are that corporate entrepreneurship and lean six sigma, though vastly differentiating in history and styles can co-exist in a single organisation. There were no instances of negative correlation as may be expected from the seemingly incomplete and incompatible nature of the two methods. The recommendation is that these two strategies can and should be implemented in conjunction, given their explicit impact on organisational performance. The main limitation of the study was that a small sample used. Another limitation was the focus on banks and
not the entire financial sector. Future research could target other financial institutions that are not full service banking operations. The study could contain more detail to determine if, the size and age of the organisation impact on the practice of corporate entrepreneurship and lean six sigma.
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Chapter 1: Introduction and Background

1.1 Introduction

This chapter will highlight and define the constructs discussed in the study, namely corporate entrepreneurship, lean six sigma and organisational performance. The section discusses the problem statement and aim of the study followed by the hypothesis and the research methodology.

1.2 Background

All organisations, regardless of their nature, size or scope, are striving to perform efficiently and effectively, in order to provide high quality services or products, and in turn, make higher profits. Dess, Lumpkin & McGee (1999:85) note that virtually all organisations from new start-ups to major corporations (including financial institutions) are striving to improve organisational performance by exploiting “product-market opportunities through innovative and proactive behaviour”.

The two main ways companies can increase their organisational performance seem contradictory in nature at first glance. The first approach is through corporate entrepreneurship. This strategy involves experimentation where new ideas are researched and developed with the acknowledgment that some ideas may not work out. The second is by implementing a lean six sigma business methodology built on implementing operational improvements. Porter’s (1980:40-41) traditional strategies of ‘low cost leadership’ assist to achieve this goal. In essence, lean six sigma deals with cost reduction by using as few resources as possible and, therefore, reducing as much as possible any waste or variation in outputs.

In business, the concept of slack can be viewed as an asset or liability, depending on which school of thought one follows. Slack resources have the potential to be diverted or redeployed from their current use for the better achievement of organisational goals (George, 2005: 661). These resources in essence are ‘additional’ resources available within the firm that are not currently needed for the fundamental workings of the organisation (Paeleman,
Within corporate entrepreneurship, the idea of having this slack is important, as it creates the space needed to test and trial run innovative concepts that otherwise could not be explored. In contrast, lean six sigma considers slack as a waste that should be eliminated.

**Corporate Entrepreneurship** is defined as, “the process of identifying, developing, and bringing forward new innovative ways of doing things for the exploitation of commercial opportunities” (Kukoc & Regan, 2007:17). The main assumption of this construct is that all firms lie along a spectrum, ranging from highly conservative to highly entrepreneurial. Firms that lie on the entrepreneurial side of the continuum are “risk-taking, innovative, and proactive” (Barringer & Bluedorn, 1999:422). Inversely, un-enterprising firms are “risk-averse, less innovative, and adopt a more ‘wait and see’ posture” with regards to business management (Barringer & Bluedorn, 1999:422).

**Lean six sigma** is a significant continuous improvement methodology for accomplishing “operational and service excellence” in any firm regardless of industry (Salah, Rahim & Carretero, 2010:249). Lean six sigma is a combination of six sigma and lean thinking, two distinct but complimentary continuous improvement theories, it is depicted as "a methodology that focuses on the elimination of waste and variation" (Salah, Rahim & Carretero, 2010:250).

Despite lean thinking’s original focus of solving manufacturing problems in Japan, Womack, Jones & Roos (2007:6) believe that the principles of lean production can be utilised in all fields of business anywhere in the world, including service industries. Womack et al. (2007:6) have confidence that once implemented, lean “will have a profound effect on human society”.

Laureani & Antony (2012:257) promote lean six sigma as “a business improvement methodology that aims to maximize shareholder value by improving quality, speed, customer satisfaction, and costs”. Similarly, impressive statements could be made of corporate entrepreneurship, such as those from Morris, Kuratko, & Covin (2011:19), who argue “that the answer to
today’s hyper-competitive environments is adaptability, flexibility, speed, aggressiveness and innovativeness, which they boil down to one word – “entrepreneurship”.

Both strategies, corporate entrepreneurship and lean six sigma, offer different approaches, benefits and limitations to organisations seeking to improve their organisational performance, which is characterised by “the actual outputs or results of an organisation as measured against its intended outputs purpose or goals” (Lyons, 2013:155).

Corporate entrepreneurship and lean six sigma go about the task of improving organisational performance in vastly different ways as they have different vantage points to view the problem. According to Morris et al. (2011:452), a primary path to achieving high performance would be through corporate entrepreneurship. These “entrepreneurial attitudes and behaviours are believed necessary for firms of all sizes to prosper and flourish” (Barringer & Bluedorn, 1999:421). This attitude focuses the firm around flexibility and experimentation. On the other side, lean six sigma is perceived as rigid, and heavily process orientated in nature. Lean six sigma may, therefore, have a stifling effect on the entrepreneurial culture that businesses are trying to foster. Nevertheless, the benefits may still outweigh the negatives as lean six sigma has the potential for high cost savings benefit. Dess et al. (1999:89) reiterates this idea by stating that in the context of corporate entrepreneurship “controlling costs is an increasingly important aspect of successful strategies”.

Looking at it another way, Byrne, Lubowe & Blitz (2007:5) believe that lean six sigma is not only about “doing things better, but a way of doing better things”. The implication is that a level of creativity and innovation would be needed to transform the business to achieve this goal. In this case, lean six sigma may not hinder corporate entrepreneurship but rather promote it.

The inter-relationship between entrepreneurship and lean six sigma and their possible effect upon each other is the main focus of this study. With a focus
on South African financial institutions, the study will explore statements such as the following:

- South Africa is seen as an economic hub, given its geographic location and having the largest economy in the region. If corporate entrepreneurship is embraced, it should assist South African firms to deal with the increased competition from international firms for market opportunities, resources and customers they are facing as a result of being a gateway (Schwab, 2010:39).

- If institutions could effectively learn how to use lean six sigma principles successfully, it could lead to (a) a multitude of positive effects, including the enhancement of innovations in new products and services, (b) Improvement in operations and possibly most importantly, (c) may lead to enhancements of the company’s underlying business model (Snee, 2010:10, Wang & Chen, 2010:302)

1.3 Problem Statement
The primary problem is that it is unknown to what extent the practice of corporal entrepreneurship and lean six sigma occurs in the South African financial sector. Secondly, the relationship between corporate entrepreneurship and lean six sigma has not been established in the South African financial sector. It is important to research this topic as there is conflicting literature indicating various forms of this relationship. It is not clear if organisations can practice both corporate entrepreneurship and lean six sigma at the same time and what would the implications be on organisational performance.

1.4 Purpose and Importance of the Study
This study will provide an important comparison of corporate entrepreneurship and lean six sigma, which have up until now mostly been discussed and analysed independently. The study provides an important integrative approach.

Chakraborty & Leyer (2013:258) reviewed the literature (peer-reviewed
journals) from 1999 to 2012. They searched for the following keywords; ‘six sigma’ in combination with ‘financial services’, ‘banks’ and ‘insurance companies’. Out of the peer-reviewed journals from the following typical databases: ABI/Inform Complete, Business Source Premier, ScienceDirect and JStor, they only found five articles that met the search criteria. The implication is that the idea of six sigma (and even more so lean six sigma) within financial institutions is relatively new. The above shows that there is a need for further research on the topic.

The field of corporate entrepreneurship research has surfaced as a core area of study in management and economics (Wiklund, Davidsson, Audretsch & Karlsson, 2011:1). Though the interest in corporate entrepreneurship is high, the understanding of the concept still remains limited and fragmented (Miles & Covin, 2002:22). The study will, therefore, contribute to the knowledge base of these important areas that still have many unanswered questions to be explored.

1.5 Research Aim

The primary aims of the study are:

- To assess the practice of corporate entrepreneurship and lean six sigma implementation within the South African financial sector and
- Investigate the relationship between corporate entrepreneurship and lean six sigma and organisational performance.

The study’s hypotheses are as follows:

$(H_0^1)$: States that there is no statistical significant correlation between ‘innovation’ and $(H_0^{1a})$: ‘variation reduction’, $(H_0^{1b})$: ‘waste reduction’, $(H_0^{1c})$: ‘organisational performance’

$(H_0^2)$: States that there is no statistical significant correlation between ‘organisational flexibility and $(H_0^{2a})$: ‘variation reduction’, $(H_0^{2b})$: ‘waste reduction’, $(H_0^{2c})$: ‘organisational performance’
(H₀⁴): States that there is no statistical significant correlation between ‘variation reduction’ and ‘organisational performance’

(H₀⁵): States that there is no statistical significant correlation between ‘waste reduction’ and ‘organisational performance’

(H₀⁶): There is no statistical significant difference of opinion between male and female respondents with reference to the practice of (H₀⁶a): ‘lean six sigma’, (H₀⁶b): ‘corporate entrepreneurship’,

(H₀⁷): There is no statistical significant difference of opinion between the age groups of respondents with reference to the practice of (H₀⁷a): ‘lean six sigma’, (H₀⁷b): ‘corporate entrepreneurship’,

1.6 Division of the Study

The research is divided in the following sections:

**Chapter 1: Introduction and Background**

This chapter introduces the background, concepts to be explored and context of the study, stating the background to the study. The chapter proposes the problem that is to be investigated. A brief discussion into the research aim and the importance of the study is laid out.

**Chapter 2: Literature Review**

Chapter two outlines the theory of corporate entrepreneurship and its relationship to organisational performance. The chapter next investigates the history of the lean six sigma methodology as a continuous improvement process and its relationship with organisational performance. The chapter further reviews the relationship between corporate entrepreneurship and lean
six sigma.

Chapter 3: Research Methodology

This section explains the design for the research project, describing the population and the sampling methodology followed. In addition, some of the challenges encountered are mentioned.

Chapter 4: Results

This chapter contains the data analysis and reports the findings of the study.

Chapter 5: Summary, Conclusion and Recommendations

The final chapter of the dissertation concludes the study and puts forward recommendations for further research.
Chapter 2: Literature Review

2.1 Introduction

This chapter reviews the main literature on corporate entrepreneurship and lean six sigma, starting with the various definitions of and elements that comprise these concepts. It also looks at corporate entrepreneurship in relation to organisational performance. A historical look at the evolution of lean six sigma follows this section, showing how it is made up of two individual constructs (lean and six sigma). Next is a discussion of organisational performance’s relationship to the topic. Finally, an overview of the foremost experts’ opinions on the nature of the relationship between corporate entrepreneurship and lean six sigma are reviewed. The chapter concludes with the studies hypotheses in relation to the literature review.

2.2 Corporate Entrepreneurship

2.2.1 Defining Corporate Entrepreneurship

Corporate entrepreneurship is a term used to describe “entrepreneurial behaviour inside established mid-size and large organisations” (Morris et al., 2011:11). The word entrepreneur has a long history dating back to 1723, first published in a French dictionary “Dictionnaire Universel de Commerce” of Jacques des Bruslons (Navale, 2013:1). Over the last two and a half centuries, the concept has been continuously mulled over and debated. Still today, scholars disagree over its exact meaning.

The following definition captures the essence of the term of entrepreneurship calling it “the process of creating value by bringing together a unique combination of resources to exploit an opportunity” (Stevenson & Jarillo-Mossi, 1986:10). Present-day entrepreneurship research originates from the work of economist Joseph Schumpeter (1883–1950). Schumpeter (1939) argues “the main agents of economic growth are the entrepreneurs who establish new products, new methods of production and other innovations that stimulate economic activity”. Schumpeter’s definition of entrepreneurship is that of “a process of ‘creative destruction’ in which the entrepreneur continually displaces or destroys existing products or techniques to make
room for the production of new ones” (Schumpeter, (1936) In Barringer & Bluedorn, 1999:422).

Wolcott & Lippitz (2007:75) provide another definition of corporate entrepreneurship, calling it “the process by which teams within an established company conceive, foster, launch and manage a new business that is distinct from the parent company but leverages the parents’ assets, market position, capabilities or other resources”. Damanpour (1991:556) expands this idea by noting the broad concept of corporate innovation involving three elements: “generation, development and implementation of innovations”. When mentioning innovation, he implies the creation of a new product, service or even an internal organisational mechanism.

Corporate entrepreneurship, sometimes called ‘intrapreneurship’, grew out of traditional entrepreneurship. While traditional entrepreneurship typically focuses more on an individual or smaller business, corporate entrepreneurship involves enterprising activities within a large organisation. In addition, it attempts to apply both the mind set and skill set demonstrated by successful start-up entrepreneurs into the cultures and activities of a large and often more established business (Thornberry, 2003:331). When used within business, “entrepreneurship is a process whereby an individual or a group of individuals use organised efforts and means to pursue these opportunities to create value and grow by fulfilling wants and needs through innovation and uniqueness, no matter what resources are currently controlled” (Coulter, 2001:25).

### 2.2.2 Elements of Corporate Entrepreneurship

Corporate entrepreneurship has four major categories namely:

- “Corporate venturing;
- Intrapreneuring;
- Organisational transformation; and
The first classification is that of corporate venturing, which involves starting a business within a business. This new business typically originates from a core competency or established process within the original enterprise. For example, a bank may have a core competence dealing with processing transactions and then may offer this service to outside companies and run this new unit as a separate enterprise (Thornberry, 2003:330).

The second type involves intrapreneuring, first adopted by Pinchot (1985), has been described more recently as a process where "a person within a large corporation who takes direct responsibility for turning an idea into a profitable finished product through assertive risk-taking and innovation" (American Heritage Directory, in Wetherly & Otter, 2011:468).

The third category known as ‘corporate renewal’ occurs when a business in some way transforms its available resources, and then the output of this establishes continuous economic value (Thornberry, 2003:331). Platt (2004:6-7) outlines the stages of corporate renewal, ranging from corporate transformation and turnaround management to crisis resolution. Turnaround management is the most common this involves changing the company’s strategy drastically. He continues to mention other types or renewal such as financial restructures and operating turnarounds where revenues are increased or costs are reduced.

The fourth form of corporate entrepreneurship is a deeper branch of transformation, known as Industry rule breaking. This approach incorporates both the notion of transformation of the firm and also “the competitive environment of the industry into something significantly different than it was” (Thornberry, 2003:331).
The above four elements noted by Thornberry (2003) can relate to Barringer & Bluedorn’s (1999:423) key elements of corporate entrepreneurship:

- opportunity recognition;
- organisational flexibility;
- innovation; and
- risk taking.

Table 2.1: Mapping of Elements of Corporate Entrepreneurship

<table>
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<tr>
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<tbody>
<tr>
<td>Intrapreneuring</td>
<td>Opportunity recognition</td>
</tr>
<tr>
<td>Corporate venturing</td>
<td>Organisational flexibility</td>
</tr>
<tr>
<td>Organisational transformation</td>
<td>Innovation</td>
</tr>
<tr>
<td>Industry rule-breaking</td>
<td>Risk-taking</td>
</tr>
</tbody>
</table>

These elements can again be discussed in a slightly different manner as expressed by Guth & Ginsberg (1990: 8-12), who note that the manifestation of the firm’s entrepreneurial behaviour can be assessed by the following factors. (a) Looking at its ability to innovate, (b) Examining its ability to initiate change and (c) Being able to rapidly react to changing reflects the organisation’s flexibility.

Barringer & Bluedorn’s (1999:423) three elements are explored further below.

a. **Opportunity Recognition**

Entrepreneurial organisations capitalise on “the identification and exploitation of previously unexploited opportunities” (Hitt, Ireland, Camp, & Sexton, 2001:480). The ability to recognise opportunities is the cornerstone of being innovative and entrepreneurial. When creating a climate that supports innovation, Mascitelli (2000:180) lists a number of enabling factors. He notes companies should nurture an atmosphere that encourages “divergent thinking, improvisation, and artistic creativity” and even incorporate them into the practical demands of the service development process. His argument
emphasises face-to-face interaction as essential for creating a knowledge-sharing environment among staff. The more that knowledge is shared between colleagues, the more they should be able to identify gaps and areas for improvement that can lead to new opportunities for the organisation.

Recognising a new opportunity is commonly thought of as a ‘flash of genius’. However, it usually comes about when there are acute awareness of the industry and diligent environmental scanning has taken place (Barringer & Bluedorn 1999:436). This recognition process is a two-part approach. The firm is first required to be proactive by developing solutions to new and current problems, and then the solution needs to successfully be implemented. Responsibility and actions should be taken to do whatever is necessary to bring an entrepreneurial concept to fruition.

Having the correct mechanisms and systems in place simplifies the task of opportunity recognition simpler. This “involves considerable perseverance, adaptability, and a willingness to assume responsibility for failure” (Morris et al., 2011:71). Following on from this, this leads to a continuous search for market opportunities and experimentation with potential responses to changing environmental trend. Venkatraman (1989:949) states how this is manifested in three ways:

• “Seeking new opportunities that may or may not be related to the present line of operation;
• Introducing new products and brands ahead of competition; and
• Strategic elimination of operations that are in the mature or declining stages of the life cycle”.

b. Organisational flexibility

Englehardt & Simmons (2002:113-114) discuss that organisational flexibility is a strange counterintuitive term. An organisation is primarily a system with interdependent and coordinated elements. Conversely flexibility implies the ability to modify or adapt easily. As a group gets more systemised and dependent on formal structures, it becomes increasingly difficult to enable
change. The organisational challenge to provide both structure and flexibility become greater than ever before. When reviewing flexible organisations they commonly have less top-down control. Instead, these adaptable companies focus more on team and individual autonomy that empowers employees to be enterprising.

This requirement for organisational flexibility starts with the ability to incorporate flexibility into the planning process. When a firm has a flexible planning system, they can quickly track new opportunities and adjust their plans to reflect the environmental change (Barringer & Bluedorn, 1999:424).

c. Innovation and Risk Taking

Innovation has received considerable attention as having a crucial role in securing sustainable competitive advantage in today’s aggressive and ambitious environment. As Tushman & Nadler (1986:74) assert “in today’s business environment, there is no executive task more vital and demanding than the sustained management of innovation and change”. “To compete in this ever-changing environment, companies must create new products, services, and processes, to dominate, they must adopt innovation as a way of corporate life”.

Early research on innovation focused on product innovation in production environments (Brown & Eisenhardt, 1995:351). More recently the focus has shifted to include a wider scope of innovation, including services (Morone & Testa, 2008:313). Service innovation allows the organisation to open up new markets through increasing the quality and variety of services offered (Berry, Shankar, Parish, Cadwallader & Dotzel, 2006:60). If service firms want to gain a competitive advantage in the market, they must better manage the ‘customer experience’ granting customers the service offering they want. All innovation should connect in a meaningful way to all other innovation in order to gain the most of the combined impact on firm performance. In other words, service firms ought to examine all four types of innovation (discussed below) to enhance performance (Cho, Park & Choi, 2011:279).
Thornberry’s (2003) principles of organisational transformation or organisational renewal relates to innovation. Below is a brief highlight of some literature around service innovation. It is pertinent to the discussion of corporate entrepreneurship in the financial services industry, as service innovation may differ to manufacturing innovation.

Within the context of the service industry, there are three distinct types of innovation. These are listed below:

- Service innovation, which include innovation in the services offered, either by introducing new services or significantly improving existing services;
- Process innovation, which include new and improved ways in which services are offered; and
- Organisational innovation, which is not limited to the individual service delivery process but includes significant improvements in wider organisational structures or processes (Hipp, Tether & Miles, 2000:422).

