

The role of different innovation management modes on organisational financial performance in South Africa

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REMARKS

The editorial style and the referencing in this mini dissertation are in compliance with the Potchefstroom Business School's policy for the programme, which is to use the **Harvard Style**. To this end the NWU Referencing Guide (2012) has been used.

ABSTRACT

Title: The role of innovation management modes on organisationorganisational financial performance in South Africa

Key terms: Organisational innovation management, innovativeness, strategy, organisational financial performance, innovation management mode.

The study investigated the role of innovation management modes on organisationorganisational financial performance in South Africa. to examine what the relationship is with organisational financial performance. Although research has been conducted on the innovative strategy in South Africa none has been identified that seeks to establish the link to organisational financial performance.

Innovativeness and an adapted innovation management mode questionnaire taken from Bisbe and Malagueno's (2009), was administered to 73 companies listed on the Johannesburg Stock Exchange. These 73 companies were selected because they were registered and they confirmed to be innovating companies. A poor response rate of 18% was obtained due to changes in the willingness of respondents from when the database was compiled to the date of the actual research.

The Cronbach alpha coefficient analysis was conducted to ascertain the reliability of the measurement tool in relation to the small sample size obtained. The

innovativeness tool proved to be reliable with a Cronbach alpha coefficient of 0.845. Some of the innovation management mode tool items were coded and reversed and upon applying the Cronbach alpha coefficient, the tool was found not to be reliable when all 25 items were analysed. Reliability was obtained for three out of the six subsections when analysed separately. These subsections were used for Spearman rho correlation analyses, together with descriptive statistics for all items in the tool, in order to test innovativeness in organisations; relationship of innovativeness and IMM; and lastly the relationship between IMM and organisational financial performance; for the sample being observed.

Shareholder wealth creation (SWC) was used as a tool for organisational financial performance measurement, together with other more common measures for profitability, leverage, growth and survival.

A positive relationship between financial performance and innovativeness in the sample confirmed that innovation is a source of increased financial performance in organisations. No conclusive relationship could be ascertained between organisational financial performance using SWC, leverage, return on assets and survival. However the positive relationship found between growth and IMM in the sample, suggests that IMM may have a role to play in a growing organisation. The prevalence of systematic IMM in the sample and the high organisational financial performance of some of the companies using this mode could be due to the use of the contingency innovation management.

Limitations were identified in the study, which included the small sample size obtained and suggestions to improve on the implementation of the empirical research. Areas of further study include improving implementation and opening it up to a wider population group to ascertain whether the results found in this research are representative for South African companies.

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Chapter 1. Nature and scope of the study

1.1 Introduction

Since the industrial revolution innovation has been the source of rising living standards, the key determinant of competitiveness and national progress, as well as an important factor in solving global issues, such as climate change and sustainable development (OECD, 2007:6). The implementation of innovation is driven by a process with the following stages: creativity or idea generation; developing and testing; commercialisation (application or investment); feedback and improvement (Voeten, *et al.*, 2011:100-104). This process, when radical innovations are being introduced, can take between 3 to 25 years (Quinn, 1991:18). Early works suggest that innovation has been characterised by radical or breakthrough changes introduced mainly by larger firms, and concentrated markets, leading to marketing and technological discontinuity (Gebreyesus, 2011:129). However, incremental innovation is now also widely accepted as being associated with innovation, contained within organisations' boundaries, focusing on improvement, efficiency, existing products, and processes (Simseck, *et al.*, 2003:429).

Both incremental and radical innovation can generate entrepreneurial profits, but do so in different ways. Incremental innovation provides a steady predictable stream of profit, whereas radical innovation supply returns which are riskier, but provide higher returns on a successful outcome (outcome is only known after implementation) (Simseck, *et al.*, 2003:429).

Innovation in earlier generations has occurred within the confines of research and development departments, thus the general acceptance is that research and development management is used synonymously with innovation management (Bisbe & Malagueno, 2009:376). Various studies identify effective management of the innovation process, amongst other identified factors within organisations lead to competitive success, as found by Adams, *et al.* (2006:21). This is because innovation creates unique customer value by introducing new or improved, products, production techniques, organisation structures, markets and factors of production (Voeten, *et al.*, 2011:98).

1.2 Problem statement

Despite the great source of competitive advantage offered by this highly complex and multidimensional concept, organisations are failing to manage innovation in order to achieve the promised benefits (Adams, *et al.*, 2006:36). Simri, *et al.* (2012:5) found that South Africa has the lowest number of employees involved in entrepreneurial employee activity (EEA) out of all the efficiency driven economies. EEA is the percentage of the population of employees within the organisation involved in employee entrepreneurship (Simri, *et al.*, 2012:5). A study on a South African firm by Verhaeghe and Kfir (2002:415) has found no link between the innovation process and the strategic or business performance of the company. Another South African study reports that organisations' innovation management (OIM) is undertaken in an ad hoc manner in over 50% of all firms in South Africa, with only 44.9% having innovation strategies in place (Mayer, 2011:10). The reason for this general reluctance of OIM is offered by Ojasalo (2008:51), who refers to it as "controlling chaos" as it is wrought with difficulties arising from unexpected changes and surprises.

Furthermore, the existence of experimentation makes managing innovation a high-risk and high-cost endeavour, which has uncertain returns for the business (Kuczmarski, 1996:7).

Most research studies appear to focus on the management of sections of the innovative process, with the aim of improving these individual sections of the process; for example; Flynn, *et al.* (2003) researched idea generation, and Du Plessis (2007) researched knowledge management. Innovation management does not involve management of the activities involved in the process in silo, but involves management of the whole process of innovation with Ortt and van der Duin (2008:522) encapsulating both strategic and operational issues (Ojasalo, 2008:53). Bibse and Malageuno's (2009:376) framework identifies the following three different innovation management states organisations operate in at a strategic level and refers to them as innovation management modes.

- Intuitive IMM– Fragmented innovation management with research to be undertaken and developed is solely the remit of the research managers. This mode produces simple isolated incidents of innovation.
- Systematic IMM – Part strategic hence it is a more organised innovation management mode with a definite link between the business and research and development (R&D) activity. A matrix organisation structure exists for the management of R&D in the form of innovation projects.
- Strategic IMM – Full integration of the business and research and development exists. Innovation is an organisationwide endeavour with a balanced portfolio of research and development projects. Innovation is viewed as part of the organisations culture.

These innovation management modes were derived from organisational and managerial research and development configurations developed by Roussel, *et al.*, (1991:3-10).

1.3 Purpose of the study

The difficulties arising from managing the innovative process results from companies opting not to manage it, but resorting to taking advantage of innovation in an uncoordinated and unplanned manner. Innovation management in most companies takes the form of intuitive IMM. Another reason why companies do not manage innovation effectively is limited research on solutions of organisation innovation management. This it would appear to be contributory factors as to why South Africa is lagging behind in achieving the competitive advantage that other efficiency driven economies enjoy.

The purpose of this study is to investigate whether a link exists between the innovation management mode an organisation adopts, innovation and the organisation's financial performance.

This research will benefit South African organisations by identifying the dominant innovation management mode used by innovating companies on the Johannesburg Stock Exchange (JSE) and the relationship between innovation output and financial performance. This insight, it is envisioned, will spur South African firms on to become

more aligned with research based, current best practices in innovation management, so as to control the chaos of the innovation processes.

1.4 Research objectives

The primary objective was to investigate and empirically test the nature of the relationship between the strategic innovation management mode (IMM) and the financial performance of South African companies listed on the Johannesburg Stock Exchange (JSE).

The secondary objectives of this research was to investigate and empirically test whether a positive relationship exists between organisational innovativeness and financial performance, as well as to ascertain whether strategic IMM has a more positive relationship to organisational innovativeness in comparison to intuitive and systematic IMM.

The overall aim is to establish and recommend the innovation management mode which will provide the most financial benefit to organisations seeking to enhance their competitiveness using innovation.

1.5 Literature overview

1.5.1 Definitions and overview

Numerous definitions of innovation exist with some overlapping in their views (Baregheh, *et al.*, 2009:1325). A simple definition of the concept of innovation is offered: “putting invention into practice” (Szimari, *et al.*, 2011:5).

The purpose of innovation is to generate a competitive advantage which, according to Baltzan and Phillips (2010:22), is achieved by creating a unique customer value. Therefore the innovation must place the innovating firm ahead of its competitors, through creation of unique customer value and through better or cheaper products.

According to Voeten, *et al.* (2011:100), innovation is the result of a process. The definitions of the innovation process are dependent on the view point taken. The innovation process is viewed, either as a series of events, a social interaction, a series of transactions, or a process of communication (Adams, *et al.*, 2006:36). The innovation process is a series of activities which bring an invention to

commercialisation, according to Voeten, *et al.* (2011:100-104). In order to manage the innovation process, innovation management (IM) models are necessary to plan the various activities involved and how they relate to each other. Innovation management (IM) is a systematic planning and controlling process, to create an organisation with effective routines for implementing the innovation process, whose purpose is to produce new products and processes (Ojasalo 2008:71; Brem & Voigt, 2009:352; Tidd & Bessant, 2009:593).

Effective IM approaches have been suggested overtime and have been continuously evolved in response to changes in the macro-environment, resulting in additions to improvements made on previous IM best practices (Ortt & Van der Duin, 2008:524). Various studies have been conducted on the changes that have occurred over the years, which resulted in the categorisation of innovation models under generational innovation systems, from which the innovation management mode model is derived. This study focuses on the organisational innovativeness as defined by Wang and Ahmed (2004:304): “an organisation’s overall innovative capability of introducing new products to the market, or opening up new markets, through combining strategic orientation with innovative behaviour and process”.

They expand upon this definition by identifying that organisational innovativeness is determined by looking at the organisations’ product, market, processes, behavioural and strategic innovativeness.

1.5.2 Measuring innovation and organisational performance

The need to measure innovation at firm level is imperative for both academics and organisations. Measurement and benchmarking of organisational innovativeness is important in order to affect more effective management of this complex process. For academics, the need for measuring innovation arises from the need to search for more uniform methods of measuring innovation, in order to build upon the current body of knowledge. This can only be achieved if a duplication of studies is avoided through the use of commonly acknowledged concepts and constructs. Measurement of the effect of innovation management techniques and tools differ between organisations and academics, leading to fragmented innovation management measurement methods. Studies suggest that the lack of a uniform measure of

innovation management, results in organisations using the input and output of innovation as measures of organisational innovativeness, and ignoring the measuring of the process. This results in the loss of opportunities to improve the existing innovation management processes gained by understanding and measuring the process (Adams, *et al.*, 2006:21-22).

1.5.3 Financial performance as a measure of innovation success

Studies on the effects of innovation on a company's financial performance yield results that are often inconclusive, particularly when assessing small enterprises. Existing literature suggests that a positive relationship exists between innovation and turnover growth however, this relationship is weak or non-existent concerning business profitability. The weak relationship between innovation and profitability in firms has been attributed to weak management skills and competence (Hughes, 2001:161-162).

Interestingly, Verhaeghe and Kfir's (2002:410) holistic systems framework for innovation, use profitability as one of the measures of innovation output. They argue that the true measures of innovative outputs are economic or social. The framework uses financial measures such as return on investment, turnover and profit, as outputs. This introduces some discrepancies when compared to findings from earlier studies.

More current research supports the notion that there is a strong relationship between innovation and economic performance (Mansury & Love, 2008:54). A negative relationship was found to exist between innovation and productivity in service firms, owing to the disruption caused by innovation. However, a strong positive relationship exists between innovation and productivity growth (Love, *et al.*, 2010:995). With conflicting results in the different measures of financial performance, it was imperative to find a reliable measure for organisational financial performance. The shareholder wealth creation measure was chosen to measure organisational financial performance. This decision was taken due to the fact that the measure combines the most relevant underlying constructs of organisational financial performance, which are leverage, profitability, survival and growth measures (Carton & Hofer, 2006:83).

1.6 Research questions and hypothesis

Primarily this research sought to establish the interaction of innovation management modes with organisational financial performance.

Research questions:

- Since there are conflicting results on the relationship of innovation and financial performance the first question is:

Does organisational innovativeness impact on organisational financial performance?

- Since the purpose of implementing strategic innovation management is to increase organisational innovativeness, the research seeks to answer:

Does the strategic innovation management mode have a higher impact on organisational innovativeness?

- If strategic IMM has a higher impact on organisational innovativeness and organisational innovativeness impacts on organisational financial performance, the last question is:

What is the nature of the relationship between IMM and organisational financial performance?

Thus the hypotheses are:

H¹: A positive relationship exists between innovation and financial performance.

H²: Strategic innovation management mode plays the greater role in creating organisational innovativeness as compared to intuitive and systematic innovation management.

H³: Strategic innovation management mode affects organisations' financial performance more positively than intuitive and systematic innovation management mode organisations.

1.7 Research design and methodology

1.7.1 Research methodology

The research was based on a mix of the quantitative and qualitative approaches, using the non-probability sampling technique, namely homogeneous sampling (Lund research Ltd., 2012). The mixed method approach was used, in order to:

1. Collect data on the organisation's innovativeness and their innovation management mode, using qualitative methods.
2. The quantitative method was used to gain insight into the type or nature of the innovation the organisation was making reference, to when completing the questionnaire, since the sample covered different types of industries.

The study sought to establish the innovation management modes used by organisations on the Johannesburg Stock Exchange (JSE) and to measure the effects on the company's financial performance. This method included non-experimental hypothesis testing research using correlation design, which sought to examine the relationships between two or more variables with no planned intervention at any particular time. This method was deemed appropriate for this study as the researcher was seeking to measure how financial performance (dependent variable) is affected by the presence of innovation and innovation management modes (independent variables) (Welman, *et al.*, 2011:93).

1.7.2 Sampling and data collection

Empirical data was collected from a homogenous sample drawn from self-professed innovative South African companies listed on the JSE. This population was selected, as records of financial performance for all these companies are readily available to the public. A database was compiled with the name, phone number, e-mail address and physical address of the individuals involved in the management of innovation of South African organisations listed on the JSE. These individuals' typical positions were innovation managers, research and development managers, directors, strategy managers, chief executives, new product development officers or marketing managers. The Internet was used to collect the above information by accessing moneyhub.net for the list of JSE listed companies, and investinafrica.net for easy access to the companies' websites. Where the required information was not available on the websites, the human resources manager's information was collected. In cases where the information of the human resources manager was unavailable on the websites, contact information for the head office reception was collected. Companies listed on the JSE but were not registered in South Africa, were excluded. An introductory e-mail was circulated to all the companies identified, which

introduced the researcher and revealed the details of the proposed research. The email requested it to be directed to the relevant individuals who could assist with the research, or else indicate whether the receiver of the e-mail rather would be interested to participate in the research. Follow-up phone calls were made to complete the database. Thirty non-South African companies were excluded, while seventy three South African companies were included on the database, and the rest were excluded because they stated they did not innovate or no one responded to the request for information. E-mails with the questionnaire attached were sent out, with follow-up phone calls made to those recipients who did not respond to the initial emails. Quantitative data was collected through telephone conversations or and from the companies' websites.

The questionnaire was formulated by adapting the questionnaire items of Bisbe and Malagueno (2009:403), and administered to the seventy three individuals on the compiled database.

Before administering the questionnaire, a pilot study was conducted using innovation managers and individuals with knowledge of innovation management and research techniques, in order to correct possible ambiguity in questions and the instructions contained therein. (Welman, *et al.*, 2011:14).

1.7.3 Data analysis

Descriptive and Spearman rho correlation statistical analysis of collected data was undertaken. Cronbach alpha reliability testing was undertaken before statistical analysis was done. Data analysis was conducted by the North-West University's Statistics Consultation Services.

1.8 Demarcation of study

The study was limited to South African companies listed on the Johannesburg Stock Exchange (JSE) and excludes all delisted or suspended companies at the time of the analysis. Data was collected from the core business units in companies with multiple business units with decentralised research and development or innovation development functions. It was anticipated that some information may have been lost, by not collecting data from all the business units, however time constraints and the

size of the study has limited deeper exploration into all the sub units of the organisations.

1.9 Significance of study

The research study was undertaken to extend the current knowledge on innovation management and the financial performance of an organisation. It differs from other studies in that it has measured managing innovation in context of the whole organisation as opposed to managing the innovation process. It also did not measure innovation success in terms of research input and output (for example, the number of patents, or new products), but attempted to link innovation success to one of the key measures of organisational success, which is financial performance. Increased knowledge and awareness of the interaction of innovation management modes, and financial performance, may encourage organisations to persistently consider evaluation of the innovation management mode in use in their organisations as part of their innovation strategy. Ultimately this study will encourage organisations seeking to enhance their innovativeness to strive towards attaining the standards of the IMM, which produces superior organisational financial performance.

Chapter 2. Literature review

2.1 Introduction

Less than one in four managers reported achieving the business value promised by innovation, according to Igartua, *et al.* (2010:42). Successfully seizing the competitive edge offered by innovation, involves managers gaining a full appreciation of the management challenges and the concepts involved in managing the innovation process. Therefore the starting point of this chapter is to conceptualise innovation management by providing working definitions of innovation and management as well as innovation management.

According to Bisbe and Malagueno (2009:376), innovation management modes in organisations are an extension of the different types of research and development configurations that have developed through generations. Innovation management modes facilitate the definition of the organisation-wide stance on how innovation is managed. To this end the document describes the generational models of research and development (R&D), which shapes the thinking behind each innovation management mode. The innovation management model emerging from the generational R&D models is described in detail, as well as more recent research that investigates Rousell, *et al.*'s (1991) proposed strategic innovation management mode.

The second part of this chapter examines innovation management and its impact on organisations' performance, by identifying the available performance measurements of innovation management. This chapter will also review financial performance measures that have been used to measure organisations' financial performance.

The chapter concludes by looking at innovation management studies carried out in South Africa, in particular those that seek to identify the effects on financial performance.

2.2 Definitions

2.2.1 Defining Innovation

Numerous definitions of innovation exist with some overlapping in their views (Baregheh, *et al.*, 2009:1325).

A simple definition of the concept of innovation offered, is:

“Putting invention into practice” (Szimari, *et al.*, 2011:5).

Voeten, *et al.* (2011:98) expands by stating that it is:

“The introduction of new or improved products, production techniques and organisation structures, as well as the discovery of new markets and the use of new input factors.”

In addition to introducing something new, innovation creates value (Voeten, *et al.*, 2011:98), facilitates the creation of wealth (Drucker, 1991:3), and produces knowledge through experimentation (Ederer & Manso, 2012:2).

Eisenbeiß and Boerner (2010:365) view the introduction and application of innovation as being deliberate, and they introduce the setting in which it occurs. They state that it occurs “within a role, group or organisation of ideas, process, products or procedures...” with the purpose to “significantly benefit the individual, group, organisation or wider society”.

Carpinetti, *et al.* (2007:378) introduce the role of management in innovation by stating that it is:

“the economic implementation and exploitation of new ideas and discoveries, including the implementation of an innovation culture in an organisation.”

Voeten, *et al.* (2011:104) have found that the recurring characteristics in most definitions of innovation are newness, value creation and process.

Newness – Innovation is the recombination of old ideas to form a new or unique way of thinking or doing things which challenges the status quo as perceived by those affected by, or participating in the innovation (Voeten, *et al.*, 2011:100-104). The

newness may be due to subtle differences that build up over a period of time (incremental innovation), or dramatically obvious differences (radical innovations) (Ojasalo, 2008:53; Voeten, *et al.*, 2011:100-104).

Value creation – Does the activity create value for the innovating organisation? Value is created either when efficiency in production is improved, thus lowering costs of inputs (cost advantage), or when activities or products in an organisation are unique and offer better functionality for the customer (differentiation advantage) (Porter, as cited by Voeten, *et al.*, 2011:102). Unique customer value is what generates competitive advantages (Baltzan & Phillips, 2010:22). Therefore the innovation must place the innovating firm ahead of its competitors through the creation of unique customer value.

Process - According to Voeten, *et al.* (2011:100), innovation is the result of a process. The process that drives the innovation is dependent on the type of innovation that is employed by the organisation (Rowley, *et al.* 2011:75).

Mansury and Love (2008:53) point out that there are distinct differences between the innovation processes in products and services firms. Services firms' innovations arise more out of improving processes through interacting with clients, suppliers and competitors. On the other hand, product innovations arise from processes in internal R&D departments, interactions with universities, and research facilities.

As derived from the above, a working definition for innovation is:

The process of economic implementation of perceived new ideas in an organisation, through the organisational culture which constantly challenges the status quo, in a bid to increase customer value.

This working definition for innovation is based on recurring themes from the various definitions of innovation and do not discriminate either against services or product innovations. It also includes themes of innovation which are relevant to organisations, namely economics and management (through organisational culture), which forms the basis of this study. Furthermore it assists in defining strategic

innovation management, for which the hypotheses proposed is needed in order to achieve superior financial performance.

2.2.2 Management

Management is a process of planning, organising, leading and controlling human and other scarce resources of an organisation, so as to effectively achieve the mission and goals of the organisation (Dyck & Neubert, 2009:7; Smit, *et al.* 2011:8).

Dyck and Neubert (2009:7) point out that the four functions (planning, organising, leading and controlling) included in the definition of management are synonymous with those in the definition for an organisation, implying that, without management, the organisation ceases to exist (Smit, *et al.* 2011:6).

Planning is about formulating the organisation's strategies. Organising concerns itself with resource allocation to the various tasks and jobs, resulting in organisational structure. Leading entails making sure that the human resources employed in the organisation carry out the tasks and jobs allocated to them. Controlling ensures that professional norms, culture, and "the way things are done here", are set and maintained (Dyck & Neubert, 2009:8-9). Controlling is seen as the concluding action as, it sets standards, measures performance, compares performance to standards, and identifies corrective actions (DuBrin, 2009:510). The extent to which management carries out the above-mentioned functions, depends on organisational characteristics, such as the size, nature, culture, technology and the type of organisation (Dyck & Neubert, 2009:6).

2.2.3 Innovation management (IM)

Dankbaar (2003:xvii) view IM as the

"creation of preconditions to promote human creativity, including strategic commitment and context management".

The above definition of IM introduces dimensions such as human resources and contextual management. Ortt and van der Duin (2008:523) define innovation management as "the governance and organisation" of the innovation processes. Zabala-Iturriagagoitia (2013:76-77) add that it is a long-term, continuous, systematic process that steers organisations towards organisational change, brought about by

new concepts or discoveries. Tidd and Bessant (2009:169) support the notion of organisational change as part of strategizing in IM, due to the fast changing external environment.

Innovation management (IM) is a systematic planning and controlling process to create an organisation with effective routines in which the innovation process is implemented, in order to produce new products and processes (Ojasalo, 2008:71; Brem & Voigt, 2009:352; Tidd & Bessant, 2009:593).

Ojasalo (2008:71) adds trust to planning and controlling, to describe innovation management in a network context (open innovation). He adds that planning, controlling and trust in networks are particularly important for the process development and protection of intellectual property.

From a management conceptual point of view, the above definition omits leading and organising from it. Igartua, *et al.* (2010:42-43) reviewed literature on IM and listed components that are part of innovation management. It is interesting to note that these components can be categorised under each of the management functions identified earlier, as captured in Table 2.1.

Table 2.1: Categorisation of IM components into management functions

Planning	Organising	Leading	Controlling
Strategy management; Technology; Marketing; Portfolio management;	Organisational design; Technology; Marketing; Innovation processes;	Leadership and organisational culture; External relations; Human resources; Project management;	Performance measures; Knowledge and intellectual property management, Leadership and organisational culture;

Source Igartua (2010:42-43)

This observation is supported by Martins and Terblanche (2003:73), who observed that the planning, organising and leading functions play an important role in forming

a culture of innovativeness. A culture of innovativeness that they posit is achieved through strategy, organisational structure, support mechanisms, and innovation supporting behaviour from management and communication.

Other studies concur with the role that leadership plays in a firm's innovation orientation, suggesting that a leader's external orientated expertise (such as the experts' knowledge, skills or experience of individual top managers in subjects related to product/market issues, which influence their stock of knowledge and processing capacity) influences their method of organisational innovation management. A leader's external orientation is particularly important when strategic innovation management is employed, as leaders who have expert knowledge of the product and the market are quick to recognise the value of innovative input from their subordinates and respond positively to it (Bisbe & Malagueen 2009:375).

It is therefore safe to conclude that all the management functions should be included in definitions of innovation management, as this provides a direct link between management and innovation, allowing a more comprehensive explanation of the innovation management concept.

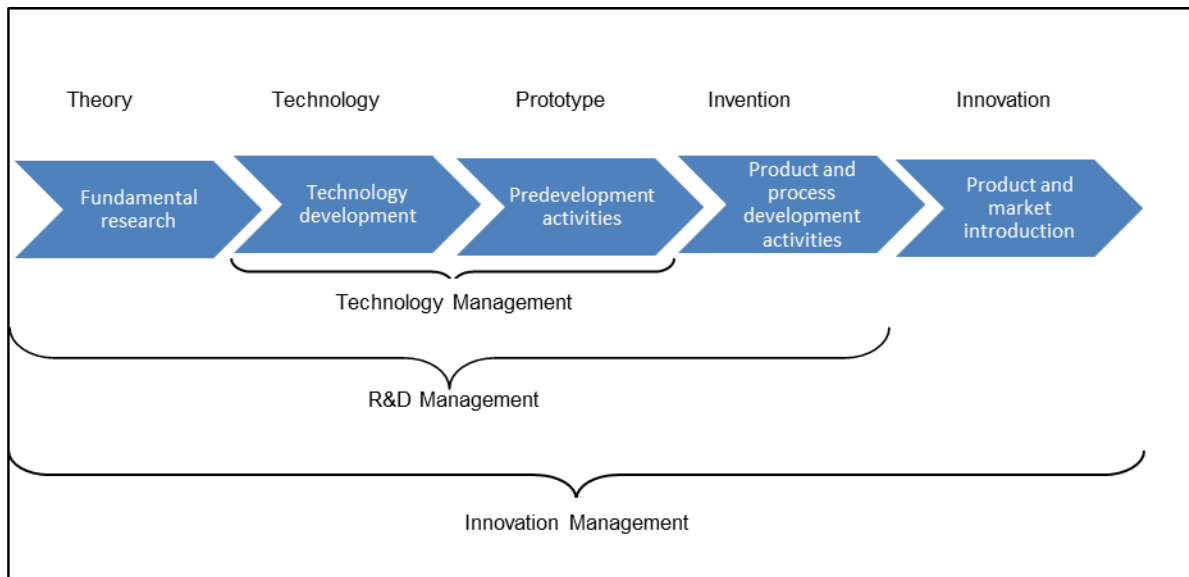
2.2.3.1 Distinction between innovation, new product development and technology management.

Igartua, *et al.* (2010:42) have found that IM literature tends to interchange the use of the terms of IM, new product development (research and development), and technology management.

Brem and Voigt (2009:352), refer to Figure 2.1, posits that research clearly makes a distinction between technology management, research and development (R&D) management, and innovation management (IM). Technology management deals with establishing the viability of an idea via the technological and pre-product development activities, while the R&D management includes new idea generation in the fundamental stages of the process and extends beyond technical exploration to convert the idea into a product (prototype to invention). Innovation management includes management of both the technological and R&D management functions, as well as ensuring that the new product is successfully taken to market (innovation), to

generate an income for the organisation. Zabala-Iturriagagoitia (2013:76) concur that there is a difference between IM, technology management, and R&D management. IM includes the management of both soft and hard factors. Hard factors are part and parcel of the organisational activities and tasks which are under the control of general management. These activities include R&D, technology and commercialisation management. The intangible soft factors that IM is also concerned with are learning, skills development, and sharing information (Zabala-Iturriagagoitia, 2013:76). However Bisbe and Malagueno (2009:375) have found that R&D and innovation “operating principles, routines and practices are interconnected in the organisational and managerial processes”. In this respect R&D and innovation management are synonymous with each other and as such Bisbe and Malagueno used Roussel’s 1991, third generation R&D management model concepts for the innovation management mode (IMM) which will be used for this research.

Figure 2.1 Classification of technology, R&D and innovation management.