As corporations become more complex and larger in scope and size, CEO’s are finding it challenging to enable innovation. Many of these corporate leaders are choosing to focus on enhancing entrepreneurship within their business, as it has long been equated with the notion of innovation (Schumpeter, 1939). Drucker (1985:27) mentioned many years back that “entrepreneurs innovate”. He notes, “innovation is the specific instrument of entrepreneurship. It is the act that endows resources with a new capacity to create wealth…In good and bad economic times, innovation is a requisite for companies seeking to remain competitive especially in uncertain and turbulent times” (Thornberry, 2003:329).

Developing breakthrough products or services often requires companies to make substantial investments without any guarantee of return. Given the risks are typically very high, companies are often unwilling to undertake them. Some experts argue that a customer centric philosophy could easily lead
organisations to focus exclusively on incremental improvements in their current products and service activities rather than trying to create new and novel solutions (Wind & Mahajan 1997:3). This would reduce the risk involved while still allowing organisations to advance their products or services, even if only minimally.

It is also essential to note that, from an entrepreneurial stance, there are two sides to the risk equation. The first is the risk of ‘sinking the boat’ (Dickson & Giglierano, 1986:58), which deals with situations when things go wrong. Organisations can ‘sink the boat’ when they misjudge the level of risk involved by trying to execute innovations that were not fully thought out. This risk may occur when an organisation lands up rushing the implementation or they launch at the wrong time. Although often overlooked, the other risk of ‘missing the boat’ can be just as consequential. Companies are prone to ‘miss the boat’ when they are overly circumspect and thus avoid or refuse to take action, that may have led to a positive advancement. Another scenario may be that the organisation is too chaotic an unorganised to have the direction to take calculated risks. This inaction also leads to missing opportunities (Morris et al., 2011:271).

2.2.3 Entrepreneurial Intensity

Not all organisations operate at the same level of intensity when it comes to the application of corporate entrepreneurship. The concept of entrepreneurial intensity measures the variable level of corporate entrepreneurship within the firm. The level of intensity can be measured by the frequency (i.e. number of entrepreneurial activities) and the degree of entrepreneurship (i.e. the nature, scale and scope of these activates). When combined, these two values were on the entrepreneurial grid the company will lie. The dual measurement of frequency and scale can be viewed as showing the risk appetite of an organisation. This measurement helps illustrate whether the firm has a passion and pro-active approach with the ability to handle frequent risks or rather if they have the opposit strategy of risk avoidance (Morris et al., 2011:74).
If the entrepreneurial intensity found in the organisation is of an adequate level, the organisation can be thought of as entrepreneurial. This type of firm is willing to take calculated risks as part of their overall business model and investment strategy. For these organisations to succeed, they must create and nurture enabling environments with supportive internal systems. This climate should be created and upheld, though at the same time remain flexible in their nature (Morris et al., 2011:87).

Dhliwayo (2010:155) notes, “corporate entrepreneurship entails being innovative, risk taking, proactive, and engaging in continuous self-renewal”. As a result, an overarching entrepreneurial strategy is required if an organisation is to be successfully maintained. Questions such as ‘who are we?’ and ‘where are we headed?’ should be asked on a regular basis. Without an early defined strategic direction, companies’ efforts for entrepreneurship land up being an arbitrary set of creative ideas (Dhliwayo, 2010:155).

**Fig 2.1: Entrepreneurship as a Variable Phenomenon**

(Morris & Lewis, 1995:33).
2.2.4 The Culture Challenge

One critical success factor when encouraging corporate entrepreneurship is having a balanced culture that encompasses an entrepreneurial spirit that guides the enterprise in its endeavours. The entrepreneurial spirit is invoked when an enterprise correctly spots opportunities, generates new ideas and has the determination and the means to implement this creativity and set of ideas (Nixon, 2004, cited in Kobia & Sikalieh, 2010:111).

For corporate entrepreneurship to be successfully implemented, employees must believe in the entrepreneurial culture of the organisation and act as entrepreneurs themselves. According to Wood (1988:13-14), these individuals should both identify an opportunity and act upon it. It is this combination of vision with action that makes corporate entrepreneurship achievable. Below that shows a framework for creating an entrepreneurial culture at a bank.

Fig 2.2: Entrepreneurial Culture of Banks

Developing and Maintaining an Entrepreneurial culture at a bank

The framework suggests a hypothesis that the corporate entrepreneurship elements of [innovation, flexibility and environmental scanning (opportunity recognition)] have significant statistical correlations with lean six sigma factors (still to be discussed) [variation and waste reduction] and organisational performance (discussed further below). They relate to the study’s three hypotheses mentioned in chapter one (Ho1, Ho2, Ho3).

These hypothesised that there is no statistical significant relationship between:

- $H_{o1}$ innovation and (a) variation reduction, (b) waste reduction and (c) organisational performance.
- $H_{o2}$ organisational flexibility and (a) variation reduction, (b) waste reduction and (c) organisational performance.
- $H_{o3}$ environmental scanning and (a) variation reduction, (b) waste reduction and (c) organisational performance.

### 2.2.5 Corporate Entrepreneurship and Organisational Performance

Corporate entrepreneurship has been found to directly influence the firm’s ability to generate wealth creation, as well as growth and profitability (Antoncic & Hisrich, 2004:542). Corporate entrepreneurship has long been recognised as “a viable means for promoting and sustaining corporate competitiveness” (Covin & Miles, 1999:47).

Over the last thirty years of academic investigation, it has been commonly established that firms that conduct themselves in an entrepreneurial manner operate at a higher level of performance than those firms that are more conservative in nature (Anderson & Yoshihiro, 2013:413). The model following shows how a company’s entrepreneurial mind-set and culture leads to wealth creation, thus improving organisational performance
A study by Antoncic & Hisrich (2004:542) found that companies with high levels of corporate entrepreneurship are more likely to have better organisational performance. Even more, “corporate entrepreneurship is expected to be positively associated with corporate financial performance” (Zahra, 1991:268). Therefore, the study’s hypotheses is that there is a significant positive relationship between corporate entrepreneurship (innovation, flexibility and scanning) and organisational performance. Ho1, Ho2, Ho3 will examine the above.

2.3 Lean Thinking

This thesis examines the relationship between corporate entrepreneurship and lean six sigma. In order to fully understand lean six sigma, this review will first examine each concept, that of lean (in this Section 2.3) and six sigma (Section 2.4) separately as unique and distinct methodologies. Following this, the thesis will review the evolution and benefits of lean six sigma as a holistic methodology (Section 2.5).
2.3.1 Origins of Lean

The term 'lean' was coined by John Krafcik (1988) when he used it to document the continuous improvement philosophy behind the Toyota Production System (Standard & Davis, 1999:49). It was later further publicised by Womack et al. (2007) in their book, *The Machine that Changed the World*, which sought to explain the productivity differences between the Japanese and Western automakers.

Drew, McMcallum & Rogenhofer, (2004:6) define lean as:

“an integrated set of principles, practices, tools and techniques designed to address the root causes of operational underperformance. It is a systematic approach to eliminating the sources of loss from entire value streams in order to close the gap between actual performance and the requirements of customers and shareholders. To meet its objectives, it tries to eliminate three key sources of loss from operating system: waste, variability and inflexibility”

According to Andersson, Eriksson & Torstensson (2006:288), lean can be defined “as a systematic approach to identifying and eliminating waste through continuous improvement, flowing the product at the pull of the customer in the pursuit of perfection”. Shamah (2013:207) comments, “lean thinking is all about adding value where value is defined by the customer”. Focusing on value allows the organisation to get rid of activities that are wasteful, in so far that they add no value to the customer.

As mentioned in chapter one, lean thinking arose out of the need to solve manufacturing problems in Japan. Womack (2005) reflects on the evolution of lean’s scope and reach, noting in a letter to the *Lean Enterprise Institute* that “the spread of lean thinking [has moved] far beyond the factory and far beyond the high-wage economies to every corner of the world and to every value-creating activity”.
Womack & Jones (2003:10) identify five principles behind the lean organisation. These key principles include:

- Specify value by specific product;
- Identify the value stream for each product;
- Make value flow without interruption through the stream;
- Let the customer pull value from the producer; and
- Pursue perfection.

**Fig 2.4: Principles of Lean**

- **Value**
  - “The critical starting point for Lean Thinking is value. Value can only be defined by the ultimate customer when expressed in terms of a specific product or service, which meets the customer’s needs at a specific price at a specific time” (Womack & Jones, 2003:16).

- **Value Stream**
  - “The value stream is the set of all the specific actions required to bring a specific product through the problem-solving task from concept through detailed design and engineering to production launch, through detailed scheduling to delivery, to the customer” (Womack & Jones, 2003:19).

- **Flow**
  - “Once value has been precisely specified, the value stream fully mapped by the lean enterprise, wasteful steps eliminated, the value-creating steps should flow” (Womack & Jones, 2003:21).

- **Pull**
  - “Pull in simplest terms means that no one upstream should produce a good or service until the customer downstream asks for it” (Womack & Jones, 2003:67).

- **Perfection**
  - “As organisations begin to accurately specify value, and identify the entire value stream, customers should pull value from the enterprise,” (Womack & Jones, 2003:26).

Lean should be seen as more than just simply a cost cutting tool. Rather it should be seen as a broader concept that embraces a process and utilises a set of tools and techniques that lead to efficient ‘resource allocation’ (Atkinson 2004:18). “At its core, the lean management system is focused on eliminating waste (called *muda 無駄* in Japanese), creating value for end-use customers, and getting material and information to flow without interruption” (Emiliani & Stec, 2004:630). Firms can be considered as employing a lean approach when they endeavour to “do things better, faster and more effectively at a lower (although not always the lowest) cost” (Atkinson 2004:18). Put simply, lean can be viewed as a mechanism of achieving more with less, particularly
through rapid and relentless improvement whereby costs are cut without sacrificing quality.

For example, just after the Second World War, Taiichi Ohno took up the difficult task of re-designing production at Toyota. His new strategy had to take into account the constraints of the organisation and focus on getting the best product made within the limited investment available. Harvey (2004:1-2) explains that in the end Ohno focused on the following:

• Build only what is needed;
• Eliminate anything which does not add value;
• Stop if something goes wrong;
• Respect those engaged in the work;
• Strive for full utilisation of workers’ capabilities; and
• Place authority and responsibility for the work with those doing it.

The principles of lean ultimately should benefit organisational performance (discussed later). These principles of lean have moved from being applicable in a strictly manufacturing environment to working in a service environment. Organisations offering a service rather than a traditional product as of 2010 made up more than 80 percent of GDP within the US. The service industry is flourishing across both the developed and developing world (Wang and Chen, 2010:301).

2.3.2 Benefits of Lean

Lean can be considered a practice of thought. It is often referred to as a thinking paradigm, which distinguishes all activities within an organisation as either wasteful or adding value (Stone, 2012:114). Womack & Jones (2003:15) defined waste “as any human activity which absorbs resources but creates no value”. Meanwhile, value is “a capability provided to the customer at the right time at an appropriate price, as defined in each case by the customer” (Womack & Jones, 2003:311). The hallmark of lean thinking in action is, therefore, “the constant identification and elimination of waste from
an organisation’s processes, leaving only value added activities in the value stream” (Rother & Shook, 1999:vv, Stone, 2012:114).

Implementing lean strategies successfully can help employees see the waste that exists in their business processes (Ohno, 1988:55) or behaviour that only adds to the total cost without adding any value (Emiliani & Stec, 2004:622).

2.3.3 Implementing Lean: Reducing Waste

According to Abilla (2010:3), there are two types of activities which are prone to produce waste:

- Steps in a process that add no value, but are still essential due to the current system in place and;
- Extraneous steps that create no value and thus can be eliminated.

Ohno (1988) identifies seven classic forms of waste, (transportation, inventory, motion, waiting, overproduction, over-processing, defects or corrections). These, and three other wastes mentioned in the literature (skills or expertise, overload, unevenness) are detailed below.

2.3.3.1 Ohno’s Seven Types of Waste

Transportation

This waste materialises when goods or materials are unnecessarily moved from one location to another. A classic example of this is when manufacturing firms relocate pallets from one side of the warehouse or storeroom for no apparent reason (Pereira, 2009:1). In a banking environment that is more transactional, this waste occurs when there is unnecessary shifting of physical files or electronic information such as delivery of unneeded documents or capturing customer details on many systems (Motwani, Ptacek & Fleming, 2012:22).
**Inventory**

The point at which a company’s inventory becomes excessive and subsequently wasteful is hard to determine. Although all producers of goods or services require some level of inventory, stockpiling inventory in superfluous quantities is inefficient (Pereira, 2009:1). In the mainly office environment of the financial sector, these types of waste can be apparent in the exorbitant piles of paperwork and computer files which result in a burdensome amount of time spent looking for documents. Time is also often wasted when firms require multiple signature approvals. There also can be a large waste of paper when various staff is required to keep duplicate copies of the same reports (Motwani et al., 2012:22).

**Motion**

The waste of motion deals with the movement of people (rather than things) that is deemed to be unnecessary and does not add value to the product or service. This waste is often misunderstood and at times confused with the waste of transportation discussed above. In a traditional factory setting, it happens whenever assembly operators are forced to walk away from their work area to fetch a tool needed to complete their job. An example within the office environment would be, “the 39 times a day office workers are forced to get up from their desk and walk 32 paces to the shared printer (1,248 paces)” (Pereira, 2009:1). If movement is not done for the right reason, it can be a high productivity killer.

**Waiting**

The waste of waiting happens “anytime people are queued up” (Pereira, 2009:1). Waiting may occur for a number of reasons from computer downtime, waiting for executive signature approval, delays in feedback from high-level management, or waiting for meetings to make decisions. These all create waste in office and business systems (Motwani et al., 2012:23). In the South African financial sector, the commonplace phrase our systems are slow today is the ultimate example of this waste in action.
**Over-production**

This waste is often considered to be the largest most significant and most costly of all the types of waste that have been examined. It happens when a company produces more than its customers (internal or external) need. Over-production often happens in manufacturing when an operator knows that there are large costs and time delays involved in re-tooling his plant, so he produces an excessive number of items. Over-production can further lead to other forms of waste, including excess inventory, transportation and motion (Pereira, 2009:1). In an office setting this waste arises when people ‘reply all’ to long email chains send the same document multiple times, or attend inefficient meetings without any outcomes (Motwani et al., 2012:22).

**Over-processing**

Over-processing is the hardest waste to identify and not surprisingly, it is also the hardest to understand. In manufacturing, over-processing occurs when products are built at such a high build quality that the production cost exceeds the price that the customer is prepared (or willing) to pay (Pereira, 2009:1). In the office environment, this waste involves reports that are eternally revised due to multi-layered and excessive approval process. In general, over-production occurs when more energy is put in than is required (Motwani et al., 2012:23). It can be thought of as any extra effort that does not add value from the customer’s perspective (Abilla, 2010:24).

**Defects or corrections**

A defect is any work product that is less than the level the customer has requested. “In manufacturing terms, defects occur when the product has something wrong with it, such as when an electronic device won’t turn on because of a short in the circuit board” (Pereira, 2009:1). In the financial and bank service sector, this may occur when a data entry error happens. This type of waste is common when the organisation lacks integrated IT systems (Motwani et al., 2012:23). Having to redo anything because it was not done right the first time is careless (Abilla, 2010:24). The more defects a product or service has, the more corrections are needed to fix the initial mistakes. As a result it becomes both a waste of time and resources.
2.3.3.2 Three newly identified types of waste

In addition to the traditional categories of waste described above, three new wastes have recently been added into the literature discussions. These new areas include skills or expertise, overload and unevenness.

**Skills or expertise**

Lean has an inherent built-in principle that should be incorporated when eliminating the seven elements of waste described by Ohno; and that is – ‘respect for people’. Lean should recognise that a company’s most important assets are its employees. When it does not, waste occurs because companies do not fully leverage the talents of its workers. If employees feel they have been wasted and under-utilised, they may stop investing their skills in the company. Often, they even decide to resign and work at another organisation that may better utilise their skills and appreciate their expertise (Pereira, 2009:1).

**Overload**

Overload is a waste concerned with over-burdening or overworking a system, machine or process. This waste materialises when a new contract requiring 60 additional hours of work to be successfully completed is not granted enough people to finish the job. Another example is when workloads are not evenly distributed throughout a team. If certain members are asked to complete an excessive number of tasks, it can create a burden for these team members. The burden and strain on the system is seen as a waste (Motwani et al., 2012:23).

**Unevenness**

This waste is closely linked to the waste of ‘overload’ mentioned above. Unevenness is the leading cause of ‘overload’ and deals with the “lack of a constant flow of inputs / information / scheduled work from upstream processes, which then causes many other types of waste previously mentioned” (Motwani et al., 2012:23). Motwani et al. (2012:23) discuss how this waste occurs if managers create schedules where staff have extreme workloads at certain times of the month and then have no or little work at
other times of the month, rather than having work evenly spread throughout the month. Similarly, if there are poor office processes for locating documents when a staff member is on leave, bottlenecks in processes can occur, resulting in wasted time and resources.

2.3.3.3 Tools to Reduce Waste

Womack & Jones (2003:276) warn that one cannot remove waste from the process unless one understands what the customer values from the process. According to Womack & Jones (2003:276), much of the waste mentioned in the proceeding sections can be reduced or eliminated through the use of many lean six sigma tools, such as:

- 5S (Sort, Straighten, Scrub, Standardise and Sustain);
- Value stream mapping;
- Scheduled work;
- Work load balancing;
- Score cards;
- Visual controls; and
- Statistical analysis

Lean has an amazing ability to focus employees and give them a single goal of reducing waste and increasing value to the customer. The tangible benefits of lean have been well documented, though it is vexing why many organisations that go on the journey of ‘lean’ fail to fully implement the methodology. (Balle, 2005:14). Perhaps the answer lies in combining lean with the six sigma philosophy, which takes a different approach to waste.

2.4 Six Sigma

Whereas lean is focused on eliminating waste as a means of operational improvement, six sigma is concerned with reducing defects. Six sigma utilises statistical methods and is often displayed as the Greek letter ‘Sigma’ (σ). The methodology is put in place with the aim to create a sustainable competitive advantage. Highly structured processes are designed with the knowledge gained from both the internal and external environment. These processes are
put in place to produce superior products, services or enterprise innovations (Klefsjö, Bergquist & Edgeman, 2006:8).

2.4.1 Origins of Six Sigma

Six sigma was developed by Bill Smith, an engineer for Motorola in the 1980s (Brady & Allen, 2006:335). Bill Smith came up with the idea of “inserting hard-nosed statistics into the blurred philosophy of quality” (Basu, 2003:37). The term ‘six sigma' therefore originates from the manufacturing industry in which statistical modelling is utilised with a structured and systematic approach to minimise and measure the defect rate within the system. “Providing an organisational context that facilitates problem solving and exploration across the organisation” (Parast, 2011:2).

Six sigma strives for process improvement with the goal of reducing defects, which can be characterised as anything that causes customer dissatisfaction. Six sigma shifts the emphasis from fixing defective products at the end of the line to making perfect products from the outset. The main focus is to identify outputs that are of critical importance to customers and then eliminate causes of mistakes in these business processes (Antony & Banuelas, 2002:21, Basu, 2003:14).

The rate of defects is determined by measuring the ‘standard deviation’ in a process, only referred to as the variation in a process. Thus, the lower the “sigma level,” the higher the number of variations or defects there are in the process. Conversely, the higher the sigma level, the fewer the number of defects there are in the process. When noting the defects per million opportunities (also known as DPMO) in the process the ‘sigma level’ is used as shorthand. A ‘two sigma level’ process consists of 308,537 DPMO, a ‘three sigma level’ has 66,807 DPMO. Six sigma strives for a goal of a reduced defect rate of 3.4 DPMO. If achieved the process would be defect-free 99.99966 percent of the time (Antony & Banuelas, 2002:21, Brady & Allen, 2006:336).
Due to six sigma, Motorola managed to reduce their costs and variation in many processes, which allowed them to become the market leader, culminating with the company winning the *Malcolm Baldrige National Quality Award* in 1988. This success increased interest in the six sigma principles and many organisations across numerous industries began implementing these principles including most notably General Electric (GE) (Rancour & McCracken, 2000:29).

### 2.4.2 Benefits of Six Sigma

Advantages associated with six sigma include the following:

- **Generating sustained success**: six sigma fosters the skills and culture for consistent revival referred to as a ‘closed-loop system’.
- **Sets performance goals**: for all employees that facilitate consistently reaching business goals, six sigma uses a common business framework, a customer centric model.
- **Enhances value to the customer**: the firm learns what the customer values and sets about on how to deliver it.
- **Accelerates the rate of improvement**: by borrowing tools and ideas from many disciplines, six sigma helps the firm with both performance and improvement.
- **Promotes learning and ‘cross-pollination’**: ideas can be shared and performance compared more readily (Pande, Neuman & Cavanagh, 2000:11-13).

The above list shows how six sigma can benefit the firm by bringing about strategic change and an enhanced understanding of the organisation. The following changes in strategy that may occur include: introduction of new products, launching new ventures and entering new markets (Pande, Neuman & Cavanagh, 2000:11-13). Other benefits mentioned include “the reduction of waste, increased customer satisfaction, and improved financial results” (Revere, Black, & Huq, 2004 in Näslund, 2008:271).
Many national economies have indeed moved away from manufacturing and now have a service-based economy. In this environment, defects manifest themselves when processes are implemented poorly. For example, they create scrap and rework in the form of costs of poor service delivery leading to wasted resources (Bisgaard & Freiesleben, 2004:61). Six sigma is not merely a statistical procedure; it is about people, processes and executing projects that meet the customers’ expectations (Eoin, 2008: 314). Six sigma can be used in this case to reduce the costs of poor quality so that a more consistent process for service delivery may be achieved. This is often the case because customers feel ‘process variability’ and not ‘process average or mean’ when they receive a service from an organisation (they remember the one bad experience over the consistent good experiences). Six sigma can help the organisation by helping to achieve acceptable target service performance (Antony, Antony, Kumar & Cho, 2007:296).

2.4.3 Implementing Six Sigma: Tools and Techniques

Six sigma provides a customer focused, well-defined methodology supported by a clear set of comprehensive tools for process improvement (van Iwaarden, van Der Wiele, Dale, Williams & Bertsch, 2008:6746). One of the main instruments available in the six sigma toolbox is called ‘Define-Measure-Analyse-Improve-Control’ or DMAIC which primarily aims to improve processes (Tjahjono, Ball, Vitanov, Scorzafave, Nogueira, Calleja, Minguet, Narasimha, Rivas, Srivastava, Srivastava & Yadav 2010:220).

Pyzdek & Keller (2009:3) elaborate on DMAIC below, outlining it as:

\[
\begin{align*}
D & \quad \text{Define the goals of the improvement activity.} \\
M & \quad \text{Measure the existing system.} \\
A & \quad \text{Analyse the system to identify ways to eliminate the gap between the current performance of the system or process and the desired goal.} \\
I & \quad \text{Improve the system.} \\
C & \quad \text{Control the new system.}
\end{align*}
\]
A representation of the six sigma methodology using the DMAIC tool (discussed above) at its core is shown in Figure 2.5:

**Fig 2.5: Six Sigma Methodology**


In addition to DMAIC, there are numerous different types of tools including “flowcharts, check sheets, Pareto diagrams, cause/effect diagrams, scatter diagrams, histograms and statistical process control (SPC)” (Ferrin, Miller & Muthler, 2005:2012). These tools are often easy to use in on-going operational activities and breakthrough improvement projects (Magnusson, Kroslid & Bergman (2003), in Andersson et al., 2006:287).

Another major tool used is Design for Six Sigma (DFSS). Watson & deYong (2010:67), define DFSS as “a process to define, design and deliver innovative products, provide competitively attractive value to customers in a manner that achieves the critical-to-quality characteristics for all the significant functions”.
DFSS is best utilised for new product development (and innovation) that focuses on quality from the very beginning (Edgeman & Dugan, 2008:8, Mader, 2006:73-74).

These tools and techniques presented above allow the organisation to focus on efficiency whilst still allowing the organisation to act organically when the challenges of new ideas present themselves (Schroeder, Linderman, Liedtke & Choo, 2008:537).

As stated in the previous section, there are benefits offered to the firm if they implement lean. Similarly, there are gains to be made through six sigma that allow for strategic change and an enhanced understanding of the organisation as just mentioned. Unfortunately, it is not always clear “which situations should use lean tools rather than six sigma tools” (Chiarini & Bracci 2013:363). The next section examines the benefits of combining of lean and six sigma and why these two strategies should be used together for maximum performance enhancements.

2.5 Lean and Six Sigma

Following an examination of the literature on lean, which focuses on eliminating waste, and six sigma, which aims the reduction of variation, the review now turns to explore how these seemingly two distinct but complimentary theories can be combined. Building on the strengths of each philosophy, lean six sigma is a methodology that simultaneously strives to eliminate both waste and reduce variation (Salah et al., 2010:250).

Table 2.2 provides a comparison of the two concepts, which supports the hypothesis that there should be a statistically significant relationship between lean and six sigma (though this is not directly tested).
Table 2.2: Summary of the Key Similarities and Differences Between Lean and Six Sigma

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Six Sigma</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>The quality evolution in Japan and Motorola</td>
<td>The quality evolution in Japan and Toyota</td>
</tr>
<tr>
<td><strong>Theory</strong></td>
<td>No defects</td>
<td>Remove waste</td>
</tr>
<tr>
<td><strong>Process view</strong></td>
<td>Reduce variation and improve processes</td>
<td>Improve flow in processes</td>
</tr>
<tr>
<td><strong>Approach</strong></td>
<td>Project management</td>
<td>Project management</td>
</tr>
<tr>
<td><strong>Methodologies</strong></td>
<td>Define, measure, analyse, improve (or design), control (or verify)</td>
<td>Understanding customer value, value stream, analysis, flow, pull, perfection</td>
</tr>
<tr>
<td><strong>Tools</strong></td>
<td>Advanced statistical and analytical tools</td>
<td>Analytical tools</td>
</tr>
<tr>
<td><strong>Primary effects</strong></td>
<td>Save money</td>
<td>Reduce lead time</td>
</tr>
<tr>
<td><strong>Secondary effects</strong></td>
<td>Achieves business goals and improves financial performance</td>
<td>Reduces inventory, increases productivity and customer satisfaction</td>
</tr>
<tr>
<td><strong>Criticism</strong></td>
<td>Does not involve everybody, does not improve customer satisfaction, does not have a system view</td>
<td>Reduces flexibility, causes congestion in the supply chain, not applicable in all industries</td>
</tr>
</tbody>
</table>

(Andersson et al., 2006:290).

Although the two concepts differ in details, they both have the same ultimate aim. Both strive to create process improvements by minimizing waste and resources, which subsequently leads to greater customer satisfaction and organizational performance (Andersson et al., 2006:283).

### 2.5.1 Origins and Evolution of Lean Six Sigma

Lean six sigma is one of many incarnations of a quality improvement methodology. It advances on previous manifestations of continuous improvement strategies, which can be more broadly defined as “a culture of sustained improvement targeting the elimination of waste in all systems and processes of an organisation” (Bhuiyan & Baghel, 2005:761).

Importantly, lean six sigma encapsulates a methodical approach that can be used when trying to enhance performance such as quality, cost, delivery and customer satisfaction. The duality of lean six sigma with its combination of
both human and process improvement help tackle bottom line improvements and ever changing and increasing customer needs (Snee, 2010:11).

Looking back, both schools of thought - lean and six sigma - share similar origins from the quality evolution in Japan after World War II (Dahlgaard & Dahlgaard-Park, 2006:266). Geoge, Rowlands, & Kastle (2003:15) state that the main contrast between six sigma and lean is that the former focuses more on accomplishing no defects, during the latter focuses on improving process flow and eliminating waste.

While these concepts existed independently for decades, the seeds of a merger were planted in the early 1980s with the emergence of Total Quality Management (TQM) (See Figure 2.6). As a main predecessor of lean six sigma, Total Quality Management warrants some further discussion. This strategy deals with satisfying customers’ needs and wants at the lowest possible cost through extensive involvement of the organisation’s human resources.

The concepts found in Total Quality Management and lean six sigma can be interchangeable. Klefsjö et al. (2006:1) clarify this by stating that, “for decades now Total Quality Management has been a dominant management concept for improving competitiveness and financial results”. Though he highlights that in current times, total quality management seems to have lost some of its shine and other methodologies approaches such as lean enterprise and six sigma are now in vogue. He summarises his findings through a useful analogy, noting that these ideas can be thought of as different dishes that merely contain the same ingredients in different proportions. Kovacheva (2010:15) summarises this discussion by stating that Total Quality Management can be seen as a best practice that is part of the lean philosophy of waste reduction.

The original merger of lean and six sigma can be traced back to General Eclectic in the 1980’s / 1990’s, when they began notice how the two concepts complemented each other (Andersson et al., 2006:293). The diagram below
illustrates the evolution of various continuous improvement strategies over the decades that have led to the current methodology of lean six sigma.

Fig 2.6: Lean Six Sigma builds on the practical lessons learned from previous eras of operational improvement.

The diagram above illustrates how these methodologies are a collective of continuous improvement strategies. They can be described as “improvement initiatives that increase successes and reduce failures” (Juergensen, 2000:3). The organisational goal of all continuous improvement effort is business excellence, which can be defined as:

(Byrne et al., 2007:4)
“an overall way of working that balances stakeholder interests and increases the likelihood of sustainable competitive advantage and hence long-term organisational success through operational, customer-related, financial, and marketplace performance excellence” (Edgeman, Dahlgaard, Dahlgaard & Scherer, 1999:260).

It is important to understand lean six sigma within the context of all these various methodologies, as outlined in Figure 2.6. It provides a big picture view, which shows how lean six sigma is built on lessons learned from a multitude of different continuous improvement methodologies, including Total Quality Management, six sigma, lean, business process re-engineering, just-in-time (JIT), Kaizen and business excellence. (Andersson et al., 2006:283).

To exemplify this point, Andersson et al., 2006:283 uses the famous fable by John Godfrey Saxe: *The Blind Men and the Elephant*, recounts the story of six blind men who endeavour unsuccessfully to describe their findings after touching the same elephant (each of whom touched a different part of the elephant). This tale is a seemingly fit analogy of ‘quality management’. Each man comments on what the elephant feels like. While one of the blind men says, it “feels like a wall” after touching the elephant’s side, another blind man describes a snake after touching the trunk. In this fable, each blind man shapes his complete vision of the elephant by examining only a part of the animal. Similarly, advocates of ‘quality management’ have written a cannon of work about individual concepts based on their understanding of only particular elements within operational management rather than examining all the collective factors that contribute to the overarching framework of lean six sigma.

As the world keeps changing, lean six sigma continues to evolve as it is improved and adapted (Bisgaard & De Mast, 2006:30). This evolution of a combined lean and six sigma is creating a ‘learning organisation’ along with this other benefit, all of which are discussed in the next section.
2.5.2 Benefits of Lean Six Sigma

While lean is all about speed and efficiency, six sigma is about precision and accuracy. Lean ensures resources are working on the right activities while six sigma ensures things are done right the first time (Laureani, Antony & Douglas, 2010:758). The benefits of each system are amplified when combined as the best of both methodologies can be utilised in any given scenario, though the challenges that are faced when implementing the philosophies remain and may be even more complex when an organisation combines the two systems.

A major benefit gained through the combination of lean and six sigma is that it creates a new goal, that of growth, not just cost-cutting. Its aim is effectiveness, not just efficiency. The combination is “not just about doing things better, it is a way of doing better things” (Byrne et al., 2007:4). The hybrid has evolved as not all scenarios are sufficiently covered when there is a focus on only ‘sustaining high production rates and high quality’ (six sigma), or ‘producing less waste’ (lean). Lean alone cannot bring a process under statistical control and six sigma unilaterally implemented is unable to make any significant improvements with regards to processing speed or reduce invested capital (Bhuiyan & Baghel, 2005:765). Thus, the advantages of both six sigma and lean have been combined to provide a “one-two punch” (Smith, 2003:37).

Snee (2010:19) notes that lean six sigma has the ability to overcome the difficulties that are faced by other improvement process when they come to deployment, as lean six sigma works due to its eight key characteristics, listed below:

- “Creates bottom line results;
- Active senior management leadership;
- Uses a disciplined approach;
- Rapid project completion (three-six months);
- Clear definition of success;
• Infrastructure created;
• Focus on customer processes; and
• Sound statistical approach”.

There has been a long history of focusing on operating cost reductions in financial services. Most recently, the focus has been on efforts such as downsizing of branch networks, and increased usage of call centres. The efforts have shown improvements in profit and loss ratios (Atkinson, 2004:21). An advantage that lean six sigma has is that it is not a ‘technology solution’. It takes a more holistic approach and can be seen as a ‘thinking solution’. This benefit can be leveraged and higher returns can be achieved only when it is “implemented in the spirit of ‘relentless improvement’ rather than ‘quick fix’ cost reductions” (Atkinson, 2004:21).

The idea of ‘eliminating waste’ tends to focus employees’ efforts on what the customers desire and the value and quality they are willing to pay for. The result is improved business processes manifested in shorter lead-times, fewer defects, fewer errors, and lower costs (Emiliani, Stec, Grasso & Stodder, 2007:89,150). All this helps to eliminate the types of waste identified earlier.

In particular, the seven dimensions of work in the office, as introduced by Swank (2003:125) as discussed below be altered in order to reduce waste and increase efficiencies. These dimensions include:

**Placing linked processes near one another**

Traditionally staff are grouped by function or specialised department / division, though this often leads to employees who work closely together on a process to be physically far apart, sometimes even in different buildings. This splitting of employees can lead to them not understanding how they fit together in the process. They may not understand that they are, in fact, a combined whole that has a specific purpose or holistic task they need to achieve. Rearranging teams can help break down traditional silos that may exist in the organisation (Swank, 2003:125).
**Standardising Procedure**

While it is important for employees to have some freedom to achieve their daily tasks, without having a standard way of doing things it becomes difficult for tasks to be completed correctly by stand in employees who may need complete someone else’s task from time to time (Swank, 2003:125).

**Eliminating loopbacks**

A loopback occurs when work is returned to a previous step for further work to be done on it. Rearranging or splitting teams so that they have more specific tasks to complete may help reduce this from accruing. The main benefit is that this new clarity helps to alleviate confusion of employees around whose job it is to make sure certain tasks are completed successfully. This both reduces delays and also improves the quality of output (Swank, 2003:125).

**Setting a common tempo**

When focusing on the day-to-day usual tasks of operating a business, smoothing out the flow of work can reduce stress for the entire team. The way this is achieved is to establish a reasonable baseline time to complete a set of tasks, such as completing ten applications an hour. These baseline times can be reviewed and potently shortened when feasible. Once the baseline has been achieved, the minimum number of employees required to meet the new expectation can be determined. There are a multitude of benefits from freeing up capacity of employees to improving quality (Swank, 2003:125).

**Balancing loads**

Workloads should be evenly distributed across the team. This is not just for fairness sake, but it helps reduce unnecessary delays and thus increases value (Swank, 2003:126).

**Segregating complexity**

In a bank branch, it is painfully apparent when this dimension has not had any thought put into it. An example is when someone is standing in line behind a teller who is dealing with a particularly complex and lengthy transaction.
Meanwhile, many other customers are waiting in line thought why is there not another line to deal with simple transactions that require minimal paperwork. The turnaround time for the simple transactions can fall by as much as 80% if complexity is segregated (Swank, 2003:126).

**Posting performance results**

If productivity rates can be displayed in relation to the company’s expectations, then when performance dips lower than the expected result, discussions can be had on how to rectify the situation. This has obvious benefits (Swank, 2003:125).

In addition to the improvements listed above, service-oriented companies adopting lean six sigma will have the following benefits through the use on data and facts instead of gut-feelings and hunches:

- Effective management decisions.
- Increased understanding of customer needs and expectations.
- Efficient and reliable internal operations.
- Improved knowledge across the organisation.
- Reduced number of non-value added operations.
- Reduced variability in service performance.
- Transformation of organisational culture from being reactive to proactive thinking or mind-set.

### 2.5.3 Implementing Lean Six Sigma: Approaches and Challenges

Lean six sigma implementation should be viewed as a continuous journey rather than a task achieved as a once off goal. As with all journeys, implementing lean six sigma “might not always produce the expected benefits” (Pay, 2008:62). The table below outlines some of the main challenges identified in the literature.
Table 2.3: Implementation Challenges of Lean Six Sigma

<table>
<thead>
<tr>
<th>Willingness to learn</th>
<th>Where “assumptions are surfaced and challenged” (Kettinger &amp; Grover, 1995:17).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture readiness</td>
<td>Where employees are part of the solution, not part of the problem (James, 2006:17).</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>Creates a common frame of reference, and the opportunity to share relevant ideas and feedback (Eskerod, 2009:8)</td>
</tr>
<tr>
<td>Process Management</td>
<td>Focus on improving the entire business system, rather than optimising individual parts of the business. The idea is that favourable results can be easily repeated (Emiliani &amp; Stec, 2004:630).</td>
</tr>
</tbody>
</table>

One of the major stumbling blocks of implementation often rests with the implementers themselves. James (2006:16) states that in many instances, organisations ‘stub their toe on the human element’ of implementation. In particular, problems may arise if senior management is not fully committed or does not fully understand the benefits of successfully implementing lean six sigma. There has to be the right people in the organisation that are willing to take on the culture change required for lean six sigma to take hold (Pay, 2008:62).

In order to address the “people problem” issue, Atkinson (2004:21-22) proposes a four-step approach to implementing lean six sigma strategies, namely:
1) Selling and communicating the philosophy: Attention should be placed on the beneficial outcomes of the methodology rather than the particulars of the tools that are utilised.

2) Senior management commitment: A critical stage dedicated to ensuring senior staff buy-in since without the proper managerial responsibility, the process becomes stifled, and no further stages will be successful.

3) Design of projects: When first implementing lean six sigma, it should occupy a high profile. The methodology should be introduced to the organisation thorough high impact projects with short time frames. There should be a demonstration on how lean six sigma was instrumental in impacting the major problems solved by the successful completion of the project. It helps build commitment to the methodology. This leads to the final stage.