Source: Specht (as cited by Brem & Voigt, 2009:352)

Therefore the following working definition for innovation management will be utilised systematic planning, organising, leading and controlling processes to create an

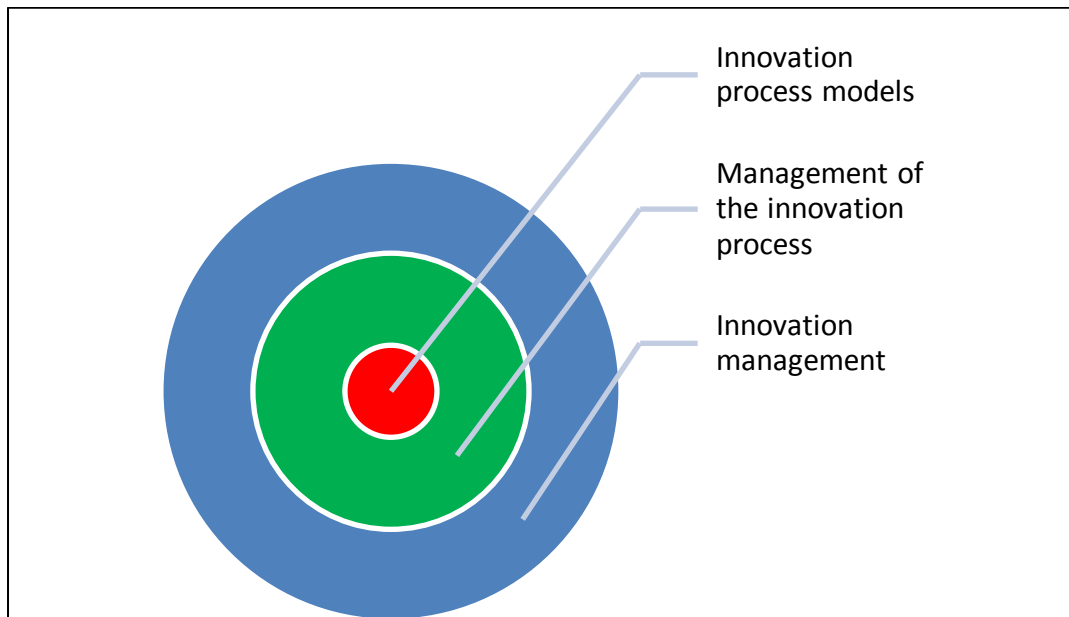
organisation with effective routines in which innovation processes are implemented for a continual competitive advantage.

2.3 Generational innovation models

Numerous innovation models have been implemented successfully, or models that promise success, have been suggested over time. The innovation management mode model (IMM) used in this study, is derived from the generation innovation models. A synopsis of the generation innovation models is described in the following section, in order to contextualise the IMM model.

In response to changes in the macro-environment, over time effective innovation models have evolved continuously (Ortt & Van der Duin, 2008: 524). Park and Kim (2005:36) identify innovation models that date as far back as the 1900s. The evolution of innovation models has been captured and classified by numerous researchers, to give rise to generational innovation models. According to Von der Gracht, *et al.* (2010:386), generational classification is used today to facilitate the identification of the innovation management approaches utilised in organisations. These innovation models include innovation process models, models to manage these processes, and innovation management systems or modes, as well as models that describe the organisation's management stance in relation to innovation processes and their management.

Figure 2.2 Generation innovation models

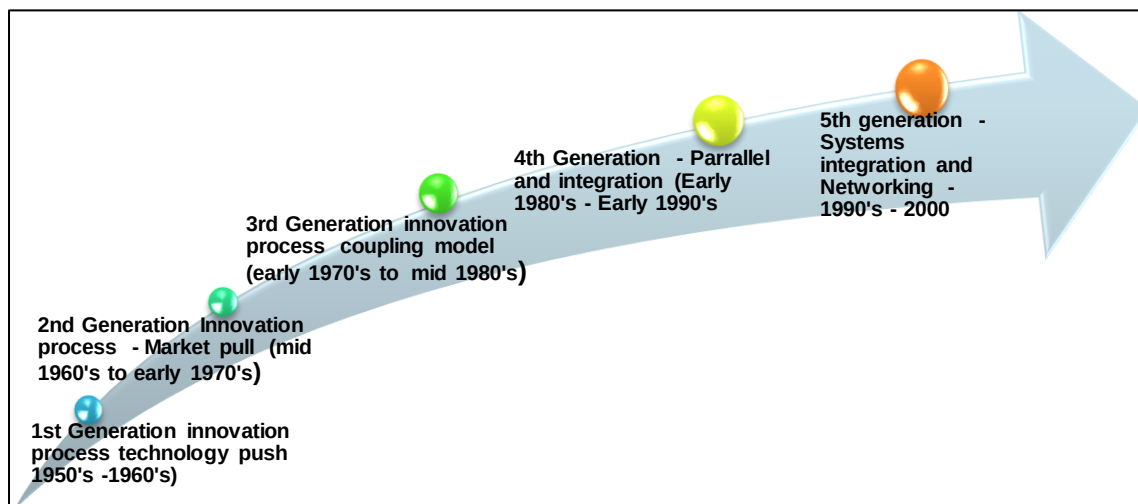


Source: Von der Gracht, *et al.* (2010:386)

2.3.1 Generational innovation process models

Rothwell's (1994:8) generational model focused on the transformation of innovation processes from the simple technology push model in the first generation innovation process (see Figure 2.3), to the complicated fifth generation innovation process model (Rothwell 1994:8).

Figure 2.3 Rothwell's 1994 generational innovation process models



Source: Rothwell (1994::8)

First generation technology push innovation processes used a single type of innovation, namely product innovation, which was generated and developed within the organisation and the product's concept was sold to the public through marketing.

Second generation markets pull innovation processes predominately used in marketing or position innovations (new markets or finding new ways to serve existing markets).

Third generation couples innovation process models, combining product and market innovations. This innovation process was viewed as a communication network between the internal and external environments, which generated new products.

Fourth generation, also known as the “rugby approach”, whereas communication with external players about new ideas, occurred simultaneously with the internal new product development team's engagement with suppliers. Thus suppliers, designers and idea generators are all engaged in the innovation process from a very early stage. This allows for quicker product development in response to shorter product life cycles.

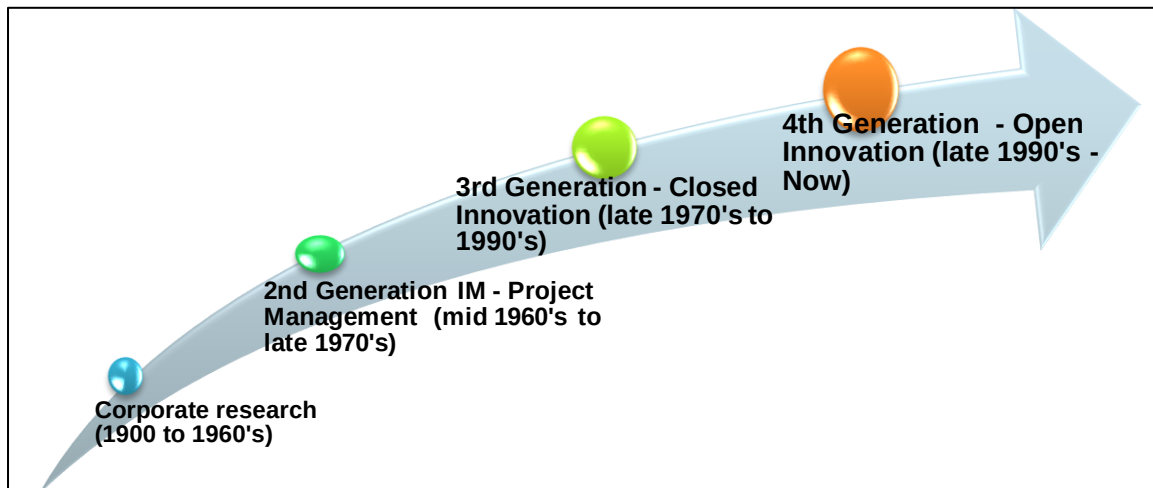
Fifth generation systems integration and networking processes are aimed at speeding up the innovation process without compromising the quality of products. It is an adaptation of the 4th generation innovation process, but introduces previously developed management practices and technological advancements into the innovation process.

2.3.2 Generational innovation management models

There is in existence four to five generational innovation management models dating from post-World War II era (1960s) to the present. For example Amidon (1996) proposed a five-generation model; Miller and Morris (1999) suggested a four-generation model (as cited by Park and Kim (2005:36-37)). Niosi (as cited by Ortt & Van der Duin, (2008: 523)) also identified a generation model of innovation management. Generally all of these models identify the first generation being the corporate research and development (R&D) laboratories, followed by the project

management approach to R&D. The third generation of IM worked on the basis of relying on internal capabilities (closed innovation) of different departments of the organisation. Lastly the fourth generation placed significant emphasis on the use of external and internal sources (open innovation).

Figure 2.4 Generation innovation management model



Source: Niosi (as cited in Ortt & Van der Duin, 2008:523).

Park and Kim (2005:37) have found recurring themes in the different generation innovation management models and summarise the common characteristics in Table 2.2. These IM characteristics timelines appear to correspond with the innovation processes timelines, suggesting that the IM approaches in use are a direct response to the innovation processes that prevailed at each timeline as shown in Table 2.3.

Table 2.2 General characteristic of R&D or innovation management systems

Generation		General characteristics of R&D system
First	Researcher orientated	Linear innovation model; science and basic research, technology–push planning; hierarchical R&D organisation, staffed by engineers and scientists only; virtually no auditing; minimum documentation; market not considered; R&D operated.
Second	Manager orientated	Partially non- linear innovation model; applied research; technology push and market pull; matrix organisation; project

		management ; data based processing;
Third	Company orientated	Chain linked innovation model; balanced portfolio of R&D types; market pull and supplier related; distributed organisation; technology road map for R&D planning; intellectual property management; information based processing.
Fourth	Customer orientated R&D	System and network innovation model; management of R&D cycle; emphasis on dominant designs; leadership of innovative researchers; global and collaborative organisation; knowledge based processing; online management.

Table 2.3 Correlation of innovation process and innovation management models

Timelines	Innovation process models	Innovation management approach
1950 – 1960s	1 st Generation technology push	1 st Generation corporate research
1960 – 1970s	2 nd Generation market pull	2 nd Generation project management approach
1970 – 1990s	3 rd and 4 th Generation coupling model and parallel and integration	3 rd Generation closed innovation
1990 – current	5 th Generation systems integration and networking	4 th Generation open innovation and contextual

2.3.3 The third generation R & D management model

Roussel, *et al.* (1991:3) proposed the third generation R&D management model by distinguishing between each generation in terms of “strategy, organisational form, funding criteria and methods of control” (Park & Kim 2005:35).

Although this model is generational, it differs from the above models in that it points out the relevance and position of innovation within the whole organisation through the generations. The Roussel, *et al.*’s (1991:3) third generation model was not only used due to the unique way it positions innovation in context of the whole organisation, but also because of its emphasis on strategic innovation. This fits the

purpose of this study, namely to establish whether strategic innovation management produces superior financial performance for the whole organisation as opposed to other methods.

Roussel, *et al.* (1991:6-7) describes the economic climate in which the first and second models were developed, with datelines and reasons for the change, from 1st to 2nd generations. The datelines generally coincide with the other generational models and it is thus fair to conclude that the same reasons applied, however Bisbe and Malagueno (2009:376) utilise these generations to conceptualise the three different innovation management modes, namely intuition, systemic and strategic innovation management modes.

2.3.3.1 First generation – Intuition innovation management mode

The first generation of R&D management, 1930s to 1950s, was born in an era where there was a boom for potential and technological opportunities worldwide. A copious amount of money was readily available for academic research from governments, and R&D from organisations. Positive returns on research and development investment were considered the norm (Roussel, *et al.* 1991:25-26).

Bisbe and Malagueno (2009:376) call this the intuitive innovation management mode, as innovation in the organisation is based on the innovation manager's intuition.

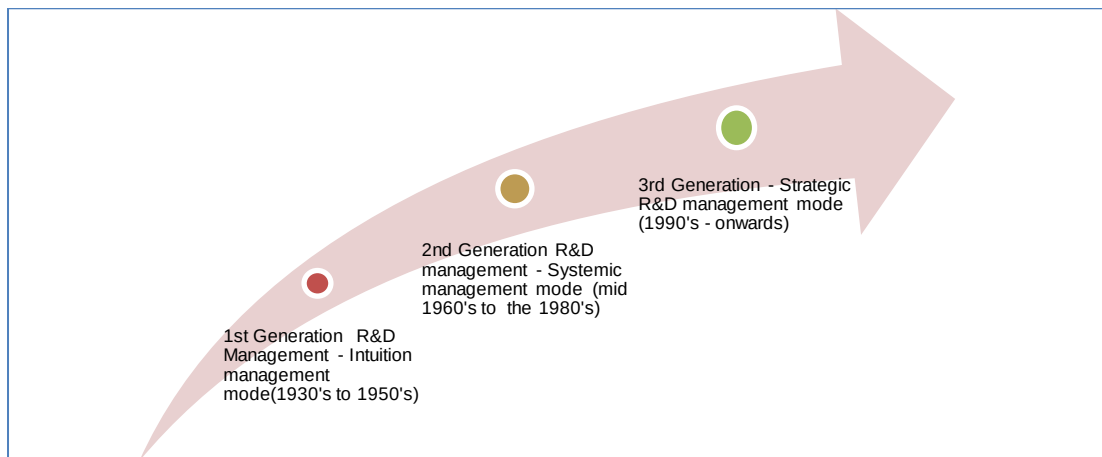
2.3.3.2 Second generation – Systematic innovation management mode

Roussel, *et al.*'s (1991:24-25) second generation R&D management, emerged in the light of the dramatic changes to the socio-economic environment in the 1960s up to the 1980s. Maturing markets resulted in increased competition and reduced profits, which led to organisations tightening their economic belts. R&D expenditure was cut, due to reduced returns on R&D investment, as well as to facilitate the diversion of resources to globalisation.

2.3.3.3 Third generation – Strategic R & D management

Globalisation brought with it increased competition, and the fast paced technological advancement placed pressure on organisations to increase expenditure on R&D in order to remain competitive. It is against this backdrop that Roussel, *et al.* (1991) suggested the third generation strategic R&D management model.

Figure 2.5 Timelines of Roussel, et al.'s 1991 third generation model and Bisbe and Malagueno's (2009:375) innovation management mode.



Source: Bisbe and Malagueno's (2009:375)

2.3.4 Innovation management modes in organisation

Bisbe and Malagueno (2009:375-379) describe these as:

“...archetypes or commonly occurring configurations of organisational and managerial processes by which innovation arises and is managed.”

These modes are formed based on organisational structures and management systems that exist in organisations to give rise to innovation. The general characteristics of each mode are shown in Figure 2.6.

Figure 2.6 Characteristics of the each mode in the Innovation management mode



Source: Summarised by the researcher from Bisbe and Malagueno (2009:375-379)

2.3.4.1 Intuitive innovation management mode

The intuition of the R&D manager governs the direction of innovation with no or limited initial input from the business or marketing management. Intuitive IMM is characterised by ad hoc innovation initiatives outside any clear innovation framework, and as such only produce simple, isolated innovations (leaving it to chance). Management of the innovation process is fragmented, as the organisation of managing an innovation does not reside in a single point of contact, but is passed on from one manager/department to another, along the innovation process. Objectives are ill defined, measuring and the evaluation of progress is superficial for radical innovations, with peer progress reviews focusing on the technical aspects of innovation, as opposed to reviews in relation to the business or the market. A complete disconnect exists between the business management and innovation or R&D management. The business managers have a limited technical understanding of what the R&D department is working on and how it will benefit the business. In turn, the R&D department's perception of the needs of the business is inadequate for making decisions on developing the next best thing for the organisation. The business, marketing and technological connection only occurs when the new product or service development is quite advanced, resulting in the likelihood of technology failing to meet the needs of the market and the business (Roussel, *et al.* 1991:28).