4) Selling the benefits of lean six sigma thinking: Once the benefits of the methodology have been ‘sold’ to employees, it becomes critical to shift the culture and how employees think about solving problems. Workers need to develop a new “outward view at looking, learning and thinking about old problems”.

Tjahjono et al. (2010:220) argues that the success of lean six sigma “does not rely only on statistical tools and techniques but also on the commitment of the top management to guarantee the involvement of the employees in the organisation”. Managers at all levels of the organisation should successfully apply the above concepts collectively in order to significantly improve the competitive edge of their products and services. If they do not achieve the above, the challenge of successful implementation will be very difficult and the potential improvements to organisational performance may never be realised (Motwani 2003:345).

2.5.4 Lean Six Sigma and Organisational Performance

This section reviews the relationship between lean six sigma and whether it benefits organisational performance or not. Many findings propose that firms which adopt continuous improvement strategies, such as lean six sigma, gain
an advantage after implementing the strategy (Shafer & Moeller, 2012:522).

Parast (2009:46) states that lean six sigma provides an organisational context that “facilitates problem solving and exploration across the organisation”. Organisational performance is also enhanced by lean six sigma, as it allows them to be more flexible when needed, such as during times when new ideas are initiated. This flexibility is granted by allowing the firm to switch structures easily (Daft, 2001:455).

Whilst there are many citations of positive effects on organisational performance, there are others who offer concern and criticism. They argue that there is “little theoretical support on the effectiveness of these projects on organisational performance” (Parast, 2011:46-74). Still others state that the continuous improvement strategies merely ‘come along for the ride’, implying that there is no hard evidence that the performance of successful firms improve as a result of implementing lean six sigma. The suggestion is that when a firm has a high level of performance prior to implementation, they maintain the performance, and the adoption of quality management was not the main factor for maintaining their competitive advantage (York & Mire, 2004: 293-295).

This discussion leads to a hypothesis that there is a statistically significant relationship between lean six sigma (waste reduction and variation reduction) and organisational performance ($H_0^4$ and $H_0^5$).

2.6 The Relationship between Corporate Entrepreneurship and Lean Six Sigma

The final section of the chapter gets at the heart of the study, which explores the nature and extent of the relationship between the two methodologies of corporate entrepreneurship and lean six sigma.

2.6.1 Overview of the Relationship

Throughout the literature, there is an on-going debate as to whether or not
there is a positive or negative relationship between lean six sigma and corporate entrepreneurship. Proponents believe that lean six sigma and corporate entrepreneurship are not only compatible, but have a symbiotic relationship. On the other hand, some argue that the methodologies counter each other. The following section discusses arguments for both sides by comparing elements of each methodology with each other.

The question as to whether corporate entrepreneurship and lean six sigma have a statistically significant positive relationship is the basis of this thesis. In other words, do elements and rates of corporate entrepreneurship and lean six sigma implementation increase or decrease in the same direction and at the same rate? As one goes up or down, what happens to the other?

It should be noted that an identified correlation does not imply causation. Corporate entrepreneurship is not necessarily occurring because of lean six sigma or the other way around. However, if a positive relationship is found, it may mean that implementing one methodology could facilitate the establishment or expansion of the other. The counter argument also could be made, in which it is determined that when corporate entrepreneurship increases, lean six sigma decreases and vice versa.

### 2.6.2 Arguments for a Positive Relationship

Many authors make a compelling case for a favourable relationship between lean six sigma and corporate entrepreneurship. Both philosophies have a strong focus on customers and processes as means of improving business outputs. Although there is a fundamental difference in timing between these two philosophies, the literature outlined below shows how they complement each other in a beneficial way.

While corporate entrepreneurship does not affect organisational performance often, when it does happen, it occurs at a rapid pace. In contrast, given that lean six sigma is incremental in nature, implementing this methodology advances the firm at a far slower pace. Establishing lean six sigma’s incremental adjustments on a daily basis helps keep firms running at an
optimal stable level. This allows the interruption of a breakthrough entrepreneurial idea to be implemented without causing a disabling disruption. Hammer & Champy’s (2003:239) state that lean six sigma “should be used to keep a company’s processes tuned up between the periodic process replacements that only reengineering (corporate entrepreneurship) can accomplish”.

The main idea of the positive argument is that both corporate entrepreneurship and lean six sigma should not be seen as a “stand alone” systems and rather as systems that need to operate alongside each other (Hoerl, Gardner, 2011:33).

O’Reilly & Tushman (2004:74-75) assert that lean six sigma has the ability to address both efficiency and innovation. They believe that the stability offered by lean six sigma can grant organisations additional flexibility that facilitates experimentation and allows businesses to focus on both incremental change (Kaizen via lean six sigma as described below) and radical change (through entrepreneurship). Thus, lean six sigma allows the creation of a flexible environment that in turn creates an enabling environment for corporate entrepreneurship. As described below, the two methodologies are both compatible and can even enable situations where implementing both philosophies together can produce even greater positive results than had a company implemented only one on its own.

2.6.2.1 Innovation

Some studies consider lean six sigma as not only part of the innovation process but as a form of innovation in itself. (Cooper, 1998:500). As mentioned above, it’s a matter of timing. Lean six sigma is constantly striving for innovation across the entire enterprise, though not via a significant breakthrough event but rather a slow and steady incremental approach (Byrne et al., 2007:6).

In lean six sigma, one significant tool that concentrates on this incremental approach to process improvement is called Kaizen (改善), which can be
translated from Japanese as either ‘incremental innovation’, ‘improvement’ or ‘change for the best’ (Imai, 1986). Imai (1986:25) states that the purpose of Kaizen is not as a substitution for innovation but rather Kaizen is needed to sustain the long-term benefits resulting from the bursts of innovation, often associated with corporate entrepreneurship. To highlight the characteristics of these concepts, the table below summarises a comparison between these two extreme types of innovation—the one sparked by a breakthrough (corporate entrepreneurship) the other innovation that is more incremental in nature (lean six sigma). While these concepts may differ in their timelines and frequency, they are both essentially explaining various kinds of revolutionary transformations.
Table 2.4: Features of Incremental (Kaizen) and Breakthrough Innovation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Breakthrough Innovation (Corporate Entrepreneurship)</th>
<th>Kaizen (incremental innovation as seen in lean six sigma).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect</td>
<td>Short-term, but dramatic</td>
<td>Long-term and long-lasting, but un-dramatic</td>
</tr>
<tr>
<td>Pace</td>
<td>Big steps</td>
<td>Small steps</td>
</tr>
<tr>
<td>Time frame</td>
<td>Intermittent and non-incremental</td>
<td>Continuous and incremental</td>
</tr>
<tr>
<td>Change</td>
<td>Abrupt and volatile</td>
<td>Gradual and constant</td>
</tr>
<tr>
<td>Involvement</td>
<td>Select few “champions”</td>
<td>Everybody</td>
</tr>
<tr>
<td>Approach</td>
<td>Rugged individualism, individual ideas and efforts</td>
<td>Collectivism, group efforts, systems approach</td>
</tr>
<tr>
<td>Mode</td>
<td>Scrap and rebuild</td>
<td>Maintenance and improvement</td>
</tr>
<tr>
<td>Spark</td>
<td>Technological breakthroughs, new inventions, new theories</td>
<td>Conventional know-how and state of the art</td>
</tr>
<tr>
<td>Practical requirements</td>
<td>Requires large investment, but little effort to maintain it</td>
<td>Requires little investment, but great effort to maintain it</td>
</tr>
<tr>
<td>Effort orientation</td>
<td>Technology</td>
<td>People</td>
</tr>
<tr>
<td>Evaluation criteria</td>
<td>Results for profits</td>
<td>Process and efforts for better results</td>
</tr>
<tr>
<td>Advantage</td>
<td>Better suited to fast-growth economy</td>
<td>Works well in slow-growth economy</td>
</tr>
</tbody>
</table>

(Imai, 1986, 24-25).

The table suggests that Kaizen is a foundation of breakthrough innovation. Implementing elements from both the corporate entrepreneurship and lean six sigma sides of the table helps to build a strong platform, whereby true innovation can successfully be implemented. However, some experts caution that Kaizen should be practiced in moderation, noting that it has the potential to hamper processes that spark innovation. These negative aspects are discussed later in this chapter.

2.6.2.2 Customer Focus

Both corporate entrepreneurship and lean six sigma consider customer focus a key element of their overall strategies.
From a corporate entrepreneurship view, customer focus encourages organisations to be innovative because they have to seek a better way to meet and exceed customers’ requirements (Prajogo & Sohal, 2001:545). Due to competitive environments, all firms (including banks) are challenged to keep up with the pace of the field and adopt entrepreneurial strategies as fast as the environment changes, and more importantly, as quickly as customers’ requirements change. The idea is to “deliver high quality, innovative products and services that exceed the customers’ expectations” (Al-Swidi & Mahmood, 2011:28).

Similarly from a lean six sigma perspective, Found and Harrison (2012:252) ask “how can you remove waste from a process unless you understand what the customer values from the process?” Lean six sigma helps achieve enterprise excellence by focusing on the customer and determining ‘what the customer really wants’ at every stage of the development process “from the identification of customer needs to the final launch of a new product or service” (Montgomery, 2010:62).

The above two paragraphs highlight how similar the approaches of corporate entrepreneurship and lean six sigma are to each other. With regard to customer focus, they both look to add real value to the customer in ways that matter to them.

**2.6.2.3 Management Style**

McAdam, Armstrong & Kelly (1998:139) express the possibility of synergies between corporate entrepreneurship and lean six sigma in their comparative study of the two philosophies. They argue that these synergies become evident when comparing managers who nurture a positive environment for either corporate entrepreneurship or lean six sigma. The researchers found that these environments that were being fostered by these managers in many ways mirrored each other and were conducive for both methodologies.

Table 2.5 shows their results of a general comparison of the two environments.
Table 2.5: Comparison of Work Environments Fostered by Managers

<table>
<thead>
<tr>
<th>Managers who foster an environment conducive to Corporate Entrepreneurship do most, if not all of the following: (Samaha, 1996:144)</th>
<th>Managers who foster an environment conducive for lean six sigma) environment do most if not all of the following: (Luthans &amp; Kessler, 1993:8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Encourage a learning organisation</td>
<td>1. Self-image themselves as a team leader, sponsor or internal consultant</td>
</tr>
<tr>
<td>2. Create long-term goals</td>
<td>2. Cut across functional lines dealing with anyone necessary to attain quality goals</td>
</tr>
<tr>
<td>3. Manage innovation proactively</td>
<td>3. Change the composition of teams in response to customer needs and needed innovation</td>
</tr>
<tr>
<td>4. Make innovation part of the strategy</td>
<td>4. Act and make decisions as part of a team</td>
</tr>
<tr>
<td>5. Create a consistent recognition system</td>
<td>5. Share and supplement information with team or anyone else</td>
</tr>
<tr>
<td>6. Create opportunities for cross-functional collaboration</td>
<td>6. Becomes an expert and has significant assignments in many different functions</td>
</tr>
<tr>
<td>7. Teach teamwork</td>
<td>7. Demand quality results and loyalty not only to the organisation and one’s boss, but also to subordinates, team-mates in other departments and especially customers</td>
</tr>
<tr>
<td>8. Encourage the use of problem-solving skills</td>
<td></td>
</tr>
<tr>
<td>9. Teach people to assess their creative potential</td>
<td></td>
</tr>
<tr>
<td>10. Take a step to overcome barriers to innovation</td>
<td></td>
</tr>
</tbody>
</table>

(McAdam et al., 1998:141).

The table shows that when a firm scores high on both corporate entrepreneurship and lean six sigma, the organisation promotes cross-functional teamwork. This leads to improved communication (Prajogo & Sohal, 2001:545). In turn, as both methodologies promote dialog and a culture of trust, an adversarial nature is diminished and businesses prosper (McAdam et al., 1998:144-145). In other words, creating a culture of continuous improvement via lean six sigma promotes the establishment of an increasingly innovative practice where corporate entrepreneurship can flourish.
2.6.3 Arguments for a Negative Relationship

Andersson et al., (2006:289) states that combining corporate entrepreneurship and lean six sigma saying that lean six sigma is not always a good idea in that the “principles do not always apply [especially] when customer demand is unstable and unpredictable”. Other literature goes further and argues that there is a negative relationship, and they should never be combined. Prajogo & Sohal (2001:545) summarise this by saying that continuous improvement process is only workable when the underlying system of production is stable and repetitive.

One of the main areas where the literature maintains the two methodologies hamper each other is around innovation. As discussed above, one of lean six sigma’s central principles is the idea of Kaizen (改善) or 'incremental innovation' (Imai, 1986). Aside from its benefits outlined above, this idea of small gradual steps forward is perceived as having several key weaknesses with regard to mainstream notions of innovation and corporate entrepreneurship. Primarily, some believe that Kaizen could lead teams to work on unambitious goals that centre around uncreative solutions. As Kaizen promotes small victories, it can, therefore, hinder novel ideas from taking root and thus preventing the establishment of more radical innovations. In contrast to Kaizen, entrepreneurial firms by design exist in an environment that is unstable and unpredictable.

Supporters of Kaizen believe an incremental approach to innovation emanates from the aspiration of continuously adapting to the evolution of current customer needs. However, in meeting the current needs, lean six sigma cancels out the idea of ever achieving more radical projects that could meet the not yet identified future needs of potential customers. The famous quote that has been credited to Henry Ford summarises this idea, (Though there is little evidence he ever said these exact words) “If I had asked people what they wanted, they would have said faster horses” (Vlaskovits, 2011). In this instance, the literature argues that Kaizen fosters an environment that squelches ambition and the entrepreneurial spirit (Santos-Vijande &
González-Alvarez, 2007:516-517). Harari (1993:37) sums up this harmful effect by noting that the obsession of achieving a zero-defect "do-it-right-first-time" routine is a dangerous luxury that often slows down new breakthrough development in products and services.

Prajogo & Sohal (2001:545) state that lean six sigma leads the organisation to be reactive in responding to current customer needs. Being reactive limits the firm's ability to engage in the entrepreneurial element of opportunity recognition. It reduces the chance that the firm will explore unserved needs and markets. Prajogo & Sohal (2001:545) state that serving your current customers in a reactive manner decreases the chance that the firm will develop radical new products and be a first-mover. In essence, according to these authors, if a firm implements Kaizen (via lean six sigma), its ability to also implement corporate entrepreneurship will suffer.

Another issue raised in the literature around whether lean six sigma and corporate entrepreneurship working together is around cost improvements. While focusing on cost improvement is important for lean six sigma, it may have a stifling effect on the corporate entrepreneurship nature that businesses are trying to foster (Mokaya, 2012:134). One way of improving cost according to the lean six sigma philosophy is to reduce slack, but this goes against the corporate entrepreneurship belief that the availability of slack resources are, in fact, an essential prerequisite for innovation (Prajogo & Sohal, 2001:545). If one believes this line of reasoning, it’s not possible to both reduce slack and be innovative at the same time. Likewise, it would not be feasible to be innovative and frugal at the same time.

2.7 A Summary of the Study’s Hypotheses

Below is a brief summary of the hypotheses for this thesis, which builds on the literature discussed in Chapter 2.

The chapter began with a discussion around defining corporate entrepreneurship and its three main characteristics, (a) innovation, (b)
organisational flexibility and (c) environmental scanning. These constructs were reviewed along with the overall benefits of corporate entrepreneurship.

Next, the elements of lean six sigma, along with its history and evolution were discussed. The two main elements of this methodology that were highlighted entailed (a) waste reduction and (b) variation reduction.

All five of these elements, the three from corporate entrepreneurship and the two from lean six sigma were discussed in the context of organisational performance.

The chapter then reviewed the literature that discussed the potential relationships that may exist between corporate entrepreneurship and lean six sigma.

The literature review informed the development of the following hypotheses and their sub-sections. $H_o^1$ to $H_o^5$, query if there is a ‘statistical significant correlation between’ the five elements and each other (the three form corporate entrepreneurship, and the two from lean six sigma) and if there is a relation to organisational performance.

$(H_o^1)$: States that there is no statistical significant correlation between ‘innovation’ and $(H_o^{1a})$: ‘variation reduction’, $(H_o^{1b})$: ‘waste reduction’, $(H_o^{1c})$: ‘organisational performance’

$(H_o^2)$: States that there is no statistical significant correlation between ‘organisational flexibility and $(H_o^{2a})$: ‘variation reduction’, $(H_o^{2b})$: ‘waste reduction’, $(H_o^{2c})$: ‘organisational performance’

$(H_o^3)$: States that there is no statistical significant correlation between ‘environmental scanning’ and $(H_o^{3a})$: ‘variation reduction’, $(H_o^{3b})$: ‘waste reduction’, $(H_o^{3c})$: ‘organisational performance’
\( (H_0^4) \): States that there is no statistical significant correlation between 'variation reduction' and 'organisational performance'

\( (H_0^5) \): States that there is no statistical significant correlation between 'waste reduction' and 'organisational performance'

First \( H_0^1 \) \( H_0^2 \) \( H_0^3 \) are graphically represented below. Followed by \( H_0^4 \) and \( H_0^5 \).

**Fig 2.7: Hypotheses \( H_0^1 \) to \( H_0^3 \)**

The relationship between corporate entrepreneurship and lean six sigma was also reviewed in the context of organisational performance that led to \( H_0^4 \) and \( H_0^5 \) figure 2.8 Below represents these.

**Fig 2.8: Hypothesis \( H_0^4 \) to \( H_0^5 \)**

In addition, the study will explore whether gender and age have an effect on the organisation’s practice of corporate entrepreneurship and lean six sigma.
(H$_{6}$): There is no statistical significant difference of opinion between male and female respondents with reference to the practice of (H$_{6a}$): ‘lean six sigma’, (H$_{6b}$): ‘corporate entrepreneurship’,

(H$_{7}$): There is no statistical significant difference of opinion between the age groups of respondents with reference to the practice of (H$_{7a}$): ‘lean six sigma’, (H$_{7b}$): ‘corporate entrepreneurship’.

2.8 Conclusion

This study posits that if South African financial institutions could effectively learn how to use lean six sigma principles successfully, it could lead to a multitude of positive effects. These positive outcomes may include the enhancement of innovations in new financial products and services, improvements in operations and possibly most importantly, it may even lead to enhancements of the company’s underlying business model, which in turn, may help to increase the organisation’s entrepreneurial intensity (Byrne et al., 2007:5).

This chapter examined the origins, evolution and various elements of corporate entrepreneurship and lean six sigma. It further reviewed the benefits and implementation challenges of each concept. Following a discussion around organisational performance in relationship to first corporate entrepreneurship and then later to lean six sigma, hypotheses were formed that there is 1) a relationship between corporate entrepreneurship and organisational performance and 2) a relationship between lean six sigma and organisational performance.

The chapter then reviewed the two potential directional relationships between corporate entrepreneurship and lean six sigma. While some literature supports a positive relationship between the two, other authors argue that the relationship is negative. In conclusion, this thesis will hypothesise that the key elements that make up corporate entrepreneurship and lean six sigma have a relation to each other. The next chapter reviews the research methodology.
Chapter 3: Research Methodology

3.1 Introduction

The chapter will discuss the study design, the population and sampling methodology, data collection processes and the measuring instruments that were utilised. The chapter is completed by reviewing some of the limitations of the study.

3.2 Research Design

Muton (2011:55-56) describes research design as a plan or blueprint of how the research is intended to be conducted. The design should make sure that all elements of the research are put in place in order to answer the ‘research question’ in a satisfactory manner. Kuma (2005:84) elaborates on this concept by stating that research needs “a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically”.

This study will be quantitative in nature. Creswell (1994:12,54) describes a quantitative study as being an enquiry process based on experimentation, a theory composed of variables and treatments, measured with numbers, and analysed with statistical procedures, in order to determine whether the predictive generalisations of the theory hold true.

A quantitative study design was selected, as it is the best means to undertake the research question at hand, namely the empirical assessment of the practice of corporate entrepreneurship and lean six sigma in the South African financial sector. The insights discovered while the writing of the literature review informed the development and design of the measurement instruments, primarily the research questionnaire, used in this study. Details of the questionnaire are discussed in section 3.4 and the questionnaire can be found in Appendix 1.
3.3 Population and Sampling Design

3.3.1 Study Population

This section reviews the population profile and its related attributes. “A population is the entire set of individuals of interest to a researcher. Although the entire population usually does not participate in a study, the results from the study are generalised to the entire population” (Gravetter & Forzano, 2006:138).

For this study the population would consists of employees working at a South African Registered Bank in either an analytical team or one dealing with special projects, including research and development. Employees with specialised knowledge in the field of study were targeted, with a special focus on recruiting individuals who work in the relevant departments at their financial institutions. For example, people who work in innovation or process improvement were actively sought to participate and complete the questionnaire.

There are 17 registered banks within South Africa. Ten of these banks are locally controlled the other seven are foreign controlled. The locally controlled banks were the focus of the study, with Absa Bank Limited being an exception as the only foreign controlled bank to be included. Standard Bank was also included, but is still considered to be locally controlled with only 40% of shares being foreign controlled (Standard Bank, 2009:27). The reason to include Absa Bank Limited is due to them being considered one of the ‘big four’ banks in South Africa (Reserve Bank of South Africa, 2013).

According to the Banking Association of South Africa, there are around 50 000 people employed at banks within South Africa. This figure includes staff at headquarters and all the branches / call centres. This study was concerned with head office staff only, as they have a direct impact on the topics under discussion. There are no clear statistics on the size of this head-office population within the overall bank staff population. In addition it is difficult to extrapolate an exact sample frame of this population. It was also
challenging to get in contact with this population due to perceived potential confidentiality issues and time constraints (e.g. this population is often in meetings or busy on assignments with tight deadlines).

Although there are many types of sampling methods each with their own distinct positive and negative features, a snowball sampling method was selected for this study given the limitations of the population noted above. Along with the limitations the researcher faced lack of time and budget.

3.3.2 Sampling Design

Snowball sampling is a non-probability method of sampling. Unlike probability methods that are based on the principles of randomness, non-probability methods are not (Maree, 2011:176). Maree (2011:176) notes that non-probability sampling does not make use of a random selection of population elements which is an obvious drawback of this method. However, there are valid reasons why this method would be selected are as follows:

- Limited time available;
- Lack of funding available;
- Need for the measuring instrument to be tested; and
- The expert opinion of participants is required.

Types of non-probability sampling are as follows:
- Convenience sampling;
- Quota sampling;
- Snowball / Network sampling; and
- Purposive sampling (Maree, 2011:176).

As noted earlier, this study will use the non-probability sample method of Snowball or Network sampling. This is a purposive sample method picking individuals who are most important to the study. The key characteristic of this sampling method is that initially selected participants are asked to identify and recruit other potential participants who meet the study criteria. This sampling method is used as a way of recruiting participants. The major advantage of
this method is that the nominator is used as a reference to enhance the researchers credibility. As the participants in the study need to be knowledgeable and have an expert opinion on the specific issues being assessed, by nature they are hard to get hold of and are small in number (Denscombe, 2010:35-37). For this reason snowball sampling was the optimal method to use.

The researcher followed a multi-step process to implement the snowball sampling method. The start-up point was first identifying a known group of individuals who could be used as a ‘seed’. This list of individuals is usually a homogenous group comprising of a list of members of the population. In this instance, the researcher has worked at a number of banks and has a moderate network of individuals who either work at other banks or know of people who work there. Thus this initial list was targeted through this personal network of colleagues and friends. In addition, a web search on Linkedin for bank employees that fit the inclusion criteria was conducted. This led to recruiting a few additional participants who were targeted via cold calling a number of strangers. The contacts provided from this group produced the first wave, which in turn, provided the names of additional colleagues that produced wave two.

**Fig 3.1: Sampling Steps**

![Figure 3.1: Sampling Steps](image-url)

Snowball Sampling process (each wave increases the sampling size).
The process ended with wave two for two reasons. First, not enough new contacts were made to constitute a third wave. Second, the 248 data points were very close to the goal of the sample size that was originally set. The study aimed for 100 respondents, and it was believed that at least 250 identified potential respondents were required to reach the desired sample size. This marked the closure of the sampling method. Reminders were sent out on a few occasions, with a final reminder and noted deadline sent to all individuals to increase the response rate.

### 3.3.3 Study Sample

The study has a particular focus on South African banks with the unit of analysis being individual bank employees and not banks. Respondents were required to not only be knowledgeable about lean six sigma (continuous improvement strategies) and corporate entrepreneurship, but also had to be currently be working at a South African bank (thus have adequate knowledge of the financial industry in general). The final number of participants contacted was 248 and the number of eventual respondents were 102, giving a response rate of 41%.

### 3.4 Data Collection Method

This study utilised an on-line self-administered questionnaire. Self-completion survey methods can benefit from the complete absence of an interviewer, as it removes the major source of potential bias and allows the respondents to be fully honest in their answers. A major disadvantage with the lack of an interviewer is that there is no opportunity for additional follow-up questions to probe any answers or explain questions that may be misunderstood. From the perspective of the survey design, self-completion questionnaires are often considerably cheaper per interview to administer than interviewer-administered ones. The downside to the method is the typically low response rate (Brace, 2008:29).

The self-completion questionnaire selected was a web-based self-completion questionnaire what was sent out with an embedded URL to the questionnaire in an e-mail. The respondents were invited by e-mail to the survey site, and
the e-mail contained a URL or web address on which the respondent will click. It will be delivered by either e-mail or in person to the relevant individuals. The advantages of this process includes the fact that participants have time to consider their answers, with no time pressure. According to Brace (2008:30-33) it has been found that web-based questionnaires are completed faster than their equivalent telephonic or face-to-face versions. Being faster in nature is a more pleasurable experience to the respondents. Another major benefit of this method is that is protects the identity of respondents and ensure their anonymity, something many bank employees value greatly.

Prior to the survey, being sent out to potential respondents a small pilot study was conducted. Participants in this pilot study were chosen at random. The result of the study was that a number of questions had to be reworded for clarity. The main result was to help with proving a level of face value validity in the study before data collection was commenced.

The output responses of the questionnaire were directly exported to SAS enterprise guide for statistical analysis.

3.5 Measuring Instrument

The survey was based on both the literature review and data gathered by field research. The survey solicits opinions based on the professional experience of respondents. In particular, questions focused on their opinion regarding the practice of corporate entrepreneurship and lean six sigma in their respective institutions.

The questionnaire is made up of closed pre-coded question. The structure of the questionnaire is stated below:

- Demographics
- Corporate Entrepreneurship;
  - Innovation and Risk Scanning Scale
  - Opportunity Recognition Scale
  - Organisational Flexibility Scale
• Lean Six Sigma
  o Variation Reduction Scale
  o Waste Reduction Scale
• Organisational Performance Scale

3.5.1 Demographics

The demographics section asked three personal information questions of the participant. They are all multiple-choice questions enquiring the gender and age of the participant. The final question asked about the size of the organisation where they currently work.

3.5.2 Corporate Entrepreneurship

The measuring instrument looked at the levels of corporate entrepreneurship within the banks. The following elements, (a) Opportunity recognition, (b) Organisational flexibility and (c) the relationship of risk taking and innovation, of this measuring instrument have been adapted from the work by Barringer & Bluedorn (1999:423), where they were examining the relationship between corporate entrepreneurship and strategic management.

3.5.2.1 Innovation and Risk Scale

This section will attempt to identify the perception of the respondents with regards to how innovative and risk averse their bank is. Being innovative and risk averse can be considered an output of the entrepreneurial endeavours of the organisation.

There were twelve questions in this scale. The questions were split into three sections. The first four questions focus on with management style. The next five deal with the outputs of the organisation. The last three investigate how the organisation handles competitors. All the questions are on a five point Likert scale ranging from ‘Strongly Disagree’ to ‘Strongly Agree’.

In the first four questions respondents were asked about the type and nature of projects that have been undertaken, and question around the level of entrepreneurial intensity in the bank.
The next block of five questions asked about the outputs of the bank. It enquired how many new product lines have been added in the last five years; how flat the organisational structure is; and if there is a department in charge of innovation and venture.

The final three questions in the scale focused on how the bank deals with its competitors. These questions were intended to determine the understanding of the staff about whether they think their bank is a first-mover or a follower in the financial bank sector.

3.5.2.2 Opportunity Recognition Scale

This section’s questions focused on the extent the bank recognises opportunities for entrepreneurial activities. It dealt with the levels of inputs that banks put into the entrepreneurial process, and examined the perception of what the firm does in high-risk situations. This section also addressed environmental scanning that Hambrick (1981:299) refers to as the managerial awareness of events and trends in the firm’s environment.

There were ten questions evenly split into two sections. All the questions were on a five point Likert scale ranging from ‘Never’ to ‘Always’. The first section asked what the organisation does when evaluating the competitor landscape. Questions address how organisations deal with their competitors, such as; how do they forecast sales, customer preferences, and so forth. The next question investigated if the organisation gathers opinions from clients. Questions such as these determine if the respondent has an opinion of their bank that shows they track the external environment in-depth or not.

The second set of five questions enquired the extent that the organisation partakes in environmental scanning. The focus was on how much information the firm collects with regards to its macro environmental factors such as economic and technological trends. This showed to what extent the organisation conducts a strategic analysis of its environment. This information
leads to a company being ready for opportunity recognition and aids in its entrepreneurial endeavours.

**3.5.2.3 Organisational Flexibility Scale**

This scale has five questions in one section. The questions lie on a five point Likert scale. The scale measured the perceived ease in which the organisation can be flexible in its strategies. This is a key input into entrepreneurship as it allows for the organisation to act upon the opportunities it may recognise. This level of flexibility alludes to the ability of a firm to alter its strategic plan as the environmental opportunities/threats emerge (Kukalis, 1989:565).

Questions in this scale included asking how difficult it is for the firm to adjust its strategic plan in response to shifts in the macro environmental such as shifts in economic conditions and the emergence of a new technology.

This concluded the set of entrepreneurial related questions. The next set of questions related to lean six sigma.

**3.5.3 Lean Six Sigma**

This section of the measuring instrument was designed based on the literature. It measures the elements of lean and six sigma independently through the use of two scales, a ‘variation reduction’ scale and a ‘waste reduction’ scale.

**3.5.3.1 Variation Reduction Scale**

The scale comprised one section of five questions. The questions were all on a five point Likert scale, ranging from ‘Never’ to ‘All the Time’. The scale measured the degree to which the firm actively reduces variation in processes. This scale represented the degree to which the bank practices a six sigma methodology.
Questions in this section asked the respondents opinion about the their organisation define, measure, analyse, improve and control the processes when dealing with process improvement. This was based on the DMAIC tool found in six sigma.

3.5.3.2 Waste Reduction Scale

This section asked eighteen questions. These questions were split into two sections. The first ten questions looked at the act of setting up lean processes. Respondents were asked if their firm has a benchmark to measure themselves against. The next eight questions specifically enquired about the various types of waste found in the organisation. All these questions were on a five point Likert scale ranging from ‘Not at all’ to ‘All the Time’.

3.5.4 Organisational Performance

The final section of the measuring instrument investigated the opinion of the respondents about the performance measures at their banks. These questions looked at whether or not entrepreneurial activities and incremental processes have any contributing factors to these measures. There are eight questions asked. It is the same four asked twice, once in relation to corporate entrepreneurship and again to lean six sigma.

The survey questionnaire is found in Appendix 1.

3.6 Method of Data Analysis

The data set was run through SAS enterprise guide to conduct the analysis. Various forms of descriptive statistics and expository factor analysis were utilised. A form of a regression model was utilised, leading to an impact assessment of independent variables on the dependent variables.

3.7 Ethics

Ethical issues were considered at each step in the research process and these were taken into consideration whilst conducting the study. These ethical principles dictated many elements of the research from the measurement technique, the selection of individuals to the way data was analysed.
a) Informed consent

Informed consent represents the ethical principle requiring the investigator to provide all available information about a study so that a participant can make a rational, informed decision regarding whether to participate in the study (Gravetter & Forzano. 2006:593). All individuals received an email with a forward explaining the purpose, context and requirements of the study.

b) Confidentiality and Participant Anonymity

Confidentiality is seen as keeping the identity of the respondent strictly secret. It ensures the information obtained from a study cannot be traced back to individuals, this is deemed as critical to ethical studies (Gravetter & Forzano, 2006:590).

Assurance has been made to the individuals completing the survey that full confidentiality will be enforced in all answers received. It was also made clear that the information supplied will be used strictly for academic purposes only this was done via email notification of the survey.

The practice of ensuring that an individual’s name is not directly associated with the information or measurements obtained from an individual (Gravetter & Forzano, 2006:589) as also adhered to. The online nature of capturing the data and coding practices ensured full anonymity.

3.8 Data Processing

Once all the data was captured in ‘Survey Gizmo’ (an advanced online survey software tool), the system scored all the data and exported it to SAS Enterprise Guide (an easy-to-use statistical tool allowing users to analyse data and publish results).

3.9 Conclusion

This chapter outlined the research methodology used in this study. It went into depth about the data collection tool and types of scales used to measure
the research questions. The chapter discussed the population of respondents and concluded with the methods of data capture and analysis.
Chapter 4: Data Analysis

4.1 Introduction

This chapter's objective is to analyse the data collected.

The primary objective of the study was to determine the relationship between the practices of corporate entrepreneurship and lean six sigma in the South African financial sector. The researcher completed the data analysis using the statistical package SAS Enterprise Guide, and the outputs are presented in here.

This chapter is divided into the following sections; descriptive statistics (including tests of normality), factor analysis, reliability analysis, comparisons, results of the research hypotheses the chapter ends with a summery.

4.2 Descriptive Statistics

Basic or descriptive statistics helps to summarise the data in the following three ways:

- Through location or centrality (mean, mode medium), which statisticians refer to as “measures of central tendency”
- Through dispersion, the range, the variance and the statistical deviation – this is the spread of the data around the average
- Through the measure of shape (skewness and Kurtosis) (Maree 2011:9-20).

The sample was made up of a non-random snowball sample of employees working at specified South African banks. The number of questionnaires distributed was 248 and the number of eventual respondents was 102 giving a response rate of 41%.

4.2.1 Demographics

The results showing the age and gender breakdown, as well as the size of the bank that the respondents' work at is presented next.
4.2.1.1 Gender

The gender split of the sample is portrayed in Figure 4.1. It shows that 69% of the population is male the remaining 31% were female.

Fig 4.1: Gender Split of the Sample

This split seems reasonable in context of the 2013 report titled *Gender Statistics in South Africa*. The report shows that the proportion of men is about twice that of women among the population that was being studied, namely the top specialised skilled categories (Statistics South Africa, 2013:40).

4.2.1.2 Age

The age split of the sample is portrayed in Figure 4.2. It shows that 53.92% of the sample is between 18 – 35 years old. 32.35% is 36 – 45 years old. 46 – 55 year olds make up 7.84% and over 55 years represent only 5.88% of the sample.
When investigating the age profile of persons in the working-age population and labour force in 2011 (Statistics South Africa, 2012:2-4), it was seen that the age group 15–34 years made up 50.1% of the labour force. The population in the study is reflective of what statistics South Africa, shows as the average spread of the workforce in South Africa.

4.2.1.3 Size of company

The company size split is portrayed in Figure 4.3. It shows that 62.75% of the respondents work at banks with over 5000 employees and 24.51% work at banks with 500 – 5000 employees. Only 12.75% work at banks with less than 500 employees. The big four banks in South Africa and a few of the specialist banks all have over 5000 employees. It is not then surprising that over 60% of respondents were from these banks.
More than half the banks in South Africa that were included in this study employ more than 5000 employees.

4.2.2 Study Constructs

Only completed surveys were involved in the analysis. As discussed above all responses were valid and within expected ranges. The online nature of the survey enforced this and incomplete surveys were not processed. In addition the software used prompts users to make sure that respondents had to complete every question in the survey and could not leave any out.

4.2.2.1 Innovation

Table 4.1: Distribution Statistics on Innovation and Risk

<table>
<thead>
<tr>
<th>Item number</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4a- Innovative</td>
<td>3.31</td>
<td>4</td>
<td>1.108</td>
<td>-0.429</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q4b- Risky</td>
<td>2.67</td>
<td>2</td>
<td>1.155</td>
<td>0.252</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q4c- Aggressive</td>
<td>2.96</td>
<td>2</td>
<td>1.226</td>
<td>0.240</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q4d- Bold</td>
<td>3.03</td>
<td>2</td>
<td>1.147</td>
<td>0.142</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q5a- Product Development</td>
<td>3.41</td>
<td>4</td>
<td>1.146</td>
<td>-0.222</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q5b- Changing Product Lines</td>
<td>3.24</td>
<td>4</td>
<td>1.196</td>
<td>-0.185</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q5c- Department for Innovation</td>
<td>3.05</td>
<td>4</td>
<td>1.315</td>
<td>-0.145</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q5d- Culture of Innovation</td>
<td>2.93</td>
<td>2</td>
<td>1.101</td>
<td>0.093</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q5e- Flat Organisation Structure</td>
<td>2.95</td>
<td>2</td>
<td>1.172</td>
<td>0.097</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
</tbody>
</table>
The information in Table 4.1 shows that the mode for the majority of the questions was 2 (Disagree). This was true for 5 of the questions. The mean was around 3 for both innovation and risk showing a good structure since there were no outliers.

4.2.2.2 Environmental Scanning

Table 4.2: Distribution Statistics on Environmental Scanning

<table>
<thead>
<tr>
<th>Item number</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q6a- Customer Opinions</td>
<td>2.75</td>
<td>3</td>
<td>0.852</td>
<td>-0.069</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q6b- Competitor Tactics</td>
<td>2.66</td>
<td>2</td>
<td>0.862</td>
<td>0.068</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q6c- Forecast Sales etc.</td>
<td>2.89</td>
<td>3</td>
<td>0.866</td>
<td>-0.347</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q6d- Market Research</td>
<td>2.69</td>
<td>3</td>
<td>0.933</td>
<td>-0.150</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q6e- Gather Media</td>
<td>2.61</td>
<td>2</td>
<td>0.892</td>
<td>0.095</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q7a- Economic</td>
<td>3.13</td>
<td>4</td>
<td>0.919</td>
<td>-0.648</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q7b-Technology</td>
<td>2.93</td>
<td>3</td>
<td>0.936</td>
<td>-0.452</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q7c-Demographics</td>
<td>2.70</td>
<td>2</td>
<td>0.942</td>
<td>-0.006</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q7d-Customer Preferences</td>
<td>2.98</td>
<td>3</td>
<td>0.879</td>
<td>-0.498</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>Q7e-Competiton Strategies</td>
<td>2.78</td>
<td>3</td>
<td>0.929</td>
<td>-0.157</td>
<td>1</td>
<td>4</td>
<td>102</td>
</tr>
</tbody>
</table>

The results in Table 4.2 shows that the most common response was 3 (Easy). This indicates that the respondents perceived their organisation degree to which it was evaluating its macro-economic factors were relatively high. The means responses were in a range from 2.61 to 3.13. There were no outliers in the distribution.