2.3.4.2 Systematic innovation management mode

Systematic IMM on the other hand, is more organised but innovation initiatives are undertaken in project silo's (for example, projects occur within business units with no central locus of control of these projects) (Bisbe & Malagueno, 2009:376). Roussel, *et al.* (1991:30) describe it as a transition between first generation and the first offerings of organised, structured management of research and development, albeit at project level.

The key difference between an intuitive and a systematic innovation management mode, is that business and research and development management jointly consider projects to take forward for development and commercialisation. Management have knowledge of different types of R&D and looks at them from a strategic and

operational perspective. Together management and R&D set budgets for the full lifetime of the innovation, consider the impact on the business, as well as risk identification and management. R&D management is afforded the benefit of providing input into the direction of the business by questioning business objectives from a technical and research and development perspective, albeit on a project by project basis. Consideration of an individual project in silo may yield excellent results, however a combination of the impacts of all projects on the organisational may not produce the anticipated enhanced organisation performance outcome. The organisational structure of innovation management in systematic innovation management mode centralises radical innovation with matrix structures formed for each project, and distributed incremental innovations which are managed within their business units. Systematic management mode sets broad objectives in project and business terms, due to high uncertainties. Progress measurement can be difficult to quantify due to the “market intelligence gap”. Formal peer reviews are also conducted on each project, utilising internal and external expertise. The results are fed back to the business, which decides whether the project continues, or is abandoned on the basis of perceived progress against the set objectives (Roussel, *et al.* 1991:30-35).

The systematic approach has been shown to be effective, however careful consideration for managing the organisation of the project, is required. Blindenbach-Driessen and Van den Ende’s (2010:719-720) study suggest effective organisation of the systematic innovation management mode in a comparative study on the effects of systematic innovation management practices between project based firms and non-project based firms. They found rigorous and efficient planning associated with project management practices inflexible when organisations attempt to implement innovation. They suggest that organisations forming matrix structures for the purpose of innovation projects, consider functional disciplines (use those disciplines relevant to the particular project), as opposed to forming collaborating multidisciplinary project teams to increase the chances of success.

2.3.4.3 Strategic innovation management mode

The complexity of the innovation processes and organisations make it imperative for the existence of a framework that efficiently coordinates its innovation (Adams, *et al.* 2006:36). Strategic IMM innovation involves coordinated input from the higher echelons of management. It crosses organisational boundaries as all innovation initiatives are considered in business terms and inter departmental (or business units) communication, and idea exchange are facilitated (Bisbe & Malagueno 2009:376). The purpose of Roussel, *et al.*'s 1991 model was to introduce the third generation R&D model for the strategic innovation management mode which they considered as the way forward for managing innovation.

Current literature suggests that the strategic innovation management mode is successfully utilised in organisations. Hidalgo and Albors (2008:15) have found that successful implementation of innovation management occurs when management recognises that the innovation process is driven by the collaborative attitudes and efforts of senior managers, marketing, employees, and information technology departments.

Igartua, *et al.* (2010:42-44) have found that the following components are important in innovation management, namely strategy; processes; portfolio and project management; leadership and culture; human resources; external relations; organisational design; performance measures; marketing; resources; knowledge and intellectual property management; and technology. Ojasalo (2008:53-54) includes organisational change, business development and incentivisation as important components of innovation management (Ojasalo, 2008:53-54). These findings illustrate that innovation is no longer an operational function on the out-skirts of the organisation, but it has become an integral part of the organisation.

Literature suggests that sustainable innovation in organisations arises from planning for IM at a strategic level. It is suggested that for IM to be successful, that the firm's overall strategy must be innovation orientated, with visions and missions that are progressive and market and customer orientated. Having a strategic innovation orientation creates an organisational culture which echoes strongly held values and

beliefs on the management of innovation. This organisational “way of life”, is enabled by leadership, which provides uniform direction for the whole firm so as to achieve long-term competitiveness (Martin & Terblanche, 2003:69; Talke, *et al.*, 2011:821).

Progressive organisations define strategic intent for the long-run (10 to 20 years) and formulate strategies that link the present to the future in order to focus management and employees on meeting future customer needs (Schilling 2010:125-127).

Damanpour, *et al.* (2009:671), demonstrate the important role that strategy plays in service organisations, in their longitudinal study. They have found that service organisations that adopt service innovations in conjunction with technological (improved support services) and organisational process innovations (change in strategy, management in support of service innovation), which greatly improved the innovation absorption capabilities of the employees in the organisation. Innovation absorption capabilities are identified as unique, and to offer the benefits of a differentiated organisation with competitive advantage (Damanpour, *et al.*, 2009:671).

Teece (2010:185) posit that new organisational forms or business models are just as important as innovation to businesses and nations, in order to capture promised value. Therefore businesses and nations must have the capacity to change, to develop and implement innovative business models to compliment new innovation - this is especially important when radical innovations are introduced.

Strategy analysis is an important step in formulating a business model to support innovation introduced in the business (Teece, 2010:180).

Tidd and Bessant (2009:168) discuss strategy formulation based on incrementalist and rationalist (Strength, Weakness, Opportunity, Threat (SWOT) analysis) schools of thought. They argue that the rationalist strategy analysis yields results that are incomplete due to the complex and fast changing external environment. Used in isolation, rationalist strategy analysis can lead to rigid strategy formulation. On the other hand, incrementalist strategy analysis recognises the limitations placed by the external environments, and suggests that organisations must formulate strategies that make them ready for change in the light of new information. They conclude that

both rational and incremental strategies are necessary for innovation management, in order to facilitate planning for future opportunities and threats, as well as being ready to change and adapt to future trends (Tidd & Bessant, 2009:165-172). Innovation managers must aspire to have the ability to quickly reorganise organisational structures and routines, in response to change, as a core competency of their organisations. Having dynamic capabilities, are seen as a source of competitive advantage (Schilling2010:124). Martin and Terblanche (2003:73) also examined organisational culture and posit that for innovation management to positively impact on organisations in a sustainable manner, it is imperative that the firm fosters a culture of innovativeness. Adams, *et al.*'s (2006:32) findings echo this sentiment, after studying numerous studies, which demonstrated that the perception of the work environment by employees influences innovative activities in organisations.

2.4 Innovation management and organisational performance

2.4.1 Definitions

Carlson (2013:5) describes performance as “an action carried out for someone”. As a concept, performance has to be taken in context of a particular phenomenon according to Carton & Hofer (2006:2). In this case, the phenomenon being the organisation, which is defined as:

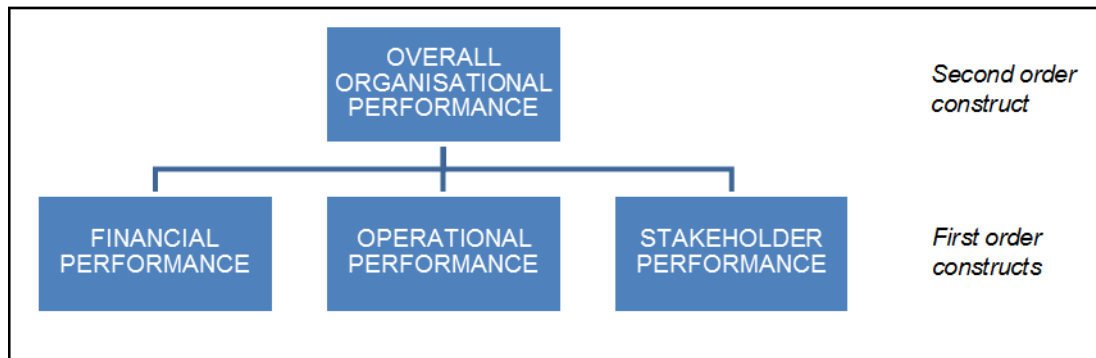
“The voluntary association of productive assets, including human, physical and capital resources, for the purpose of achieving a shared purpose.” (Carton & Hoffer, 2006:3).

Carton and Hofer (2006:3) describe performance in context of the organisation as the creation of value for individuals or entities. They add that the value created must be at par or exceed the value of the contribution made, in order to ensure continued investment from the contributors.

Overall organisational performance is a second order multidimensional construct, built out of the following first order constructs, namely financial, operational and

stakeholder performance. It is suggested that the first order dimensions could be further operationalised by using additional indicators (Carton & Hofer, 2006:57).

Figure 2.7 Overall organisational effectiveness as a second order construct



Innovation management has a role to play in enhancing organisation performance, fuelled by continued external pressure faced by organisations. Innovation is adopted in order to achieve improved performance through organisational change, aimed at gaining first mover advantage, or to fill a performance gap in the market.

(Damanpour, *et al.*, 2009:655).

This organisational performance enhancing change occurs after the control function of management has been implemented, by reviewing the status quo and taking deliberate actions towards improving upon the results of the review. Thus performance measurement is deemed as an important aspect in the continuous innovation management process, as it allows for the assessment of the impact of change actions on the economic and social goals of the organisation. This in turn, provides information on changed actions required in the future (Carpinetti, *et al.* 2007:379).

Performance measurement has been defined as:

“The process of quantifying an action.” (Neely, *et al.*, 2005:1228).

According to Neely, *et al.* (2005:1228), this involves measuring efficiency (how well were resources utilised) and effectiveness (how well the action achieved its objective).

2.4.2 Effects of innovation on organisation performance

No studies have been identified that specifically examine the effects of innovation management modes on organisational financial performance. However, numerous studies have been conducted on the effects of innovation on aspects of organisational and industrial performance (Mansury & Love, 2008:54), such as the effects of innovation on productivity, patents, and more recently, market based measures, which include new product counts, and innovation counts (Tidd & Bessant, 2009:536-539).

These studies generally concluded that the innovating organisations' performance outweighs that of non-innovating firms. Studies on innovating services organisations have found that, in addition to having superior organisation performance, innovation augmented innovativeness. (Mansury & Love, 2008:54).

García-Morales, *et al.* (2007:555) have reviewed studies that looked at the effects of innovation on performance in small and medium enterprises (SMEs), and large enterprises, and found conflicting results. Some studies take the view that the characteristics of large firms make them better equipped to manage innovation, and as a result improve organisational performance more than SMEs, see Table 2.4, for the distinction of innovation promoting characteristics between large firms and SME's.

Table 2.4 Distinction of innovation promoting characteristics between large firms and SMEs

Characteristics	Large organisations	SME's
Inside the organisation	Capabilities to mobilise resources	Flexibility allows for quick adaption to market changes
	Economies of scale in R&D	Dominance in narrow market niche's = R&D efficiencies
	Better positioned to radically innovate	Less bureaucracy makes for nimble decision making
	Time and resources to form internal and external networks	Quick learning capabilities and routines are easily adapted to improve strategy

	Large R&D laboratories	Incentives are better managed
	More skilled, specialised workers, capabilities and experience in new product development	Highly motivated technical and scientific staff, as individual contribution impacts are more visible
	Systems in place for knowledge and technology absorption	
	External finance is more accessible	
	Comprehensive distribution networks	
	Formal management systems	
Industry	Capital intensive	Highly innovative industries
	Concentrated	Skilled labour intensive
	Highly unionised	Close proximity to market
	Produce differentiated goods	Focus on niche markets
	Fundamental science based innovations, and large scale applications	

Source: Garcí'a-Morales, *et al.*, (2007:552).

From an industry perspective, large firms are in capital intensive, highly concentrated and unionised, producing differentiated products with large R&D investments that tend to increase the performance of the organisation more because of innovative activities. Whereas SMEs in very innovative industries which are reliant on skilled labour, located near the niche markets that they serve, tend to derive enhanced organisational performance from innovation (Garcí'a-Morales, *et al.*, 2007:552).

Other studies have shown that a strong positive relationship exists between innovation and organisations' financial performance, to the extent that Hull and Rothenberg (2008:783) advocate the inclusion of the impact of innovation in studies that look at the financial performance of organisations.

However, difficulties in constructing models that measure the effects of innovation on organisational financial performance have been identified as:

- The weak relationship that exists between innovation financial inputs and outputs at firm level (compared to industry level) exists. This weakness is attributed to the unpredictable nature of innovation and the different technological opportunities that different firms have.
- Firms adjust their reporting behaviour due to being monitored for innovation, thus financial performance measures become unreliable.
- Firms do focus their attention on measuring the effects of innovation on financial performance, as it does not exert as much influence on financial markets and lending as management and technological efficiency do.

(Tidd & Bessant, 2009:536).

2.4.3 Models for measuring organisational performance

Based on the multidimensional nature of organisational performance, as shown in Figure 2.5, some of the tools used to measure the subcontracts under the first order constructs, are identified in this section.

2.4.3.1 Balance score card

Kaplan's (as cited by Carton & Hofer, 2006:42), balance score card provides a measurement tool that combines operational and financial measures in order to ascertain overall organisational performance. The balance scorecard measurement tool provides historical information (financial data) and potential opportunities for exploitation in the future (Carton & Hofer, 2006:42).

Organisations stand to benefit from having a global picture on which to base their change initiatives. Adams, *et al.* (2006:26-38) proposed a model which they view as the balanced scorecard for measuring innovation management. A systematic review should be implemented, which involves measuring inputs, knowledge management, innovation strategy, organisational structure, portfolio management, project management, and commercialisation. This model is split into different functional categories, under which measurable components are grouped together, for example, the inputs category contains the following components:

- People - measuring the actual number taking part in innovation; their demographics, education level and propensity to innovate.
- Physical and financial resources – measuring unused capacity (human or financial slack).

A tabulated version of the model showing the types of measures used, is provided in the next table.