4.1.2.3 Organisational Flexibility

Table 4.3: Distribution Statistics on Organisational Flexibility

<table>
<thead>
<tr>
<th>Item number</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q8a- Economic</td>
<td>3.09</td>
<td>4</td>
<td>1.006</td>
<td>-0.061</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q8b- Technology</td>
<td>2.74</td>
<td>2</td>
<td>1.089</td>
<td>0.219</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q8c- Government</td>
<td>3.25</td>
<td>3</td>
<td>1.019</td>
<td>0.004</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q8d- Customer Preferences</td>
<td>3.27</td>
<td>4</td>
<td>0.966</td>
<td>-0.177</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q8e- Competitor Strategy</td>
<td>3.06</td>
<td>3</td>
<td>0.983</td>
<td>0.072</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
</tbody>
</table>

All questions had a mean around 3. The analysis revealed that no outliers exist in the data set. The data is therefore normally distributed.
4.2.2.4 Variation Reduction

Table 4.4: Distribution Statistics on the Variation Reduction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Kurtosis</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9a- Define</td>
<td>3.58</td>
<td>4</td>
<td>1.076</td>
<td>-0.336</td>
<td>-0.597</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q9b- Measure</td>
<td>3.57</td>
<td>4</td>
<td>0.990</td>
<td>-0.404</td>
<td>-0.350</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q9c- Analysis</td>
<td>3.58</td>
<td>4</td>
<td>0.906</td>
<td>-0.301</td>
<td>-0.279</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q9d- Improve</td>
<td>3.58</td>
<td>4</td>
<td>1.019</td>
<td>-0.255</td>
<td>-0.503</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q9e- Control</td>
<td>3.56</td>
<td>4</td>
<td>1.049</td>
<td>-0.474</td>
<td>-0.395</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
</tbody>
</table>

The mode for this set of questions is 4 (Usually) for all the questions on this scale. This indicates that the respondents perceive their bank to have some process in place that deals with business problems. This scale was based on the six sigma tool DMAIC. This scale does not imply that in all instances this tool is utilised, though it does indicate that the respondents feel their bank usually does define, measure, analysis, improve and control processes. The mean for these questions is about 3.5.
### 4.2.2.5 Waste Reduction

#### Table 4.5: Distribution Statistics on Waste Reduction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Kurtosis</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q10a- Understand Good</td>
<td>3.86</td>
<td>4</td>
<td>0.809</td>
<td>-0.356</td>
<td>-0.315</td>
<td>2</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10b- Processes Designed</td>
<td>3.62</td>
<td>4</td>
<td>1.034</td>
<td>-0.324</td>
<td>-0.432</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10c- Processes Understood</td>
<td>3.69</td>
<td>4</td>
<td>0.985</td>
<td>-0.219</td>
<td>-0.472</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10d- Compare with Perfection</td>
<td>3.40</td>
<td>4</td>
<td>1.101</td>
<td>-0.881</td>
<td>-0.131</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10e- Processes Optimised</td>
<td>3.17</td>
<td>3</td>
<td>1.118</td>
<td>-0.809</td>
<td>0.097</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10f- Value Defined</td>
<td>3.32</td>
<td>4</td>
<td>0.997</td>
<td>-0.740</td>
<td>-0.141</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10g- Value Stream Identified</td>
<td>3.41</td>
<td>4</td>
<td>0.937</td>
<td>-0.596</td>
<td>-0.107</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10h- Activities Uninterrupted</td>
<td>3.24</td>
<td>3</td>
<td>1.007</td>
<td>-0.784</td>
<td>0.044</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10i- Products Pulled</td>
<td>3.24</td>
<td>3</td>
<td>1.036</td>
<td>-0.637</td>
<td>-0.107</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q10j- Perfection Perused</td>
<td>3.13</td>
<td>3</td>
<td>1.224</td>
<td>-0.950</td>
<td>0.049</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11a- Talent</td>
<td>2.96</td>
<td>3</td>
<td>1.125</td>
<td>-0.747</td>
<td>0.121</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11b- Inventory</td>
<td>2.85</td>
<td>3</td>
<td>1.120</td>
<td>-0.777</td>
<td>0.081</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11c- Motion</td>
<td>2.57</td>
<td>3</td>
<td>1.190</td>
<td>-0.721</td>
<td>0.283</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11d- Waiting</td>
<td>2.90</td>
<td>3</td>
<td>1.165</td>
<td>-0.745</td>
<td>0.079</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11e- Transportation</td>
<td>2.79</td>
<td>3</td>
<td>1.180</td>
<td>-0.926</td>
<td>-0.069</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11f- Defects</td>
<td>3.21</td>
<td>3</td>
<td>1.129</td>
<td>-0.610</td>
<td>-0.164</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11g- Over-Production</td>
<td>2.80</td>
<td>3</td>
<td>1.126</td>
<td>-0.609</td>
<td>0.015</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q11h- Over Processing</td>
<td>2.74</td>
<td>2</td>
<td>1.193</td>
<td>-0.878</td>
<td>0.209</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
</tbody>
</table>

The mean, for this variable is around 3. There are no outliers and therefore the data structure is good.
4.2.2.6 Organisational Performance

Table 4.6: Distribution Statistics on Organisational Performance Scale

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
<th>Kurtosis</th>
<th>Skewness</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q12a- Sales Growth</td>
<td>3.42</td>
<td>3</td>
<td>1.181</td>
<td>-0.929</td>
<td>-0.213</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q12b- Gross Profit</td>
<td>3.43</td>
<td>4</td>
<td>1.113</td>
<td>-0.767</td>
<td>-0.264</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q12c-Market Share</td>
<td>3.35</td>
<td>4</td>
<td>1.050</td>
<td>-0.414</td>
<td>-0.335</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q12d- Competitive Position</td>
<td>3.37</td>
<td>4</td>
<td>1.080</td>
<td>-0.706</td>
<td>-0.264</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q13a- Sales Growth</td>
<td>3.37</td>
<td>4</td>
<td>0.974</td>
<td>-0.623</td>
<td>-0.288</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q13b- Gross Profit</td>
<td>3.33</td>
<td>4</td>
<td>0.894</td>
<td>-0.254</td>
<td>-0.289</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q13c-Market Share</td>
<td>3.23</td>
<td>3</td>
<td>0.878</td>
<td>-0.006</td>
<td>0.078</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
<tr>
<td>Q13d- Competitive Position</td>
<td>3.25</td>
<td>4</td>
<td>0.979</td>
<td>-0.407</td>
<td>-0.255</td>
<td>1</td>
<td>5</td>
<td>102</td>
</tr>
</tbody>
</table>

Overall the mode for this set of questions was mostly 4 (Large Contribution). The perceived contribution on organisational performance is still high. The results reflect a good data structure.

4.2.3 Descriptive Analysis Summary

The data was complete and had no missing values. All ranges minimum and maximum were in the expected range, thus no errors in capturing occurred. The general mean scores and skewness show that the data contains no dramatic errors. The next step after reviewing the descriptive statistics is to conduct a factor analysis.

4.3 Factor Analysis

4.3.1 Introduction

Factor analysis gives the researcher a structured statistical method to analysis of the research problem.
Factor analysis can be seen as an exploratory device that gives the researcher a structured statistical method to analysis of the research problem it is useful in formulating theories (Harman, 1976:5). The researcher can use factor analysis to review variables in-depth, as it allows the structure of a construct to be analysed. These constructs are distinct in nature and all belong to their own individual set. Kelley (1940:120) explains that factor analysis “represents a simple straightforward problem of description in several dimensions of a definite group functioning in definite manners”.

The type of factor analysis in this study is ‘confirmatory factor analysis’, which according to Sharma (2007:2-4) assesses the extent to which the hypothesised set of identified factors indeed fits the data.

The observed variables in this study have interrelationships to each other. Factor analysis through data reduction assists in identifying this complex array. Smaller sets of variables are grouped together into dimensions or factors of variables that have common attributes. Thus the factors are linear combinations or clusters of these observed variables. These clusters represent a specific underlying dimension of the construct being studied. Each factor is to be as distinct as possible from each other factor in the study (Sharma 2007:2-4).

The aim of the factor analysis was to get a reduced set of factors that summarizes and describes the elements that make up corporate entrepreneurship and lean six sigma. According to Sharma (2007:2-4), the output of the factor analysis should be concise and understandable.

The method of rotation used in this factor analysis is ‘Varimax Rotation’. It is an orthogonal style of rotation. Varimax rotation is a very common form of rotation especially in academic studies. The goal is to simplify the columns of the un-rotated factor-loading matrix. Varimax maximises the variance of the loadings within the factor. Higher loadings are made higher and lower loadings are made lower (Sharma 2007:141-143).
The main advantage of this rotation system is that the interpretation is easy and it also provides a relatively clean set of information about which items correlate mostly with a given factor. The main disadvantage is that the rotation method is designed to eliminate general factors. Thus, it cannot be discounted that general factors do exist (Sharma 2007:91-92).

The rotation produces ‘eigenvalues’. This is a single scalar value, which represents the level of variance each item in the factor produces. All eigenvalues are greater than zero, as they represent the explained variance (Sharma 2007:91-92).

The eigenvalues for the first few components is typically large and the later are relatively small. (Sharma 2007:94). When plotted on a graph, it is known as a Scree Test, to which the researcher then looks for a definitive ‘break’ between the components with relatively large eigenvalues over those with relatively small eigenvalues (O’Rourke, Hatcher & Stepanski 2005:451).

Once the factor analysis has been completed, the internal consistency needs to be measured to see if the factor is homogeneous. The ‘cronbach alpha’ helps measure the inter-correlations among the items. If a score is too low the factor may be rejected.

### 4.3.2 Corporate Entrepreneurship Factors

Below are the results of the factor analysis for the three scales that make up corporate entrepreneurship in the measurement instrument, (innovation and risk scale, organisational flexibility and environmental scanning).

**Sampling Adequacy:** This factor analysis combined questions 4a to 8e comprising of 24 items. It was determined that no negative scoring occurred so no scores had to be reversed. The data seemed stable as an overall MSA, Kaiser's Measure of Sampling Adequacy was 0.742 which exceeds the threshold of 0.5. as shown in Table 4.7. This score is used to compare the
magnitudes of the observed correlation coefficients in relation to the magnitudes of the partial correlation coefficients (OECD, 2008:67).

Table 4.7: Kaiser’s Measure of Sampling Adequacy: Overall MSA = 0.74.

<table>
<thead>
<tr>
<th>Question</th>
<th>MSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4a</td>
<td>0.75</td>
</tr>
<tr>
<td>Q4b</td>
<td>0.75</td>
</tr>
<tr>
<td>Q4c</td>
<td>0.67</td>
</tr>
<tr>
<td>Q4d</td>
<td>0.61</td>
</tr>
<tr>
<td>Q5a</td>
<td>0.70</td>
</tr>
<tr>
<td>Q5b</td>
<td>0.74</td>
</tr>
<tr>
<td>Q5c</td>
<td>0.71</td>
</tr>
<tr>
<td>Q5d</td>
<td>0.71</td>
</tr>
<tr>
<td>Q5e</td>
<td>0.65</td>
</tr>
<tr>
<td>Q5a</td>
<td>0.48</td>
</tr>
<tr>
<td>Q6b</td>
<td>0.65</td>
</tr>
<tr>
<td>Q6c</td>
<td>0.69</td>
</tr>
<tr>
<td>Q7a</td>
<td>0.82</td>
</tr>
<tr>
<td>Q7b</td>
<td>0.79</td>
</tr>
<tr>
<td>Q7c</td>
<td>0.83</td>
</tr>
<tr>
<td>Q7d</td>
<td>0.83</td>
</tr>
<tr>
<td>Q7e</td>
<td>0.81</td>
</tr>
<tr>
<td>Q6a</td>
<td>0.77</td>
</tr>
<tr>
<td>Q6a</td>
<td>0.83</td>
</tr>
<tr>
<td>Q8c</td>
<td>0.83</td>
</tr>
<tr>
<td>Q8d</td>
<td>0.75</td>
</tr>
<tr>
<td>Q8e</td>
<td>0.80</td>
</tr>
</tbody>
</table>

The factor analysis outputted 3 distinct factors as reflected in Table 4.8 the Innovation Factor, Environmental Scanning Factor and the Organisational Flexibility Factor. These three factors will be compared to the lean six sigma factors and an organisational performance factor.
Table 4.8: Rotated Factor Pattern Factors 1-3

<table>
<thead>
<tr>
<th>Questions</th>
<th>Environmenta l Scanning</th>
<th>Innovation</th>
<th>Organisational Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4a- Innovative</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4b- Risky</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4c- Aggressive</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4d- Bold</td>
<td>0.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5a- Product Development</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5b- Changing Product Lines</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5c- Department for Innovation</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5d- Culture of Innovation</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5e- Flat Organisation Structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6a- Customer Opinions</td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6b- Competitor Tactics</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6c- Forecast Sales etc.</td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6d- Market Research</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6e- Gather Media</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7a- Economic</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7b- Technology</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7c-Demographics</td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7d-Customer Preferences</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7e-Competition Strategies</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8a- Economic</td>
<td></td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Q8b- Technology</td>
<td></td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Q8c- Government</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8d- Customer Preferences</td>
<td></td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Q8e- Competitor Strategy</td>
<td></td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td><strong>Eigenvalue</strong></td>
<td>5.44</td>
<td>3.95</td>
<td>2.50</td>
</tr>
</tbody>
</table>

All factor loadings < 0.5 are excluded.

Only question 8c on government was removed since it had factor loading of less than 0.5. The eigenvalues of 5.44 (Environmental Scanning), 3.95 (Innovation) and 2.50 (Organisational Flexibility) are acceptable.
Table 4.9: Cronbach Coefficient Alphas for Factors Environmental Scanning, Innovation and Organisational Flexibility

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cronbach Coefficient Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Scanning</td>
<td>0,889</td>
</tr>
<tr>
<td>Innovation</td>
<td>0,805</td>
</tr>
<tr>
<td>Organisational Flexibility</td>
<td>0,789</td>
</tr>
</tbody>
</table>

All three factors score a relatively high alpha thus all three are maintained.

4.3.3 Lean Six Sigma Factors

Table 4.10: Rotated Factor Pattern for Factors

<table>
<thead>
<tr>
<th>Questions</th>
<th>Six Sigma</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9a- Define</td>
<td>0,64</td>
<td></td>
</tr>
<tr>
<td>Q9b- Measure</td>
<td>0,74</td>
<td></td>
</tr>
<tr>
<td>Q9c- Analysis</td>
<td>0,54</td>
<td></td>
</tr>
<tr>
<td>Q9d- Improve</td>
<td>0,72</td>
<td></td>
</tr>
<tr>
<td>Q9e- Control</td>
<td>0,63</td>
<td></td>
</tr>
<tr>
<td>Q10a- Understand Good</td>
<td>0,64</td>
<td></td>
</tr>
<tr>
<td>Q10b- Processes Designed</td>
<td>0,74</td>
<td></td>
</tr>
<tr>
<td>Q10c- Processes Understood</td>
<td>0,72</td>
<td></td>
</tr>
<tr>
<td>Q10d- Compare with Perfection</td>
<td>0,68</td>
<td></td>
</tr>
<tr>
<td>Q10e- Processes Optimised</td>
<td>0,75</td>
<td></td>
</tr>
<tr>
<td>Q10f- Value Defined</td>
<td>0,75</td>
<td></td>
</tr>
<tr>
<td>Q10g- Value Stream Identified</td>
<td>0,73</td>
<td></td>
</tr>
<tr>
<td>Q10h- Activities Uninterrupted</td>
<td>0,77</td>
<td></td>
</tr>
<tr>
<td>Q10i- Products Pulled</td>
<td>0,56</td>
<td></td>
</tr>
<tr>
<td>Q10j- Perfection Perused</td>
<td>0,69</td>
<td></td>
</tr>
<tr>
<td>Q11a- Talent</td>
<td>0,68</td>
<td></td>
</tr>
<tr>
<td>Q11b- Inventory</td>
<td>0,69</td>
<td></td>
</tr>
<tr>
<td>Q11c- Motion</td>
<td>0,79</td>
<td></td>
</tr>
<tr>
<td>Q11d- Waiting</td>
<td>0,76</td>
<td></td>
</tr>
<tr>
<td>Q11e- Transportation</td>
<td>0,85</td>
<td></td>
</tr>
<tr>
<td>Q11f- Defects</td>
<td>0,69</td>
<td></td>
</tr>
<tr>
<td>Q11g- Over-Production</td>
<td>0,8</td>
<td></td>
</tr>
<tr>
<td>Q11h- Over Processing</td>
<td>0,77</td>
<td></td>
</tr>
</tbody>
</table>

All factor loadings < 0.5 are excluded.

The eigenvalues of 9.44 (six sigma) and 3.24 (lean) are acceptable.

**Sampling Adequacy:** This factor analysis combined questions 9a to 11h comprising of 23 items. It was determined that no negative scoring occurred.
so no scores had to be reversed. The data seemed stable as an overall MSA, Kaiser's Measure of Sampling Adequacy was 0.89 this exceeds the threshold of 0.5. The output is reflected in Table 4.11.

**Table 4.11: Kaiser’s Measure of Sampling Adequacy: Overall MSA = 0.89.**

<table>
<thead>
<tr>
<th>Question</th>
<th>MSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9a</td>
<td>0.83</td>
</tr>
<tr>
<td>Q9b</td>
<td>0.86</td>
</tr>
<tr>
<td>Q9c</td>
<td>0.92</td>
</tr>
<tr>
<td>Q9d</td>
<td>0.91</td>
</tr>
<tr>
<td>Q9e</td>
<td>0.86</td>
</tr>
<tr>
<td>Q10a</td>
<td>0.93</td>
</tr>
<tr>
<td>Q10b</td>
<td>0.86</td>
</tr>
<tr>
<td>Q10c</td>
<td>0.87</td>
</tr>
<tr>
<td>Q10d</td>
<td>0.92</td>
</tr>
<tr>
<td>Q10e</td>
<td>0.93</td>
</tr>
<tr>
<td>Q10f</td>
<td>0.89</td>
</tr>
<tr>
<td>Q10g</td>
<td>0.87</td>
</tr>
<tr>
<td>Q10h</td>
<td>0.93</td>
</tr>
<tr>
<td>Q10i</td>
<td>0.82</td>
</tr>
<tr>
<td>Q10j</td>
<td>0.93</td>
</tr>
<tr>
<td>Q11a</td>
<td>0.85</td>
</tr>
<tr>
<td>Q11b</td>
<td>0.91</td>
</tr>
<tr>
<td>Q11c</td>
<td>0.91</td>
</tr>
<tr>
<td>Q11d</td>
<td>0.90</td>
</tr>
<tr>
<td>Q11e</td>
<td>0.90</td>
</tr>
<tr>
<td>Q11f</td>
<td>0.90</td>
</tr>
<tr>
<td>Q11g</td>
<td>0.83</td>
</tr>
<tr>
<td>Q11h</td>
<td>0.93</td>
</tr>
</tbody>
</table>

The factor analysis outputted 2 distinct factors, from the lean six sigma construct. These are named variation reduction and waste reduction.
Table 4.12: Cronbach Coefficient Alphas for Variation Reduction and Waste Reduction

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cronbach Coefficient Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation Reduction</td>
<td>0.930</td>
</tr>
<tr>
<td>Waste Reduction</td>
<td>0.907</td>
</tr>
</tbody>
</table>

Both factors score a relatively high alpha thus they are maintained.

4.3.4 Organisational Performance Analysis

An item analysis was conducted on question 12 and question 13 independently as they measured organisational performance. In both instances the scree plot found that only one item (factor) would be maintained. The Item scores are shown in Table 4.13 below.

Table 4.13: Item Analysis for Organisational Performance

<table>
<thead>
<tr>
<th>Questions</th>
<th>Organisational Performance Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q12a- Sales Growth</td>
<td>0.90</td>
</tr>
<tr>
<td>Q12b- Gross Profit</td>
<td>0.89</td>
</tr>
<tr>
<td>Q12c-Market Share</td>
<td>0.89</td>
</tr>
<tr>
<td>Q12d- Competitive Position</td>
<td>0.90</td>
</tr>
<tr>
<td>Q13a- Sales Growth</td>
<td>0.90</td>
</tr>
<tr>
<td>Q13b- Gross Profit</td>
<td>0.90</td>
</tr>
<tr>
<td>Q134c Market Share</td>
<td>0.90</td>
</tr>
<tr>
<td>Q13d- Competitive Position</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Eigenvalue 3.23

The eigenvalue of 3.23 (organisational performance) is acceptable.

4.3.5 Factor Analysis Summary

The factor analysis produced three factors for corporate entrepreneurship, two factors for lean six sigma and an item analysis was done for organisational performance. Once these factors have been produced the next stage is to determine what relationship they hold with each other. The factors lead to eleven possible relationships that can be conducted between the factors. The next section will detail the nature of these relationships as hypothesised in the study. The tests will be done utilising Pearson’s correlation coefficient.
4.4 Evaluating the Research Hypotheses

This section will present the various hypothesis \((H_o^1 - H_o^5)\) an analysis into the results of the satirical significance of the relationship between the various factors is reviewed and analysed. This is followed by a review of a couple of T-tests.

Karl Pearson’s correlation coefficient is a standard measure for linear relationship. It qualitatively measures the extent to which two variables \(x\) and \(y\) are correlated. The correlation coefficient is a numerical number between -1 and 1 (symbolised as ‘r’). This gives a range that summarises both the magnitude as well as the direction (positive or negative) of association between the two variables (Cohen, et al., 2003:28).

The interpretation of the coefficient score is detailed below:

- \(\pm 1.00 = \) strong perfect correlation
- \(\pm .80 = \) perfect correlation
- \(\pm .50 = \) Moderate correlation
- \(\pm .2 = \) Weak correlation
- \(\pm 0 = \) No correlation (Caldwell, 2007:289).

4.4.1 Hypothesis Tests

\((H_o^1):\) There is no statistical significant correlation between ‘innovation’ and
\((H_o^{1a}):\) ‘variation reduction’, \((H_o^{1b}):\) ‘waste reduction’, \((H_o^{1c}):\) ‘organisational performance’

\((H_o^2):\) There is no statistical significant correlation between ‘organisational flexibility’ and \((H_o^{2a}):\) ‘variation reduction’, \((H_o^{2b}):\) ‘waste reduction’, \((H_o^{2c}):\) ‘organisational performance’

\((H_o^3):\) There is no statistical significant correlation between ‘environmental scanning’ and \((H_o^{3a}):\) ‘variation reduction’, \((H_o^{3b}):\) ‘waste reduction’, \((H_o^{3c}):\) ‘organisational performance’
(H₀⁴): There is no statistical significant correlation between ‘variation reduction’ and ‘organisational performance’

(H₀⁵): There is no statistical significant relationship correlation ‘waste reduction’ and ‘organisational performance’

Table 4.14: The Relationship between the various factors

<table>
<thead>
<tr>
<th></th>
<th>Innovation</th>
<th>Organisational Flexibility</th>
<th>Environmental Scanning</th>
<th>Variation Reduction</th>
<th>Waste Reduction</th>
<th>Organisational Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>1.000</td>
<td>-</td>
<td>-</td>
<td>.132</td>
<td>.212</td>
<td>.272</td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td></td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td></td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>.132</td>
<td>.361</td>
<td>.422</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.186</td>
<td>.000***</td>
<td>.0001***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>102</td>
<td>102</td>
<td>102</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>.212</td>
<td>.040</td>
<td>.463</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.033***</td>
<td>.0001***</td>
<td>.0001***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>102</td>
<td>102</td>
<td>102</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>.272</td>
<td>.435</td>
<td>.260</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.006***</td>
<td>.0001***</td>
<td>.0001***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>102</td>
<td>102</td>
<td>102</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***P-value indicates significance if < α = 0.05

4.4.2 Correlations

4.4.2.1 Hypothesis 1

(H₀¹): There is no statistical significant correlation between ‘innovation’ and ‘organisational performance’, (H₀¹a): ‘variation reduction’, (H₀¹b): ‘waste reduction’, (H₀¹c): ‘organisational performance’.
Innovation’ and variation reduction (H₀¹ᵃ):

When reviewing the correlation between innovation and variation reduction, it can be seen (Table 4.13) that there is a positive but non-significant relationship between innovation and variation reduction as shown by a p-value of 0.186. We therefore accept H₀¹ᵃ which stated that there was not a statistically significant relationship.

From this, the findings show that the output of corporate entrepreneurship in the form of innovation has a positive link in reducing variation within the organisation. Having standardised processes and levels of service offering eliminates some uncertainty in the organisation. This lets the organisation have the space to be more innovative. This standardisation does not negatively impact on the ability to be innovative and take risks but rather accommodate it. This leads to the notation that both activities can co-exist in a single organisation without having a negative impact on each other. They have a potential positive impact, but it can only be considered a potential relationship, as the relationship is not significant in value.

According to the literature when an organisation aims to achieve variation reduction there are certain strategies and procedures that are undertaken. Some of these would enhance innovation others will hamper it. Results show that variation reduction will improve innovation within the organisation, though, not in a significant way.

Innovation’ and waste reduction (H₀¹ᵇ):

In Table 4.13, it can be seen that there is a weak positive correlation between innovation and waste reduction as shown by a p-value of 0.33. The hypothesis is rejected, as the correlation is positive, and it is just significant.

In the literature there were discussions of the impact of slack on the ability for an organisation to be innovative. The data implies that some control over the level of waste in the organisation does aid in the innovation process. The
result implies that through innovative activities there is some positive impact on the ability to reduce waste in the system.

It is worthy to note that there is not a negative correlation between the aspects of lean six sigma and innovation, as some of the literature claimed. An overall recommendation would be to continue to pursue the methodologies relating to lean six sigma and attempt to implement them concurrently, as the two methodologies do not negatively impact on each other (Prajogo & Sohal, 2001:545).

**Innovation and organisational performance (H_{0}^{1c}):**

When reviewing the correlation between innovation and organisational performance it can be seen (Table 4.13) that there is a weak correlation as shown by a p-value of 0.272. We reject H_{0}^{1c} which stated that there was not a statistically significant relationship. This implies that there is a weak direct relationship between innovation and organisational performance. This can be seen to imply that bold actions involved in innovation are often risky and do not always work out to significantly contribute to organisational performance in many instances.

There is a general view that innovation would be key for an organisation to gain in organisational performance (Tushman & Nadler 1986:74). This assertion supports the research’s findings. However it appears that the net gain is only slightly positive and this could be due to the nature of innovation—whether it is incremental or radical. According to Schumpeter (1939) there may not be an overwhelming positive impact due to the difficulty that organisations face in the way they implement innovation.

4.4.2.2 Hypothesis 2

(H_{0}^{2}): There is no statistical significant correlation between ‘organisational flexibility and (H_{0}^{2a}): ‘variation reduction’, (H_{0}^{2b}): ‘waste reduction’, (H_{0}^{2c}): ‘organisational performance (in relation to corporate entrepreneurship)’. 
Organisational flexibility and variation reduction ($H_0^{2a}$):

Results from table 4.13 show that there is a p-value of 0.361 indicating that innovation and risk and waste reduction have a weak correlation, though it is significant. The hypothesis is thus rejected. This indicates that there is a direct positive relationship between organisational flexibility and variation, even though it is not that strong. This can be seen to imply a weak link between the controls required keeping variations in products and processes to a minimum, and the control required to have a flexible organisation.

When opportunities for corporate entrepreneurship arise the organisation wants to be flexible enough to move in that new unexpected direction. These organisational shifts will impact on the current processes and services offered to customers. The data shows that there is a relationship between being flexible and keeping quality variations at a minimum. The reverse will hold true in keeping quality variations at a minimum is an indicator that the organisation is ready for any shifts in the internal or external environment i.e. flexible.

The literature explains that there is an organisational challenge to provide both structure and flexibility. Flexible organisations often exemplify team and individual empowerment (Englehardt & Simmons, 2002:113-114). This puts the power of control on individuals to manage variation deduction.

Organisational flexibility and waste reduction ($H_0^{2b}$):

The correlation between organisational flexibility and waste reduction can be seen in Table 4.13. The results show that the correlation is non-significant as a result the hypothesis is accepted. This means that there is no relationship between organisational flexibility and waste reduction. Excess waste in the system or a fully implemented lean strategy has no significant relationship with a flexible organisation. The same is true for the other way around.
The data suggests that the strategies that are required to reduce excess resources in the organisation have no impact on the organisation's ability to be flexible. The discussions in the literature that assumed some form of negative relationship implied that excess resources would make the organisation less agile and unable to be flexible. Other literature discussed how these resources would be required in order to be flexible, as they would need to be consumed in the additional effort in changing strategies. Neither assumption seems to be relevant when reviewing the data, as there is no correlation found in the analysis.

Even though the data shows no significant correlation between organisational flexibility and variation reduction. The literature provides benefits for both variation reduction (Pande et al., 2000:11-13) and organisational flexibility (Barringer & Bluedorn, 1999:424). Organisations should pursue both strategies without worrying if any negative impact will occur on each, as they are uncorrelated.

**Organisational flexibility and organisational performance (H\(_{o}^{2c}\))**:

In table 4.13 it can be seen that there is weak (almost moderate) positive and significant correlation between organisational flexibility and organisational performance as shown by a p-value of 0.435. The hypothesis is rejected. This implies that there is a positive and significant relationship between organisational flexibility and organisational performance. This can be seen to imply a moderate link between the ability to react to changing customer demands and other environmental factors and the ability to perform as an organisation.

The literature discusses the dual benefits of corporate entrepreneurship and organisational performance (Antoncic & Hisrich, 2004:542). With the external environment being increasingly unstable, there is a benefit to being flexible. When an organisation can adapt to changes in the external environment, it is able to service its customers at a higher level that is expected. The organisation is also able to exploit opportunities in the external
environment that lead to entrepreneurial endeavours. This in turn boosts organisational performance.

The recommendation given from these findings is to ensure that the organisation has built processes and systems that are flexible enough to move with the changing environment. The data shows that between the three elements making up corporate entrepreneurship the highest relationship to organisational performance is organisational flexibility. It appears that being innovative only means something if it is in response to changes in the external environment. Hence, flexibility has a higher relationship than innovation. This theme is continued through the next hypothesis where environmental scanning is not as relevant without the appropriate response to the changes that are observed in the scanning processes.

4.4.2.3 Hypothesis 3

(H_0^3): There is no statistical significant correlation between ‘environmental scanning’ and (H_0^{3a}): ‘variation reduction’, (H_0^{3b}): ‘waste reduction’, (H_0^{3c}): ‘organisational performance (in relation to corporate entrepreneurship)’.

Environmental scanning and variation reduction (H_0^{3a}):

When reviewing the correlation between environmental scanning and variation reduction it can be seen (Table 4.13) that there is a positive significant relationship between environmental scanning and variation reduction as shown by a p-value of 0.422. We therefore reject H_0^{3a} which stated that there was not a statistically significant relationship. This implies that there is a direct relationship between organisational flexibility and variation reduction though this relationship is weak it is almost moderate in nature. There is therefore a link between the controls required keeping variations in products and processes to a minimum, and the control required to have a flexible organisation.

The recommendation here is to develop the skills required to actively scan the external environment for opportunities. The reason for this is that these skills
are similar to the skills required to scan the internal environment for improvements. When scanning the internal environment through tools such as DMAIC, root cause analyses could be conducted in order to detect issues that cause variation reduction (van Iwaarden et al., 2008:6746). Developing these skills aid organisations two fold in being able to both reduce variation and find external opportunities that facilitate innovation and improve overall corporate entrepreneurship.

**Environmental scanning and waste reduction (H₀³b):**

The correlation between environmental scanning and waste reduction can be found in Table 4.13 the p-value of 0.463. This is above the threshold for a weak correlation and quite close to being considered a moderate correlation. The null hypothesis is thus rejected. This reveals a direct relationship between environmental scanning and variation reduction though this relationship is about moderate. This can be seen to imply a moderate link between the discipline of reviewing the external environment for opportunities to increase the companies value and the discipline required to review internal practices that need altering in order to reduce waste, which then would increase organisational value.

The literature (Antony, 2006:236) discusses how an organisation that focuses on six sigma strategies and variation reduction will have an organisation that has a proactive mind-set and that has an increased understanding of customer needs. This ties in closely with the skills that are developed in environmental scanning such as sharing knowledge amongst colleagues (Mascitelli, 2000:180).

An overall recommendation would be to invest in strengthening employees’ skills and training them to observe both their internal and external environment critically. Employees should continually be questioning the current way things are being done. From an external perspective, they should be reviewing the political, environmental, social, technological and legal landscape on an on-going basis. Changes in the external environment pose
threats, but more importantly, they provide opportunities to be entrepreneurial. From an internal perspective scanning the internal environment is critical to enable the isolation of issues that may cause variations in the quality of service or the way processes run. Also, scanning the internal environment for excess waste contributes to improving the organisation and raising the organisational performance (this is looked at in the analysis of the next hypothesis).

**Environmental scanning and organisational performance (H\textsubscript{3c}):**

The relationship between environmental scanning and organisational performance (Table 4.13) is positive and significant as shown by a p-value of 0.260. The hypothesis is therefore rejected. The significant direct relationship between environmental scanning and organisational performance strongly suggests that reviewing the external environment for business opportunities and threats is likely to result in better organisational performance.

Scanning the external environment does seem to play a very high roll in the ability for an organisation to perform. However, in relation to the above discussion organisational flexibility has a moderate relationship to organisational performance. That said, for an organisation to be flexible, it should scan its environment on a regular basis.

Thus, the recommendation would be organisations should scan their external and internal environment as this contributes to organisational performance. There is a small relationship between the act of scanning and better performance, it adds to the greater whole.

The literature states that corporate entrepreneurship is expected to be positively associated with corporate financial performance (Zahra, 1991:268). This is confirmed in the study where the constructs of corporate entrepreneurship (innovation, organisational flexibility and environmental scanning) all have significant correlations with organisational performance.
4.4.2.4 Hypothesis 4

\( (H_0^4) \): There is no statistical significant correlation between ‘variation reduction’ and ‘organisational performance’.

When reviewing the correlation between variation reduction and organisational performance it can be seen (Table 4.13) that there is a positive significant relationship between variation reduction and organisational performance as shown by a coefficient value of 0.439. We therefore reject \( H_o^4 \), which stated that there was not a statistically significant relationship. This can be seen to intimate that if the organisation maintains a consistent level of service quality, rather than fluctuating between good and bad service, it would lead to a higher level of organisational performance.

Consistent processes and services that offer the same quality time after time contributes to both having satisfied customers and also helps ensure business have internal stability. This positively affects organisational performance. As shown by Byrne et al. (2007:4), strategies involved in variation reduction are not just for efficiency, but also for effectiveness and this helps to drive organisational performance.

4.4.2.5 Hypothesis 5

\( (H_0^5) \): There is no statistical significant correlation between ‘waste reduction’ and ‘organisational performance’

Table 4.13, shows that there is no statistical correlation between waste reduction and organisational performance, as shown by a p-value of 0.022. The hypothesis is accepted. This indicates that the concept of reducing waste within these banks does not seem to have any relation to their ability to perform as an organisation.

As waste often simply exists in an organisation, getting rid of it will not be perceived as a reason why organisational performance may increase. The lack of a significant correlation may be due to the fact that all banks face the
same regulatory pressures that sometimes produce waste in order to have the required redundancies. The lack of intense competition within the South African financial environment may also result in the lack of incentive to reduce waste in order to be competitive. Arndt (2002), Jones (2004:13) tout examples where continuous improvement strategies, such as waste reduction have led directly to improvements of organisational performance. On the other hand, (York & Mire, 2004: 293-295) state that these strategies merely come along for the ride and add no true benefit.

It can be seen that the concept of reducing waste within these banks does not seem to have any significant relation of their ability to perform as an organisation. Though that should not be a reason not to pursue waste reduction, as stated in the literature, there are numerous other non-direct benefits that improve organisation performance.

4.4.3 T-test

One final set of tests were run to determine if the demographic variables showed any variation between overall for the corporate entrepreneurship, lean six sigma and organisational performance constructs respectively.

A pared sample t-test was used to compare the mean differences between two groups, differing in either age (a) or gender (b).
Table 4.15: Levin’s T Test on Gender, Age and Dependant Variables

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Attribute</th>
<th>Assumption For Variance</th>
<th>Levine’s test for equality of variance</th>
<th>T-Test for Equality of Means</th>
<th>95% Confidence Interval of Difference of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>P-Value</td>
<td>T-Statistic</td>
</tr>
<tr>
<td>Ho6a</td>
<td>V1: Gender</td>
<td>Equal</td>
<td>1.69</td>
<td>0.0724</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>V2: Lean Six Sigma</td>
<td>Not Equal</td>
<td>0.78</td>
<td>0.4396</td>
<td>-4.5196</td>
</tr>
<tr>
<td>Ho6b</td>
<td>V1: Gender</td>
<td>Equal</td>
<td>1.24</td>
<td>0.4625</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td>V2: Corporate Entrepreneurship</td>
<td>Not Equal</td>
<td>-0.35</td>
<td>0.7287</td>
<td>-5.4779</td>
</tr>
<tr>
<td>Ho7a</td>
<td>V1: Age</td>
<td>Equal</td>
<td>1.11</td>
<td>0.6975</td>
<td>-2.64</td>
</tr>
<tr>
<td></td>
<td>V2: Lean Six Sigma</td>
<td>Not Equal</td>
<td>-2.63</td>
<td>0.0099</td>
<td>-5.4751</td>
</tr>
<tr>
<td>Ho7b</td>
<td>V1: Age</td>
<td>Equal</td>
<td>1.05</td>
<td>0.861</td>
<td>-0.68</td>
</tr>
<tr>
<td></td>
<td>V2: Corporate Entrepreneurship</td>
<td>Not Equal</td>
<td>-0.68</td>
<td>0.4967</td>
<td></td>
</tr>
</tbody>
</table>

4.4.3.1 Hypothesis 6 (Gender)

(H₀⁶): There is no statistical significant difference of opinion between male and female respondents with reference to the practice of (H₀⁶ᵃ): ‘lean six sigma’, (H₀⁶ᵇ): ‘corporate entrepreneurship’.