Table 2.5 Innovation management measurement model

Framework category	Measurement area	Type of measures
Inputs	People	Actual numbers taking part in innovation relative to all employees; demographic mix; level of education; and propensity to innovate
	Physical and financial resources unused capacity (slack) (human or financial)	Buildings, computers, equipment, finances, unused capacity (slack) (human or financial)
	Tools	Idea promotion; Formal or informal; and Quality management (e.g. TQM)
Knowledge management	Idea generation	Number of ideas generated per period; extent of tools and techniques used
	Knowledge repository	Absorptive capacity =No. of patents; informal hours spent on R&D; tacit knowledge = causal mapping (story telling), difference between

Framework category	Measurement area	Type of measures
		book value and market value
	Information flows	External links of innovating groups with organisations and sources of information; Internal information gathering, project reviews, benchmarking against competitors, customer information contact, extent of use of clients as a source of information;
Innovation strategy	Strategic orientation	Measure of existence of IS – commitment to differentiated funding, explicit expression, presence of roles for product and service development. Effectiveness measures – alignment of structures and systems, matching of innovative goals and strategic objectives
	Strategic leadership	Expression of existence, evidence of existence in annual reports, levels of concern, and physical assignment of individuals to innovative roles (champion). Measure understanding of the role of the champion – tolerance of rule bending of procedures to gain

Framework category	Measurement area	Type of measures
		organisational innovation commitment
Organisational culture	Culture	Team Climate Inventory (TCI), Anderson and West (1996 & 1997); KEYS instrument (creative work environments); measures of autonomy; morale and motivation measures – individual and or group rewards; ways organisations try to gain competitive advantage; trust; job satisfaction. Vision – adopter innovator inventory; team climate inventory. Climate – number of people applying for jobs. Participative safety (risk tolerance) – group cohesiveness five scale measure
	Structure	No measure identified
Portfolio management	Risk return balance	Financial measures - return on investment, internal rate of return (IRR), net present value (NPV),
	Optimization tool use	Explicit existence of portfolio management tools, extent of use and formalisation off tools; measure of balance

Framework category	Measurement area	Type of measures
		(short- and long-term, high and low risk); post project review measures of portfolio management
Project management	Project efficiency	Comparison of budget and actual project management costs. Speed – compared to schedule or duration of process
	Structured tools and processes (e.g. gate stage processes; phased development; total design)	Project process evaluation – formal problem finding and problem solving cycles, post launch evaluation procedures, and certified processes. Measurement instruments – interactive CAD/CAM, computer integrated manufacturing processes
	Communication	Objective measures - committees, number of meetings and contacts, Subjective - explicit statements of whether external communications occur, on what level and with whom (e.g. we always communicate with our customers)
	Collaboration	Frequency of guest engineer involvement; extent third

Framework category	Measurement area	Type of measures
		parties contribution as a percentage; extent of cross functional decision making; Existence of internal collaboration measures (none identified).
Commercialisation	Market research	Post launch measures - rate of adopters
	Market testing	Launch proficiency - measures whether facilities in firms are sufficient for launch activities. (sales force, distributional and promotional support)
	Marketing and sales	Rate of product launches,

Adapted from Adams, *et al.* (2006:26-38).

A similar study was undertaken in South Africa, where a balance scorecard approach for measuring strategic innovation management of the whole organisation was proposed, where the onus is placed on the chief executives and senior management to ensure the coordination of measuring performance in different areas of the organisation. This required a substantial investment of time from the chief executives, which they may not have, to ensure accurate measurements (Witcher, *et al.*, 2006:99).

Carton and Hofer (2006:42) point out that the key weakness of the balance scorecard approach, is its subjectivity, therefore it cannot be used for inter-organisational comparisons, to measure the performance of the organisation.

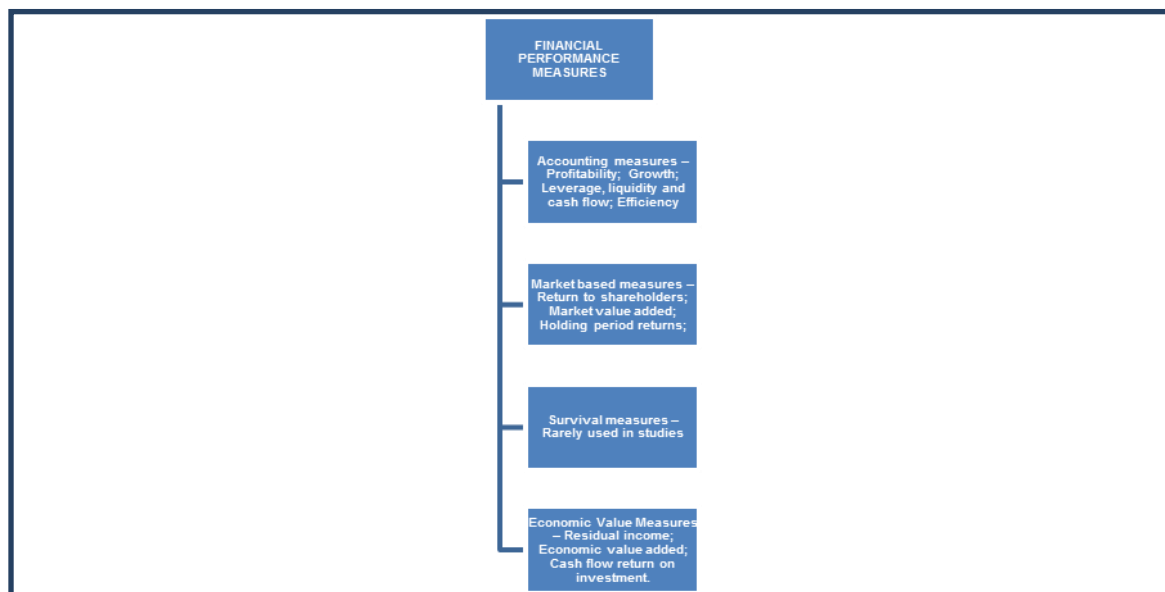
2.4.3.2 Strategic management measures

The strategic management measures look at measuring factors of the organisation that ensure its survival, which include Drucker's eight performance dimension model; Ansoff's return on investment of individual stakeholders, including financial and non-financial measures, and Venkatraman and Ramanujam's three dimension model. These methods have been criticised for not being viable to carry out inter-firm comparisons of performance, due to the unique perspective each organisation has on its performance (Carton & Hofer, 2006:44-45).

2.4.3.3 Measuring organisation financial performance

The four categories of organisational financial performance measurement that have been used, have been identified as accounting, market based, survival, and economic value measures (Carton & Hofer, 2006:61-63).

Figure 2.8 Sub-constructs for financial measures



The most widely used measures of organisation financial performance are return on investments (Neeley, *et al.*, 2005:1236) and productivity measures (Neeley, *et al.*, 2005:1239). Carton and Hofer (2006:83) demonstrate this in Table 2.6, which shows

the frequency of use of different accounting measures that have been used in empirical studies.

Table 2.6 Frequency of use of different accounting measures

Measure	Frequency
<i>Profitability</i>	
Return on assets	52
Return on equity	18
Return on sales	13
Net income	9
<i>Growth</i>	
Sales growth rate	32
Employee growth	7
<i>Leverage, liquidity and cash flow</i>	
Growth rate of operating cash flow	2
Cash flow on equity	1
Cash flow on return on assets	1

Source: Carton & Hofer, (2006:83).

Hull and Rothenberg (2008:782) have used return on assets (ROA) as a measure for calculating firms' financial performance, in their study of the interaction between innovation and corporate social responsibility. ROA, they posit, provides information that directly links it to strategy through the utilisation of all resources available to the organisation, so as to accomplish competitiveness. Return on investment has been criticised as being short sighted and productivity tends not to measure all inputs and outputs due to the difficulties in measuring them. Despite the criticism, they continue to be used.

The use of sales to measure the value added to a firm's performance, has been deemed less useful than other financial measures, such as level of profit and the growth rate on production. A positive relationship exists between level of profit and innovation in service and manufacturing firms. However growth rate on production reflected a more positive relationship in manufacturing firms than in service firms (Löf & Heshmati, 2002:21).

A more recent study, that used productivity as a measurement for firm performance in service organisations, has found that a negative relationship exists between productivity and performance in the short-term, with long-term productivity benefits. They attribute this phenomenon to the learning curve and building capabilities that are required in service firms when a new service is introduced (Mansury & Love, 2008:60). In the same study, productivity was measured using value added per employee, while growth was measured using the percentage change in sales volume and employment over a three year period (Mansury & Love, 2008:56). Most empirical research measures for organisational performance are used without conducting validity tests. Researchers suggest previous used measures as justification, which can be taken at face value. However, face value is not fulfilled until a common consensus exists amongst experts in the field, that the measure is indeed measuring the concept that it set out to measure (Carton & Hofer, 2006:117).

2.5 Innovation management mode studies in South Africa

Although no studies have been identified that specifically investigate the innovation management modes at work in South African businesses, studies on innovation have systematically been undertaken. This has happened to the extent where South Africa has actually been applauded as the only African country that consistently and thoroughly collects data on innovation, through surveys conducted during 1991-1992; 2001-2002; 2003-2004 and 2004-2005 (Bogliacino, *et al.*, 2012:230-231), albeit not at the level of sophistication of developed countries (Bogliacino, *et al.*, 2012:224).

A case study carried out on the failed South African Pebble Bed Mortar Reactor innovative project, provided a glimpse of the challenges South African organisations face in strategically managing innovation. The study found the following as key contributing factors to the project's failure:

- Technical expertise were lacking;
- Lack of strategic direction and control; and
- Limited financial investment.

The research concludes by questioning the wisdom of investing limited resources to fund ill-defined outcome projects such as innovation (Hipkin, 2013:634-635).

This suggests that South Africa is still lagging behind in terms of innovation management, utilising the intuitive innovation management mode, based on the strategic management mode, thinking that the question should be; which opportunities should be pursued with the limited resources available that will most likely yield positive results.

Chapter 3. Empirical research

3.1 Research Methodology and Design

3.1.1 Sample selection

Data for testing the hypothesis was obtained from a sample of companies listed on the Johannesburg Stock Exchange all share index (JSE). A database of individuals responsible for innovation in these JSE listed companies, was compiled from a total of 231 companies, as listed in the Business Times Newspaper 14th April 2013, page 19. Hunter (2012:11) points out, that research participants are increasingly being recruited via the Internet. Hence the Internet search engine, Google Search, was used to obtain the contact information for the companies and to ascertain whether they were South African companies or not.

A database of organisations listed on the JSE was compiled with names, telephone numbers and e-mail addresses of innovation managers, or research and development managers, or people responsible for innovation. A list of companies listed on the JSE was obtained from the moneyhub.net website and access to the companies' websites, were acquired through investinafrica.net. Through their websites, it was possible to ascertain whether companies were South African, or non-South African. Thirty non-South African companies were eliminated from the database. The remaining companies were contacted telephonically to establish the contact details for innovation managers or individuals who were responsible for innovation. The details sought were collected from seventy three companies, with the remainder not considered, as they reported that they did not innovate due to the company's size or the nature of the business that they were in. One company's director stated they had no capacity to innovate as they were struggling to survive. The information collected was either from the companies' websites or from Who's who South Africa (for those companies without websites). Since South African companies were the subject of interest, 30 companies were identified as non-South African on the basis of where the companies were registered, and as such were excluded from the study.

The contact details of interest were name, phone number, e-mail address and the physical address of the individuals involved in the management of innovation. These individuals' positions could be either innovation managers, research and development managers, directors, strategy managers, chief executives, new product development officers or marketing managers. Where this information was not available, the human resources manager's information was collected. Where the information for the human resources manager was unavailable on the websites used, the contact information for the head office reception was collected. Some websites did not list their contact details, but instead contact was established via an e-mail generated on their website. A standard e-mail was drafted which was used for this purpose (see Appendix 1).

Hunter (2012:20) suggests a better response rate from participants if initial contact is made in person. Companies where telephone numbers were available were contacted via telephone to confirm the position of the individual listed on the website, and to introduce the research to the participant, or to ascertain the identity of the correct person to contact for the innovation research.

Following the initial telephone contact, further information regarding the research was issued via e-mail (see Appendix 2).

3.1.2 Data collection

A measurement instrument for innovation and innovation management modes which was adapted from Bisbe and Malagueno's (2009:403) study of "The choice of interactive control systems" was used. Using an existing measurement tool was selected as opposed to formulating a new innovation management mode tool, in order to avoid adding to the already fragmented innovation measurement tools that currently exist (Adams, *et al.* 2006:21).

Bisbe and Malagueno's (2009:384-385) instrument uses a seven-point Likert scale to measure the following attributes, in order to ascertain the innovation management mode in operation:

- Involvement of senior management in resource allocation;

- Recognition of organisation wide autonomous contributions of innovation initiatives (from all staff levels);
- Extent of portfolio management;
- Precision by setting goals and progress evaluation; and
- Evaluation tools used and project trade-offs.

They also used the same scale to establish the level of innovation in organisations by measuring the following three items, namely rate of innovation; propensity to be innovative; and new products introduced. The summated scale produced a Cronbach- α of 0.83.

The same attributes were used to measure innovation and the innovation management mode, however a four-point Likert scale was used that ranged from strongly agree to agree; disagree to strongly disagree.

The effective use of questionnaires can only be achieved if the questions are worded clearly and are unambiguous, thus facilitating analysis. To this end, pilot studies are encouraged in order to rework the questions based on feedback (Lethbridge, *et al.*, 2005:319). The questionnaire instrument was initially issued to one post doctorate and two doctorate students, and revised after comments. It was then issued to a chief executive officer and an innovation manager of an innovation management consultancy company, after which final revisions were made. After the final sign-off by the supervisor, the questionnaire was sent via e-mail to the 73 individuals on the compiled database, including a cover letter as shown in Appendix 3.

The key benefits of using the Internet as a mode of collecting data are documented as reduction in time and costs, according to Birnbaum (2004:804). Furthermore individuals in geographically dispersed areas can be reached at a low cost. However, it was found that a low response rate to web based questionnaires, is a key disadvantage of using this mode of data collection, due to individuals having to complete the questionnaire on their own and not having free time to do so (Lethbridge, *et al.*, 2005:321-322).

After the first week that participants were given to return the questionnaires, only 6.85% of the 73 e-mails that were sent out, were returned completed. A total of 30% bounced back unread with the response email address unknown or stating that the individuals had left the company. One company responded that they had been de-listed.

Follow up telephone calls were placed over a three day period to non-responding companies and those whose e-mails bounced back, to ascertain the following:

- The name and contact details of the new person in the post;
- Willingness of the individuals to participate; and
- To complete the survey telephonically.

The questionnaires completed via telephone interviews constituted 12.5% of the total questionnaires issued, while those received via e-mail were 6%. The individuals who were unavailable for telephone interviews, were 43%; and 16.2% were unwilling to participate, either by expressly stating this or because their personal assistants refused access to the relevant individuals. The innovation manager's role in one company was made redundant through a restructuring programme. The remaining 25% expressed an interest to participate, but were unsure or uncomfortable to divulge the information requested from them.

The total percentage of received responses via telephone or e-mail was 17.8%.