The test looked to see if there is a variation between the two genders in respect to the means in the corporate entrepreneurship, lean six sigma and organisational performance constructs.

In both these tests, no differences were found due to gender. Male and female respondents gave very similar answers with regard to all questions in relating to corporate entrepreneurship and lean six sigma. Both hypothesis with respective p-values of 0.44 and 0.73 are accepted H₀⁶ᵃ,H₀⁶ᵇ. The hypotheses has a p-value of over 0.5 and thus are accepted. This implies thus both male and female respondents have similar opinions on corporate entrepreneurship, and lean six sigma. There is no gender bias in any regard.
4.4.3.2 Hypothesis 7 (Age)

\((H_0^7)\): There is no statistical significant difference of opinion between the age groups of respondents with reference to the practice of \((H_0^7a)\): ‘lean six sigma’, \((H_0^7b)\): ‘corporate entrepreneurship’,

The t-test was conducted with reference to the age variable in respect to the difference in means of age in the corporate entrepreneurship and lean six constructs. In the analysis, the age variable was split into two groups instead of four as in the original questionnaire. This was done because on analysis, it was found that the older groups had very few data points, which did not warrant the four groups. As a result, the three older age bands were grouped together. The new depiction was younger (18-35 years old) and older (36 – 55 years old).

It was found that there is a significant variance between the mean scores for age and lean six sigma \(H_0^7a\) – but no significant variance between age and corporate entrepreneurship \(H_0^7b\) - The test compared the mean scores between the two age groups showing t-tests values of -2.63 and -0.68 and p-values of 0.0099 and 0.4967 at 0.95% confidence respectively.

\(H_0^7a\) is rejected whilst \(H_0^7b\) is accepted. In the first hypothesis \(H_0^7a\) the younger set of respondents thought quite differently to the older set of respondents with reference to the lean six sigma set of questions.

This shows that the older responders viewed their organisations as implementing lean procedures at a better rate than younger respondents. Possibly younger respondents are more critical of what can be achieved and thus scored their banks more harshly. This may be the case as all questions were perception questions. There was no difference between the age groups with regards to the application of corporate entrepreneurship.
4.5 Conclusion

This chapter analysed the data and presented the results. Through descriptive statistics, the data was deemed to be sound in nature with no major errors. From the data, 6 factors were created. A number of hypothesis tests were completed. Pearson’s coefficient and Levine’s T-test was utilised to complete this task.

Overall, certain elements of corporate entrepreneurship are possibly related to the elements of lean six sigma. This shows that the two methodologies can co-exist within a single firm without having a negative impact on each other and in some instance have a positive impact on each other and the organisation. It was also found that certain elements of corporate entrepreneurship and lean six sigma had a positive impact on organisational performance. In addition, gender had no impact on the perceived practices of corporate entrepreneurship and lean six sigma though age had an effect on perceived practices of lean six sigma. Younger responders felt their organisations had lower levels of implementation of lean six sigma practices.
Chapter 5: Conclusion and Summary of Findings

5.1 Introduction

The chapter is divided into three sections. The first presents a summary of the literature review, the aim and hypotheses of the study. This is followed by a discourse around the findings. The final part discusses the contribution of this study to the financial sector and proposes some recommendations and ideas of further research areas.

5.2 Overview of the Study

5.2.1 The Literature Review Revisited

The literature review was split into several sections. The first section of the literature review discussed corporate entrepreneurship (Morris et al., 2011) and elements that make up this construct as described by Barringer & Bluedorn (1999:423). These overarching aspects, including (a) Opportunity recognition, (b) Organisational flexibility and (c) the relationship of risk taking and innovation, were explored at length. Entrepreneurial intensity, defined as “the variable level of corporate entrepreneurship within the firm” was examined (Morris et al., 2011). Following, the implementation challenge of having the right culture was discussed. (Antoncic & Hisrich, 2004, Wood, 1988, Kobia & Sikalieh, 2010). Lastly, the relationship between corporate entrepreneurship and organisational performance was reviewed.

Overall, the literature posits that if organisations want to remain relevant and competitive in their respective fields, they should embrace the ideals or corporate entrepreneurship (Schumpeter, 1939, Drucker 1985:27, Thornberry, 2003:329). Much of the literature also highlighted the challenges involved in implementing corporate entrepreneurship, and stressed that both the correct culture amongst other things needs to be in place (Wood, 1988: 13-14). However, once achieved, corporate entrepreneurship was sure to improve organisational performance (Anderson & Yoshihiro, 2013:413).

Multiple definitions of lean were reviewed, including those by Krafcik (1988), Drew et al. (2004) and Andersson et al. (2006). The main philosophy and
The underlying principle of lean is that of waste management, in which eliminating waste has an overall benefit for organisations (Ohno, 1988).

The literature found that there are real and substantial benefits for the organisation when implementing both lean (Stone, 2012:114, Womack & Jones, 2003:15,311, Ohno, 1988:55) and six sigma (Pande et al., 2000:11-13, Näslund, 2008:271). If these two methodologies are combined, these benefits are amplified (Snee, 2010:19, Byrne et al., 2007:4, Bhuiyan & Baghel, 2005:765). There are also direct benefits to organisational performance (Shafer & Moeller, 2012:522, Arndt, 2002, Parast, 2009:46).

The main findings of the literature review showed that the relationship and related benefits between corporate entrepreneurship and lean six sigma are inconclusive. There are as many negative examples in the literature stating that continuous improvement strategies will destroy all innovation and entrepreneurial capabilities (Prajogo & Sohal, 2001:545) as there are positive articles stating that continuous improvement strategies are the building blocks of corporate entrepreneurship (Hammer & Champy, 2003:239). Some even state that lean six sigma is an element of corporate entrepreneurship (Cooper, 1998:500). Overall, there is consensus in the literature that benefits to corporate entrepreneurship and lean six sigma exist independently. That said there seems to be no agreement if these two methodologies can co-exist within one organisation, and if they do co-exist, whether they will make each other stronger or all benefits will be cancelled out by the other’s existence.

5.2.2 The Relationships Between the Constructs

The purpose of the study was to assess the practice of corporate entrepreneurship and lean six sigma in South African financial institutions. The research investigated the nature of the relationship between the two methodologies. Both corporate entrepreneurship and lean six sigma were broken down into smaller constructs for analysis purposes. The data analysis determined if indeed there was a relationship between the three corporate entrepreneurship constructs (Innovation, organisational flexibility and
environmental scanning) and the two lean six sigma constructs (variation reduction and waste reduction).

Secondary aims of the study were to determine if there was any relation between these constructs and organisational performance. Another secondary aim was to determine if any demographic characteristics of the respondents would influence the mean scores for corporate entrepreneurship or lean six sigma.

These aims have been achieved in this study through the literature review and the testing of hypotheses via a quantitative analysis. A number of hypotheses were put forward and then tested. Each hypothesis is first set forth then is followed by a highlight of the results and lastly recommendations are suggested.

The summary of the hypothesis and the results are indicated in the table 5.1 below.
Table 5.1: Summary of the Hypotheses

<table>
<thead>
<tr>
<th>Pearson’s Correlation</th>
<th>Hypothesis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation and Variation Reduction</td>
<td>$H_0^{1a}$</td>
<td>Accept</td>
</tr>
<tr>
<td>Innovation and Waste Reduction</td>
<td>$H_0^{1b}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Innovation and Organisational Performance</td>
<td>$H_0^{1c}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Organisational Flexibility and Variation Reduction</td>
<td>$H_0^{2a}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Organisational Flexibility and Waste Reduction</td>
<td>$H_0^{2b}$</td>
<td>Accept</td>
</tr>
<tr>
<td>Organisational Flexibility and Organisational Performance</td>
<td>$H_0^{2c}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Environmental Scanning and Variation Reduction</td>
<td>$H_0^{3a}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Environmental Scanning and Waste Reduction</td>
<td>$H_0^{3b}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Environmental Scanning and Organisational Performance</td>
<td>$H_0^{3c}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Variation Reduction and Organisational Performance</td>
<td>$H_0^{4}$</td>
<td>Reject</td>
</tr>
<tr>
<td>Waste Reduction and Organisational Performance</td>
<td>$H_0^{5}$</td>
<td>Accept</td>
</tr>
</tbody>
</table>

The three factors that made up corporate entrepreneurship (Innovation, organisational flexibility and environmental scanning) were compared to the two components of lean six sigma (variation reduction and waste reduction) and organisational performance.

Innovation is considered to be an output of corporate entrepreneurship. There was no relation to variation reduction. This would make sense, as being innovative is not related to being stable and ensuring consistency in product and process. There was a weak relation to waste reduction. Though being resourceful and cost conscious with regards to waste in some instances may
force the organisation to be innovative to achieve this goal of being cost conscientious. There was also a weak link to organisational performance. In instances innovation and risk pays off and increases organisational performance.

The second hypothesis dealt with organisational flexibility and its correlation with waste reduction, variation reduction and organisational performance. There was a weak relation to variation reduction. In keeping services and processes constant, it can make the space required to be flexible when adding a new service or process. There was an insignificant relation to waste reduction. There is a significant positive relationship between organisational flexibility and organisational performance.

The third hypothesis was about environmental scanning. There was a weak relation between scanning and waste reduction and also organisational performance. Scanning the environment externally may give insights how others control waste and these practices can be implemented internally. There is a weak relationship to organisational performance. As environmental scanning is an intangible act in many instances its direct link to organisational performance may not always be apparent.

The relationship between lean six sigma element of variation reduction and organisational performance showed that there was a weak relationship that was close to being considered moderate. This shows that constancy with regards to services and processes in the firm are perceived to being a small contributing factor to organisational performance.

There was no relationship between waste reduction and organisational performance. This may be due to the nature of the waste in the firm, it is not considered to be negatively or positively impacting the organisational performance. It's just there in the system and may just be considered a cost of doing business.
5.2.3 Demographic Variables

a) Gender

A t-test was used to find the significant difference between the mean scores of the constructs; corporate entrepreneurship, lean six sigma and organisational performance constructs respectively.

The aim of the hypothesis was to find out if men and women think differently around the questions that were asked in the measuring instrument. There is no statistically significant difference between the mean scores of gender and the other constructs. This is an interesting finding; there was gender equality in the perception levels of the employees that were surveyed. This shows that males and females perceive these management and strategic concepts in the same light.

b) Age

A t-test was used to find the significant difference between the mean scores of the constructs; corporate entrepreneurship and lean six sigma.

The results revealed that a significant statistical difference does exist between age and lean six sigma but not corporate entrepreneurship. This result shows that the variable “age” does play a significant role in the perception of lean six sigma implementation inside South African financial institutions. Further research would have to be conducted to find out why younger employees have a different perception that older ones with regards to this construct.

There was no statistical significant variance between age and the other two constructs.

5.3 The Contribution of the Study

The empirical results of the study provide new insight into the relationships between the managerial methodologies of corporate entrepreneurship and lean six sigma and organisational performance.
The literature review investigated a variety of previous studies, which looked at corporate entrepreneurship or lean six sigma separately but not in an integrated approach.

The other contribution of the study is that it has been empirically proven that there is a relationship between some of the elements that determine a business’s level of performance and some of the constructs of corporate entrepreneurship and lean six sigma.

5.4 The Limitations of the Study

As with other research projects, this study had some limitations. Firstly, the study was limited to banks only and not all financial institutions in South Africa. Therefore, the results may not be able to be generalised to other types of financial institutions or other countries. Secondly, only a small sample set was surveyed utilising a snow ball methodology. Having a much larger sample frame may produce different results. Another limitation is that the results could not be split by bank, due to confidentiality constraints. The quality of the results could have been better if the results could have been analysed by both a unit of the financial institution and individuals. This focus could have produced other dimensions to focus on, such as the type of bank or the size of the bank.

5.5 Future Research

Future studies could focus on the organisation as the unit of study. This would take into account issues regarding the size and type of the financial institution. A larger sample size could be taken to get a more representative data set. Other financial institutions could be studied such as insurance companies or smaller micro lenders that are not officially banks. This study could be carried out in other countries with a similar financial system as South Africa (e.g. developing economy) as well as in countries with different systems for comparative purposes. It would be interesting to find out if similar results would be found, especially with regards to the performance of the
organisation as a result of the application of corporate entrepreneurship and lean six sigma.
References


Create Value and Eliminate Muda, Cambridge: Lean Enterprise Institute.


Appendix

Dear Sir/Madam,

Thank you for agreeing to fill in this short survey. The survey is 13 questions and should take 10-15 minutes or less to complete.

The objective of this research project is to determine the nature of the relationship between the business improvement philosophy of Lean Six Sigma – which focuses on increasing efficiencies, strengthening quality management, and optimising processes – and the practice of Corporate Entrepreneurship in South African financial institutions.

In order to answer this survey, you are required to be working at a South African Bank. Preferably you work in an Entrepreneurial Department or Process Development Department that focuses on Product Development, Process Improvement, Innovation Strategies, Change Management or similar issues.

Please be assured that all the information supplied will be used strictly for academic purposes only and respondent anonymity will be respected. Final results will be shared with respondents upon request. Please email mgoldsmithuj@gmail.com if you would like to receive the final results once available.

Please answer the questions below as truthfully as you can as they relate to your business. There is no right or wrong answer. Please note the survey requires you to fill in all answers, so please ensure not to leave any blanks.

Thanks again,

Malcolm Goldsmith
mgoldsmithuj@gmail.com
A. Personal information

Respondent’s number

1. Gender?

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Your Age?

<table>
<thead>
<tr>
<th>Age Range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18 - 35 years</td>
<td>1</td>
</tr>
<tr>
<td>36 - 45 years</td>
<td>2</td>
</tr>
<tr>
<td>46 - 55 years</td>
<td>3</td>
</tr>
<tr>
<td>Over 55 years</td>
<td>4</td>
</tr>
</tbody>
</table>

3. Number of employees at the organisation you work at?

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50 – 500 employees</td>
<td>1</td>
</tr>
<tr>
<td>500 – 5000 employees</td>
<td>2</td>
</tr>
<tr>
<td>Over 5000 employees</td>
<td>3</td>
</tr>
</tbody>
</table>
B. The Corporate Entrepreneurship Scale

The following statements are meant to identify the collective management style of your firm’s key decision-makers.

*Kindly use one of the following codes: for questions 6, 7 and 8:*

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

4. In general, the top managers of my firm favour . . .

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. A strong emphasis on R&amp;D, and Innovation</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. High-risk projects with chances of very high returns</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. A bold, aggressive mentality not wanting to ‘wait and see’</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Bold, wide-ranging acts apposed to Exploring gradually via cautious behaviour</td>
<td>1 2 3 4 5</td>
<td></td>
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</tbody>
</table>

5. In the past 5 years, my firm has . . .

<p>| | | | | |</p>
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<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a. Added many new lines of products or services</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Made making dramatic changes to product or service lines</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Has established a special department in charge of innovation and venture</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Has produced a corporate culture that advocates innovation and risk-taking.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Had a trend of flattening of the organisation structure.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. The Environmental Scanning Scale

**Kindly use one of the following codes: for questions 9 and 10**

1 = Never
2 = Occasionally
4 = Often
5 = Always

---

6. In dealing with its competitors, my firm...  
   1  2  3  4  

   a. Routinely gathers opinions from clients
   b. Explicitly tracks the policies and tactics of competitors
   c. Forecasts sales, customer preferences, technology, etc.
   d. Carries out special marketing research studies
   e. Gathers info from trade magazines, government publications and news media

---

7. To what extent do you collect information about the trends below...  
   1  2  3  4  

   a. Economic trends
   b. Technological trends
   c. Demographic trends
   d. Customer needs and preferences
   e. Competitor strategies
D. The Organisational Flexibility Scale

*Kindly use one of the following codes:*

1 = Very difficult  
2 = Difficult  
3 = Neutral  
4 = Easy  
5 = Very easy

8 How difficult is it for your firm to change its strategic plan to adjust to each of the following contingencies/possibilities?

<p>| | | | | | | | | | | | | | | | |</p>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Shifts in economic conditions</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. The emergence of a new technology</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>c. Changes in government regulations</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Shifts in customer needs and preferences</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. The market entry of new competition</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

E. Variation Reduction Scale

*Kindly use one of the following codes:*

1 = Never  
2 = Rarely  
3 = Sometimes  
4 = Usually  
5 = All the time
9 When dealing with business problems or significant process improvements, to what extent does your organisation ...

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Define the problem and scope of the work effort of the process / project (this includes the pain felt by the customer and or internal stakeholder).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b. Measure the current process or performance. (Identify what data is available)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c. Analyse the current performance to isolate the problem (statistical and qualitative analysis)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. Improve the problem by selecting a solution, (brainstorm potential solutions and then test them) best solution</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e. Control the improved process or product performance to ensure target(s) are met. (Manage the risks)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

V27
V28
V29
V30
V31
F. Waste Reduction Scale

*Kindly use one of the following codes: for questions:*

1 = Never  
2 = Rarely  
3 = Sometimes  
4 = Usually  
5 = All the time

10 To what extent are the following statements true of your organisation?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. We understand what ‘good’ looks like</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>b. Our processes are designed</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>c. We understand our current processes well enough</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>d. We compare ourselves against perfection</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>e. We optimise the whole process and not just individual steps</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>f. We define value and all of the value adding features in a given process</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>g. We identify the “value stream” i.e. the chronological flow of activities that add value</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>h. We have focused these activities to flow without interruption</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>i. We allow our customers to pull our product or service through the process</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>j. We constantly pursue perfection of the process by revisiting the steps again and again in a continuous loop</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
When dealing with business problems, to what extent does your organisation track the following wasteful activities in relation to excess ...

<table>
<thead>
<tr>
<th>Activity</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Talent Underutilising peoples talent, skills and knowledge</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>b. inventory Excess products, materials or information not being processed</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>c. Motion Unnecessary movements of people that do not add value, e.g. walking</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>d. Waiting Wasted times by employees and customers waiting for the next step in the process</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>e. Transportation Unnecessary movements of products or materials (including electronic documents)</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>f. Defects Efforts caused by errors, mistakes, rework or incorrect information</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>g. Over-Production Production that is more than needed or before it is needed (including electronic data)</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>h. Over-Processing More work or higher quality than is required by the customer.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
G. Scale for Organisational Performance

*Kindly use one of the following codes*

1 = No Contribution  
2 = Small Contribution  
3 = Somewhat Contributed  
4 = Large Contribution  
5 = Immense Contribution

12 In your opinion to what extent have entrepreneurial activities contributed to the following attributes of your organisation.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>V50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross profit</td>
<td>V51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market share</td>
<td>V52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our competitive position</td>
<td>V53</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13 In your opinion to what extent have incremental process improvements contributed to the following attributes of your organisation.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>V54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross profit</td>
<td>V55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market share</td>
<td>V56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our competitive position</td>
<td>V57</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>