3.2 Measuring organisation financial performance

3.2.1 Financial performance model

A composite financial performance model, instead of single measures of financial performance, was used in order to reduce the disadvantages described in Chapter 2. The chosen model accounted for the multidimensional nature of the concept of financial performance in organisations, which included financial measures of survival, leverage, profitability, and growth. Shareholder wealth creation over three years was calculated using the following:

$$\text{SWC 3} = 0.846 \text{ CALT Z} + 0.317 \text{ CLIAB/AST} + 0.275 \text{ GR AST} + 0.115 \text{ ROA}$$

CALT Z = Change in Altman Z score (change in survival measure)

CLIAB/AST = Change in liability/assets

GR AST = Growth rate of total assets

ROA = Return on assets

For companies listed for less than three years, the shareholder's wealth creation formula for one year was used:

$$SWC\ 1 = 0.739CALT\ Z + 0.244CLIAB/AST + 0.208GR\ AST$$

3.2.2 Financial data collection

The financial information for the companies was collected by accessing the INET BFA database online, through the North-West University Ferdinand Postma Library membership. The following standardised financial information from 2010 to 2013 was extracted:

- Financial statements;
- Income statements;
- Equity statements; and
- General information.

Microsoft Excel was used to formulate two tables: one being financial data from 2013 and the second financial data from 2010 (see Appendix 4) to calculate the following:

- Altman Z score (none manufacturing) – $([Working\ Capital / Total\ Assets] \times 1.2) + ([Retained\ Earnings / Total\ Assets] \times 1.4) + ([Operating\ Earnings / Total\ Assets] \times 3.3) + ([Market\ Capitalization / Total\ Liabilities] \times 0.6)$ (Stockopedia 2011)
- Altman Z score (manufacturing companies) = $([Working\ Capital / Total\ Assets] \times 1.2) + ([Retained\ Earnings / Total\ Assets] \times 1.4) + ([Operating\ Earnings /$

$$\text{Total Assets}] \times 3.3) + ([\text{Market Capitalization} / \text{Total Liabilities}] \times 0.6) + ([\text{Sales} / \text{Total Assets}] \times 1.0)6)$$

- Leverage = liability / asset
- Return on assets = total net income / total assets
- Growth of assets = $Y_2 - Y_1 / Y_2$

The resulting SWC3 and SWC1 values are shown in a section of the table.

Table 3.1 Financial measures' values

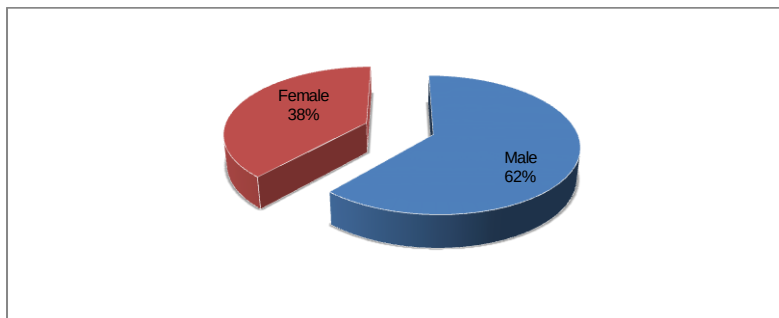
Profitability measure		Survival	Leverage	Profitability	Growth	Shareholder Wealth Creation	
Manufacturing							
Sector	Name of company	Z Score	liabilities/ assets	ROA	Asset Growth	SWC3 years	SWC1 year
Chemicals	SPANJAARD LIMITED	4.416	0.351	0.070	0.166	0.37	
Mining	DRDGOLD LIMITED	5.339	0.169	0.033	0.086	0.79	
Mining 2013 only	SIBANYE	1.386	0.287	0.082	0.014		0.91
Industrial goods and services	NAMPAK LIMITED	3.165	0.668	0.062	0.336	- 0.36	
Electronic and electrical equipment	ELLIES HOLDINGS LIMITED	6.052	0.503	0.153	0.627	- 0.07	
Food producers	CLOVER INDUSTRIES LIMITED	4.66	0.56	0.07	0.12	-	-0.105
Food producers	OCEANA GROUP LIMITED	8.203	0.464	0.191	0.338	1.18	
Pharmaceutical s and biotechnology	ADCOCK INGRAM HOLDINGS LIMITED	4.897	0.540	0.126	0.197	- 1.41	
Non-production companies							
Electronic and electrical equipment	ALLIED TECHNOLOGIES LIMITED	1.533	0.694	-0.032	0.149	1.55	
	ARB HOLDINGS LIMITED	3.918	0.324	0.119	0.279	1.66	
General Retailers	VERIMARK HOLDINGS LIMITED	2.700	0.532	0.053	0.349	- 0.63	
Media	CAXTON CTP PUBLISHERS & PRINTERS LD	6.009	0.157	0.076	0.075	2.25	
Travel and Leisure	COMAIR LIMITED	1.557	0.701	0.078	0.432	- 2.93	

3.3 Results

3.3.1 Demographics

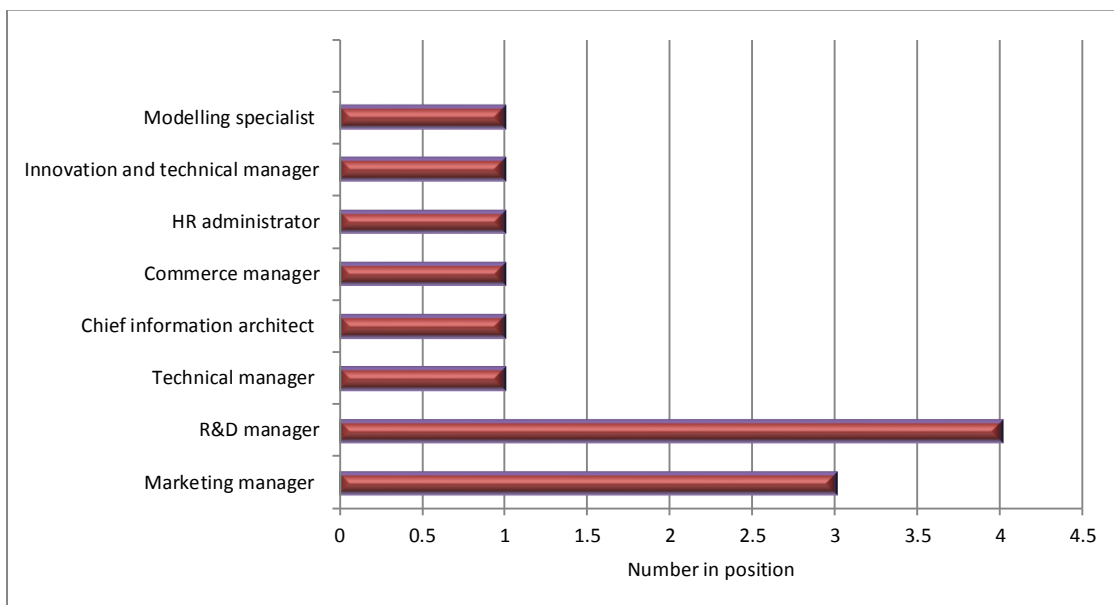
The composition of the 13 respondents were 38% male and 62% female (see Fig 3.1), with a mean average age of 39.5 years; the youngest being 25 years and the oldest 56 years of age, with a standard deviation of 8.9 years.

Figure 3.1: Gender distribution of sample



The positions held by the majority of respondents were, 4 research and development managers, as shown in Fig 3.2 below, followed by 3 marketing managers. The rest of the positions held were 1 modelling specialist, 1 innovation and technical manager, 1 human resources administrator, 1 commercial manager, 1 chief information architect and 1 technical manager.

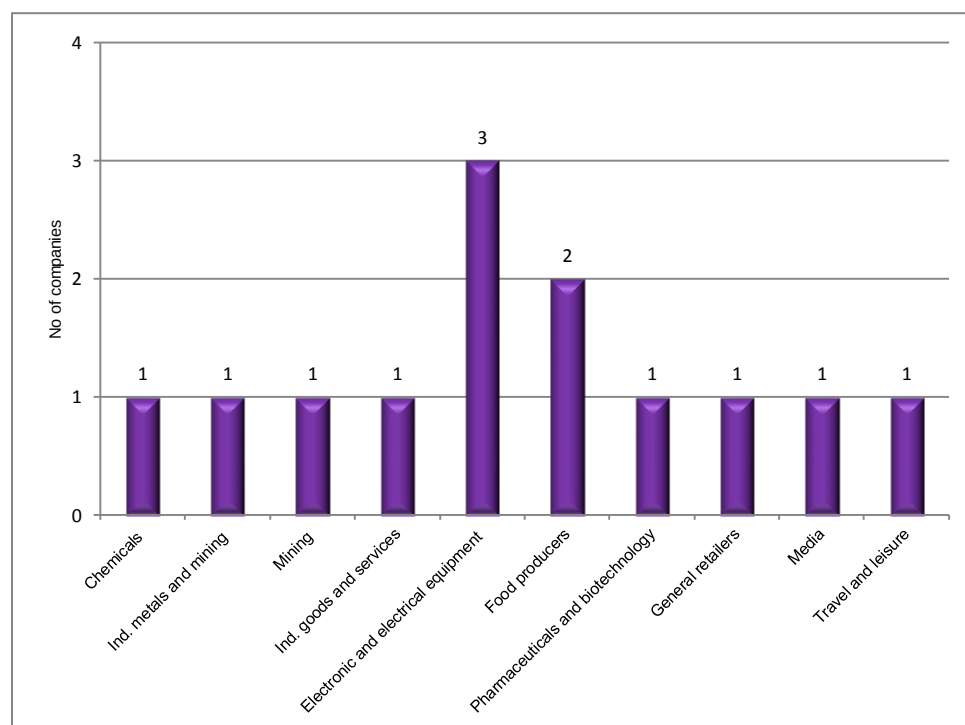
Figure 3.2 Positions of respondents



The mean average length of service in the above-mentioned positions was 4.79 years with a minimum time of 1 month and a maximum of 15 years, with a standard deviation of 3.9 years.

The industry from the Johannesburg Stock Exchange listing that most respondents belonged to, was electronic and electrical equipment consisting of 3 out of the sample; followed by 2 in the food production sector. The remaining companies were all equally distributed among the chemical, industrial metals and mining, mining, industrial goods and services, pharmaceuticals and biotechnology, general retailers, media, travel and leisure industries, each representing 1 company as shown in Fig 3.3 below.

Figure 3.3 Industry of respondents



The nature of innovativeness of the companies was as follows:

Chemicals industry – Company L is a manufacturer of lubricants, whose innovativeness depends on new product developments and improving existing products. The respondent from company L was the technical manager who has been in that position for 6 years.

Industrial metals and mining – Company K used innovation in improving their methods to increase efficiency and innovation. This is managed by the human resources department which runs an incentivised idea generation programme, where employees at all levels are encouraged to submit ideas on how to improve efficiency through a drop box. Every month an idea is selected and implemented, if successful the employer is given recognition and is compensated. The individual who responded was a 25 year old human resources administrator who has been in the current position for 2.5 years.

Mining – Company F's innovation is managed by a 29 year old modelling specialist who has been in this position for a year. In this company innovation is used the same way as company F does, so as to improve the efficiency of their extraction methods.

Industrial goods and services – The 56 year old general manager of company I's R and D, who had been in this position for 15 years, expressed that the company was superior in the African market in providing customers with unique products and services in the packaging industry.

Electronic and electrical equipment – Company H was an electrical manufacturing company, thus innovation for them was around new product and market development. The 42 year old new business development manager, who had been in this position for 8 years, completed the questionnaire. Company A was a manufacturer and retailer and the 44 year old group chief information architect who had been in this position for 4 years, participated in this research. Their innovation was in new products and new markets. Company B was purely an electrical wholesaler and innovation was in new markets. The responsible individual for this role was the 26 year old marketing manager who had been in this position for 2 years.

Food producers – Both companies G and J were food producers. The 45 year old group manager for product innovation and technology from Company G, participated in the research and had held this post for the last 8 years. Product innovation was the sole nature of innovation in Company G. Company J's 41 year old marketing

manager, who had been in this position for 4 years, participated in the study. Innovation for this company was in both new products and markets.

Pharmaceuticals – The research and development manager of Company M who was 46 years old and had held this post for 3 years, provided responses for the research. Innovation for Company J centred on new products.

General retailers – Company E's 37 year old marketing manager participated in the research and had been in this position for 1 month. The innovativeness of the organisation was in sourcing innovative products and new markets to exploit.

Media – The 44 year research development manager of company C who had been in the position for 6 years, advised that innovation was on new services and products.

Travel and Leisure – Company D's 37 year old e-commerce manager who had been in this position for 2 years, assisted with information on innovation in company D, which was in new markets and services.

3.3.2 Analysis of questionnaire items

Internal consistency was measured using Cronbach's alpha coefficient. The internal consistency of innovation management mode questions could not be measured collectively, due to the small size of the sample. The Cronbach alpha coefficient can be compromised on the basis of the sample size and the number of questions in the measuring tool (Pallant 2010:97). In this case, the sample size was 13 and the number of questions in section 3.2 of the questionnaire 25.

Descriptive and Spearman's rho correlation statistical analysis was conducted on the questionnaire and the SWC, leverage, Altman Z score, growth of assets and return on asset values were established in order to test the hypotheses.

H¹: A positive relationship exists between innovation and financial performance

To test the first hypothesis, statistical analysis was used on the values obtained from the organisational innovativeness section of the questionnaire (section 3.1).

H²: Strategic innovation management mode plays the greater role in creating organisational innovativeness as compared the intuitive or systematic innovation management mode.

Descriptive analysis was used to test the second hypothesis, using the average values obtained from the questionnaire. Some negatively phrased statements were reversed to match the positively phrased ones.

H³: Strategic innovation management mode had a greater impact on the organisation's financial performance compared to the intuitive or systematic management modes in organisations.

Due to the small size of the sample (n=13), it was not possible to obtain a Cronbach alpha coefficient to measure the collective internal consistency of all 25 items in the innovation management mode section of the questionnaire. Therefore internal consistency measures were applied to each sub-section of the questionnaire, after reversing some of the negatively phrased statements to match the positively phrased ones.

3.3.3 Statistical analysis for internal consistency

The summated scale was allocated the following values: strongly agree = 1; agree = 2; disagree = 3; and strongly disagree =4. Items for organisational innovativeness were analysed as they were, with the lower value representing higher levels of innovativeness in the company. Some of the items in the section measuring the innovation management mode, were coded and reversed to ensure that all items reflected the strategic innovation mode as the lower value and intuitive as the higher value.

Cronbach's alpha coefficient was used to measure the internal consistency of innovativeness, which was found to be 0.845 for organisational innovativeness. This result was in keeping with Bisbe and Malagueno (2009:388), with a Cronbach alpha of 0.83.

A Cronbach alpha value of above 0.7 is ideal for internal consistency, however scales with less than 10 items, produce values as low as 0.5. Thus it is

recommended that the mean inter-item correlation should be reported (Pallant 2010:97).

The inter-item correlation results for innovation management mode were as follows:

3.3.3.1 Resource allocation (Section 3.2.1).

This section originally had 4 items, which gave a low Cronbach alpha value of 0.490, as shown in Table 3.2.

Table 3.2 Four item reliability Statistics for resource allocation

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.541	.490	4

The corrected item total correlation had negative values for question 2, as highlighted in Table 3.3 below.

This, according to Pallant (2010:100) is due to incorrect reverse coding. Pallant adds that deleting items that yield negative values is acceptable when developing a scale. In this case the scale that was being used, was an adaptation of an existing scale, hence it was deemed appropriate to delete Question 2.

Table 3.3 Four item-total statistics for resource allocation

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q3N2N1	5.9231	2.077	.364	.479	.444
Q3N2N2	6.9231	3.077	-.177	.400	.788
Q3N2N3_r	6.4615	1.603	.510	.530	.288
Q3N2N4	6.7692	1.192	.781	.610	-.065 ^a

The resulting Cronbach alpha value found was 0.789. Since there were less than

Table 3.4 Reliability statistics resource allocation

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.788	.789	3

10 items on the scale, the mean's inter item correlation was reported as 0.55 with a minimum of 0.507, and a maximum of 0.640, as well as a range of 0.133 (see Table 3.5).

Table 3.5 Summary of item statistics for resource allocation

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.555	.507	.640	.133	1.263	.004	3

A Cronbach alpha of 0.786 suggested that resource allocation in Section 3.2.1 had good internal consistency.

The same process as above was applied to the remaining sections and the results were as follows:

3.3.3.2 Recognition of innovation projects (Section 3.2.2).

Table 3.6 Reliability statistics for recognition of innovation projects

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.603	.650	3

Originally this section had 6 items on the scale, but 3 items were dropped (item numbers 2, 3 and 4) to produce a Cronbach alpha value of 0.603 (see Table 3.6), with a mean inter-item correlation of 0.382 including minimum and maximum values of 0.047 and 0.595, and with a range of 0.548 as shown in Table 3.7.

Table 3.7 Summary item statistics' recognition of innovation projects

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.382	.047	.595	.548	12.702	.069	3

3.3.3.3 Innovation projects portfolio

Table 3.8 Reliability statistics for project portfolio

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.570	.600	6

(Section 3.2.3)

In this section the first three items were reversed and all six items were retained, since deleting some items would not have improved the Cronbach alpha value of 0.570 significantly. This was reflected in the inter-total statistics for the innovation project portfolio in Table 15 below. The mean inter-item values were 0.2 with -0.347 as a minimum, and 0.814 as maximum values, and a range of 1.162.

Table 3.9 Item-total statistics for the innovation project portfolio

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q3N23N1_r	11.5000	3.909	.276	.381	.562
Q3N23N2_r	11.2500	4.386	.331	.397	.514
Q3N23N3_r	11.3333	5.152	.143	.480	.588
Q3N23N4	12.0833	4.811	.409	.800	.500
Q3N23N5	11.9167	4.083	.544	.795	.422
Q3N23N6	11.9167	4.811	.253	.781	.547

3.3.3.4 Precision

(Section

3.2.4)

Table 3.10 Reliability statistics for precision

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.949	.950	3

All three items in this section were unchanged and a Cronbach alpha value of 0.949, as shown in Table 3.10, was obtained with mean item correlation values of 0.382, which included a minimum value of 0.047, and a maximum value of 0.595, and with a range of 0.548 (see Table 3.11).

Table 3.11 Summary of item statistics for precision

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.382	.047	.595	.548	12.702	.069	3

This suggested a very strong internal consistency for this section of the questionnaire.

3.3.3.5 Technology and business integration

In this section, all three items were retained and none were reversed. This gave a Cronbach alpha value of 0.915 (see Table 3.12), with a mean inter-item correlation of 0.789, producing a minimum of 0.677, a maximum of 0.904 and a range of 0.227, as shown in Table 3.13.

Table 3.12 Reliability statistics for technology and business integration

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.915	.918	3

Table 3.13 Summary item statistics for technology and business integration

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.789	.677	.904	.227	1.335	.010	3

This suggested a high internal consistency for this section of the questionnaire.

3.3.3.6 Trade offs

One item was deleted due to a negative value, leaving 2 out of the original three items. This provided a Cronbach alpha value of 0.653 with a minimum as well as a maximum of 0.485 with 0 range.

Table 3.14 Reliability statistics trade-offs

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.653	.653	2

Table 3.15 Item-total statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.485	.485	.485	0.000	1.000	0.000	2

3.3.3.7 Summary of the reliability results of items measuring the innovation management mode

Table 3.16 Summary of the reliability analysis results of IMM

Questionnaire item	Original items in subsection	Final items in subsection	Cronbach alpha value	Mean inter-item correlation	Reliable?
Resource allocation	4	3	0.788	0.555	Yes
Recognition of innovation projects	6	3	0.603	0.382	No
Project Portfolio management	6	6	0.570	0.200	No
Precision	3	3	0.949	0.382	Yes
Technology and business	3	3	0.915	0.789	Yes
Trade-offs	3	2	0.653	0.485	No

Based on the sample size of 13, three out of six subsections of the questionnaire were reliable with a Cronbach alpha coefficient of 0.70 or more. These sections were resource allocation, precision and technology, and business integration, as shown in Table 3.16 above.

3.4 Analysis for organisational innovativeness

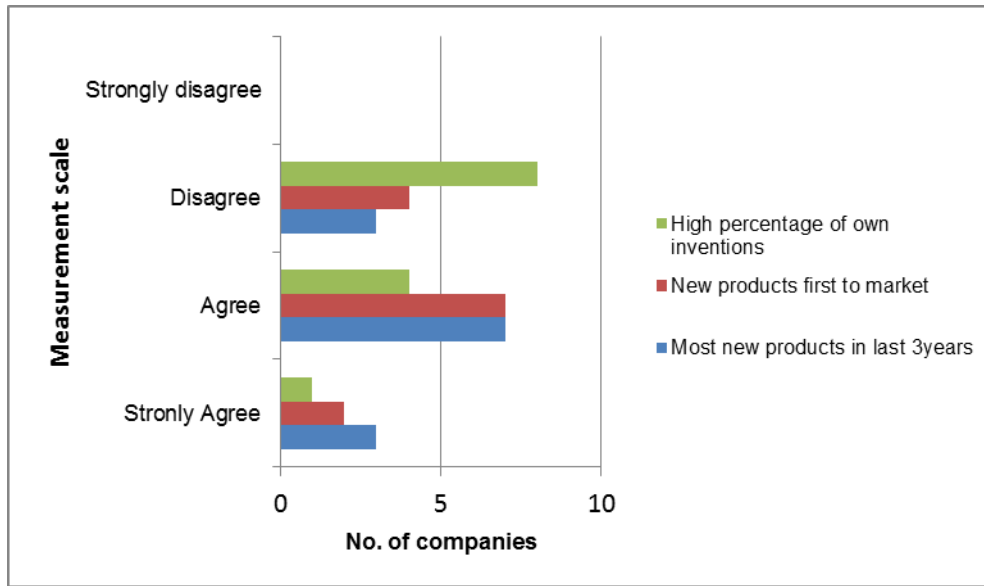
The numerical values were allocated to the strongly agree, agree, disagree and strongly disagree scale used in the questionnaire; with 1 = strongly agree; 2 = agree; 3 = disagree and 4 = strongly disagree. It was possible to conclude that generally the companies in the sample used agreed to disagree that their

Table 3.17 Average responses

Questions	Average of responses received	
	Mean average	Standard deviation
Most new products in last 3 years	2	0.707
New products first to market	2.15	0.689
High percentage of own inventions	2.54	0.66
Mean average of innovativeness	2.23	0.685

organisations were innovative (a mean average of 2.23 with a 0.685 standard deviation), but leaned slightly more towards agreeing. Three companies in the sample reported that they strongly agreed that they produced the most new products over the last three years in their industries, with three disagreeing with this statement and the remaining seven companies agreeing. With regard to being first to market in their respective industries, two companies strongly agreed, four disagreed and the remaining 7 agreed. Only one company strongly agreed with the statement that their product portfolio included a much higher percentage of own inventions in their industries, with eight companies disagreeing and four agreeing with this statement.

Figure 3.4 Innovativeness of companies



The majority of companies from the sample, seven out of thirteen, reported that they were innovative to the extent that they agreed that they produced the most new products over the last three years, which were first to market.

A smaller number of companies in the sample reported being very innovative. Only one company reported being very innovative by strongly agreeing that a high percentage of their products were their own inventions. Two companies from the sample strongly agreed that their new products were first to market, with three companies expressing the same sentiment that in their industry they introduced the most new products over the last three years.

3.4.1 Organisational innovativeness versus financial performance

H¹: A positive relationship exists between innovation and financial performance.

Spearman's rho correlation coefficient of 0.2168 was found after the analysis of the innovativeness and shareholder wealth creation (SWC) values. This meant that there was a small to medium correlation between organisational innovativeness and financial performance in the sample used. The hypothesis tested positive using SWC measures.

Table 3.18 Spearman rho's correlation values for organisational innovativeness and financial performance

Organisational innovativeness	SWC3
	Correlation coefficient = 0.218 Significance = 0.474

Ellis and Steyn (2003:51) suggest that conclusions about a population can only be made using statistical inference, if the sample selection is random. Therefore, since random sample selection was not used in this study, the significant value of 0.474 was not relevant and was only reported for completeness of the results of the analyses. The same applied to the rest of the results. This meant that what had been observed in this sample was not necessarily true for the population from which the sample was drawn.

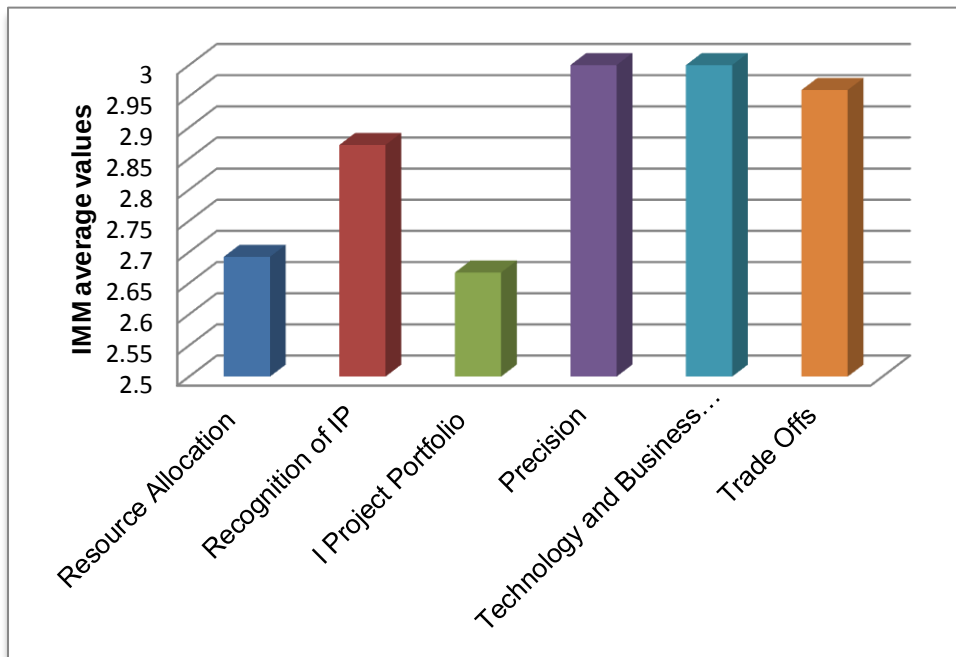
The correlation of organisational innovativeness was also compared with the underlying measures of SWC. A small to medium positive correlation existed between innovativeness and survival (Altman's Z score for 2013), with a Spearman rho coefficient of 0.18. The measures of leverage for 2013 and growth from 2010 to 2013 reflected a negative relationship with organisational innovativeness. As innovativeness increased, the lower was the leverage that the company had (Spearman's rho coefficient of -0.632). The Spearman rho correlation coefficient of -0.162 between asset growth and innovativeness, was also found. Suggesting that-as the company's assets grow the innovativeness for the sample used decreases.

3.5 Innovation management mode

3.5.1 Descriptive analysis

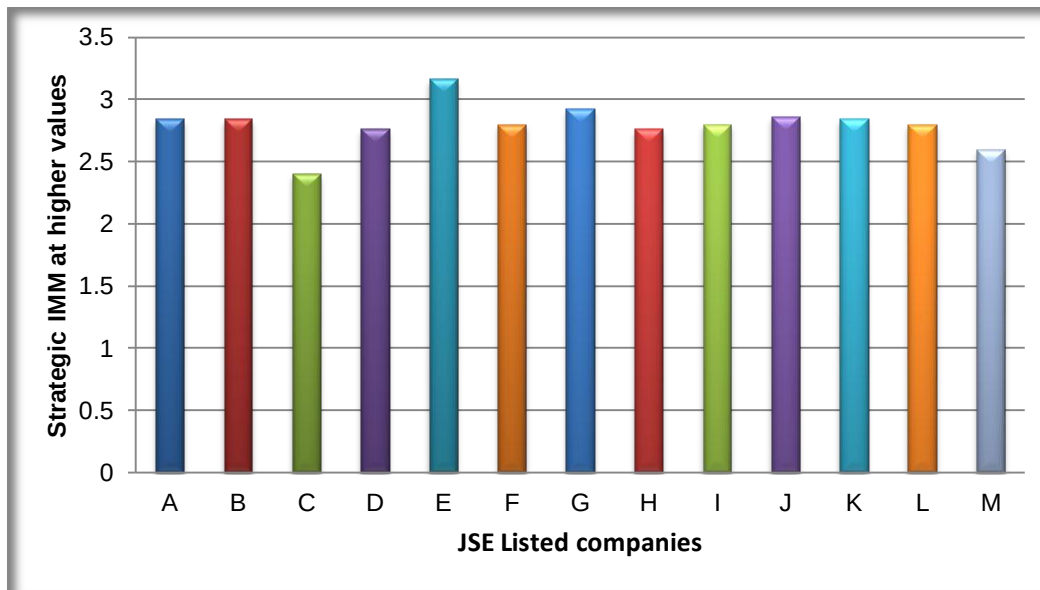
On the basis of the questionnaire items used to calculate the Cronbach alpha coefficient values, the mean average values for each subsection were reflected in Graph 5. Generally the mean average reflects that the companies in the sample operated in the systematic IMM zone (between 2 and 3).

Figure 3.5 Mean values of subsections of IMM



In this section, an adjustment was made by subtracting the relevant scores from 5 so that all items in the questionnaire reflected. The higher scores were strategic IMM (that is 3-4); the lower scores were intuitive IMM (that is 1-2) and scores in the middle were systematic (that is 2-3). The same was done for the organisational innovation section, so that higher values (values closer to 4) meant that the firm was more innovative.

Figure 3.6 Average IMM values of companies

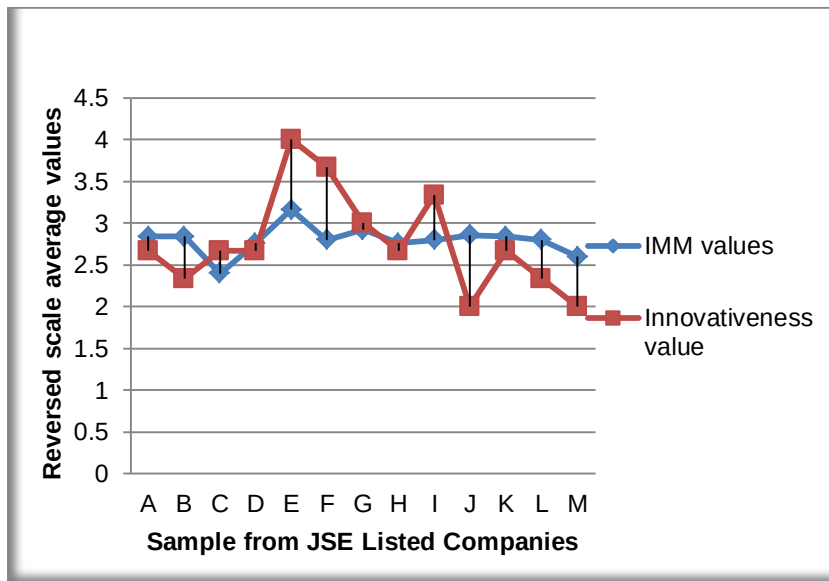


The five companies in the non-manufacturing sector companies (companies from A to E in graph 6), had a slightly higher aggregate average value for innovation management mode at 2.8, in comparison with the 8 manufacturing companies (companies F to M), with an aggregate average value of 2.797. This suggested that the non-manufacturing companies in the sample were slightly closer to implementing the strategic management mode. The company that obtained the highest value (Company E) belonged to the non-manufacturing sector with the highest average value of 3.16. The company with the lowest value (Company C) belonged to the non-manufacturing sector as well, with an average value of 2.4.

3.5.2 Innovation management mode versus innovativeness

H²: Strategic innovation management mode plays the greater role in creating organisational innovativeness as compared to the intuitive or systematic innovation management modes.

Figure 3.7 IMM vs Innovativeness



Using the average mean values of all items in the questionnaire to obtain an IMM value for each company, the researcher could not conclusively observe the role that the strategic innovation management mode plays on organisational innovation in this sample, as shown in fig 3.7. The zones in the graphs show, for companies D, E, G, K, L, and M, a general pattern emerging between the two graphs. The innovativeness values graph shape, matches the IMM values graph shape, from D to F and K to M. This suggested that a positive relationship existed between organisational innovativeness and the IMM mode. However, no clear pattern emerged for companies B, G, H and I. At company B and J, a negative relationship was observed, thus the higher IMM values showed lower organisational innovativeness.

Due to the small sample size, it was not possible to conclusively say that a positive relationship existed between IMM and innovativeness. For this particular sample strategic IMM provided the highest organisational innovativeness, with an average innovativeness score of 4, as shown in Table 3.19. Systematic IMM had an average value of 2.667, with a high score of 3.667 and a low score of 2 for organisational innovativeness. No companies in the sample were found to be implementing intuitive IMM.

Table 3.19 Results of organisational innovativeness and IMM

IMM	IMM value bands	Average innovativeness values	No. of companies
Strategic	3 to 4	4	1
Systematic	2 to 3	2.667	12
Intuitive	1 to 2	0	0

Using statistical analysis results Spearman's rho correlation values for the three subsections with high internal consistency (see Section 3.3.3.7), showed that only a very small positive relationship existed for resource allocation and precision, while no relationship existed for technical and business integration (where 0.1 to 0.299 = a small positive relationship; 0.3 to 0.499 = a medium positive relationship; and 0.5 + = a large positive relationship). This result in Table 25 echoed the finding in the descriptive analysis, where all items on the scale were used. A conclusive positive relationship could not be found for all the companies in the sample.

Table 3.20 Spearman's Rho correlation values for the three subsections of IMM and innovativeness

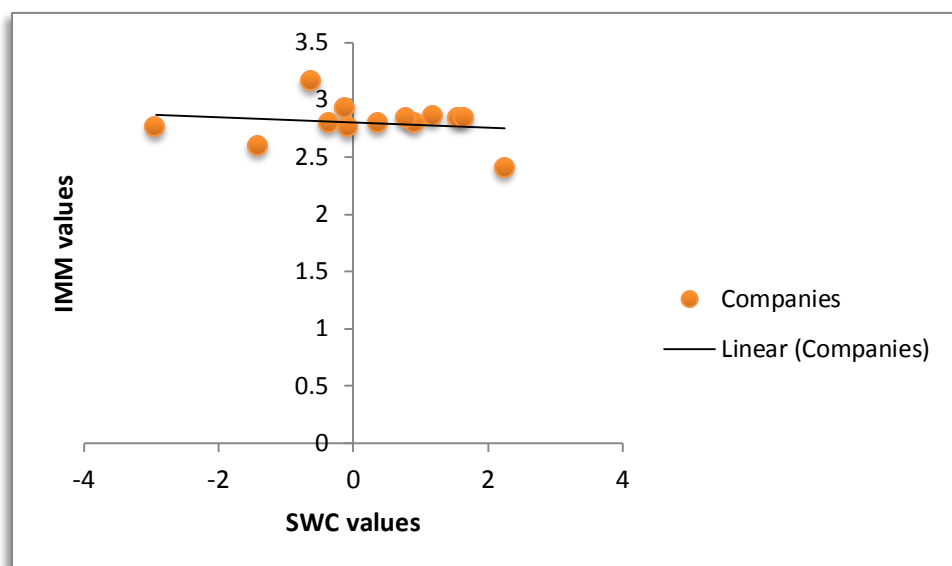
IMM sub sections which test positive for reliability	Spearman Rho correlation values	Existence of relationship
Resource allocation	0.1	Small positive relationship exists
Precision	0.177	Small positive relationship exists
Technical and business integration	-0.036	No relationship exists

However, based on the results observed from this sample, one can conclude that since the only company that had values high enough for the strategic IMM achieved, the highest value for innovativeness, thus in this respect H^2 tested positive. Suggesting strategic IMM produced the highest average value for organisational innovativeness, in comparison to the systematic and intuitive modes in the sample being observed.

3.5.3 Innovation management mode versus financial performance

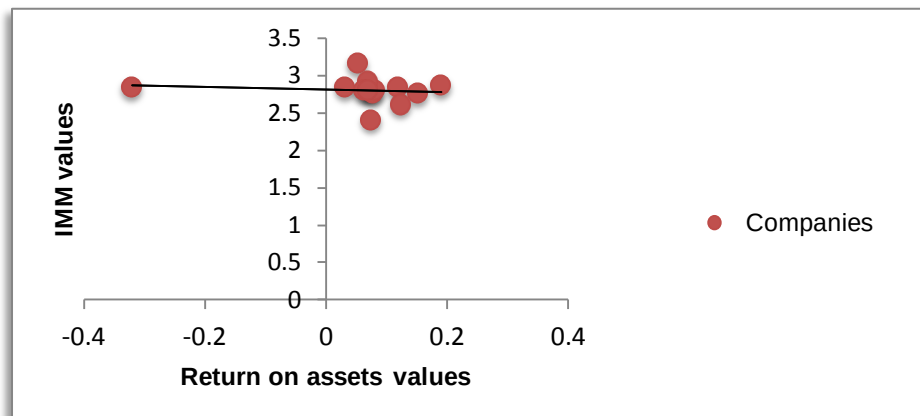
H3: Strategic innovation management mode in organisations financial performance is superior to intuitive or systematic management mode in organisations

Figure 3.8 Relationship of IMM and SWC



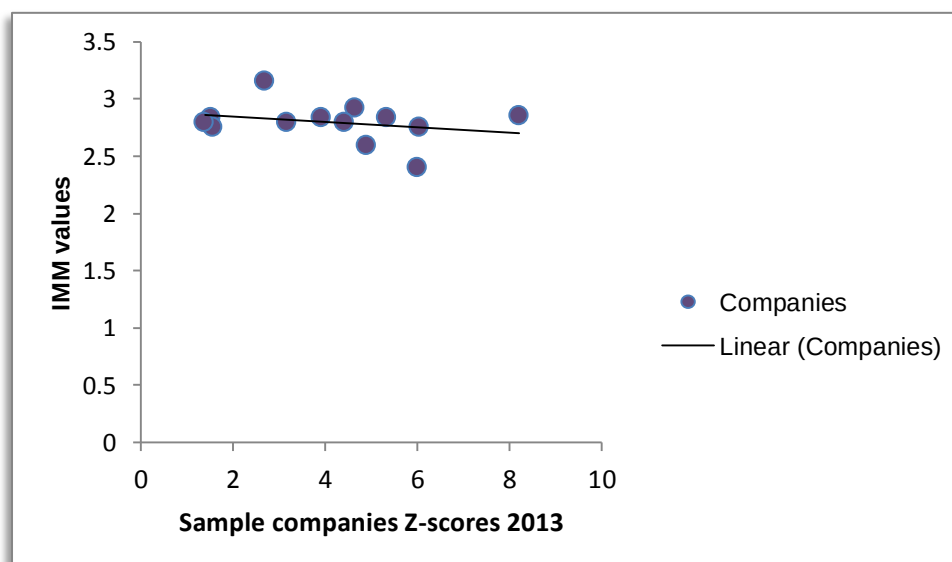
The results of organisational financial performance using the shareholder wealth creation measure were plotted against the average IMM values, obtained from the descriptive analysis of all items in the questionnaire. The resulting relationship was a very small negative affiliation, as shown in Graph 8 above. The Z score values and return on asset 2013 values were also used and plotted against the average IMM values from the descriptive analysis results, to test the hypothesis. A similar relationship emerged as shown in Figs 3.9 and 3.10, suggesting that the negative relationship between return on assets and IMM was much smaller.

Figure 3.9 IMM values vs. Return on assets



The Altman Z score is a measure of a company's financial health; scores below 1.80 means that the company has a high probability of suffering severe financial difficulties, while scores between 1.80 to 2.7 suggests that the company may face **bankruptcy in the next two years**, and scores from 2.7 to 2.99 indicates a **high alert** for financial difficulties and that the company must be viewed with caution. Scores above 3 are in the safe zone (Benjamin, SA).

Figure 3.10 IMM vs Z-score 2013

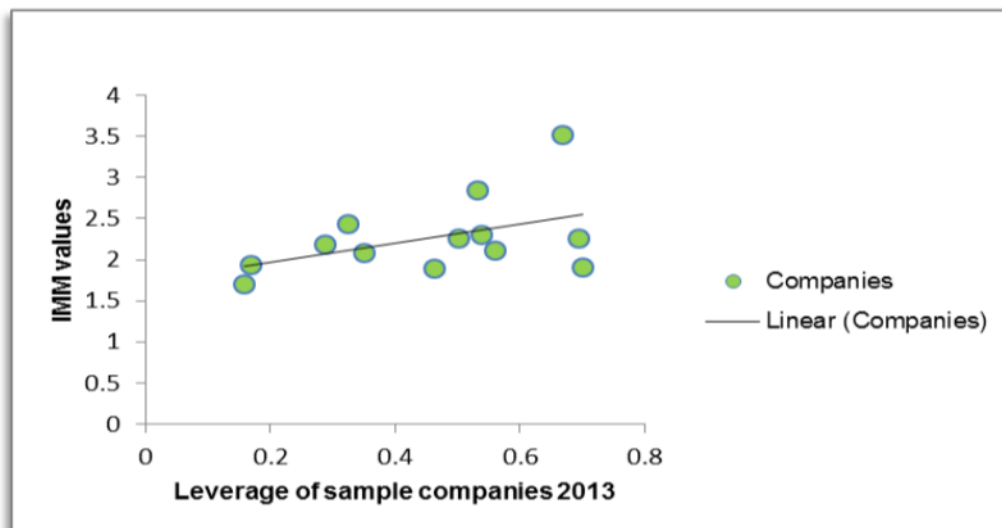


The Altman Z score relationship with IMM values reflected three companies with Z scores below 1.80 had IMM values ranging from 1.9 to 2.25 (in the intuitive to systematic IMM zones). One company (Company E) had a Z score in the high alert

zone with an IMM value of 2.85 (systematic IMM zone). Out of the remaining nine companies in the safety zone, one company was in the strategic zone; three belonged in the intuitive IMM zone and the remaining five were in the systematic IMM zone.

A positive relationship was found between the level of borrowing and the average IMM values from the descriptive analysis. The systematic IMM used less leverage than the strategic IMM companies. The only company that used strategic IMM was one of the three companies with the highest leveraging out of the sample being observed.

Figure 3.11 IMM vs leverage



The three items that tested positive for internal consistency using the Cronbach alpha coefficient, were used to ascertain, for the sample being observed, the relationship between IMM and shareholder wealth creation, survival, profitability, growth and leverage, as using Spearman's Rho correlation values (see Table 26). A strong negative correlation existed between shareholder wealth creation and resource allocation (-0.78). The same was true for precision (-0.91) where -0.1 to -0.299 = small negative correlation; -0.3 to -0.499 = medium negative correlation; and -0.5+ = large/strong negative correlation. However, a small positive correlation was found between SWC and technology and business integration. Survival and leverage produced a combination of both positive and negative relationships for the three IMM

items as produced for SWC. No relationship was found between profitability and the three IMM items. The author could not conclusively state whether a positive or negative relationship existed between financial performance and IMM when, these measures were considered. However, the growth measure for organisational financial performance reflected positive relationships with three IMM items, albeit a small positive relationship between both resource allocation and technology and business integration. A medium relationship was found to exist between precision and growth.

Table 3.21 Spearman rho correlation values between three IMM items and financial measures

Rho Spearman's correlation	IMM items	SWC	Survival	Profitability	Growth	Leverage
	Resource allocation	-0.78	-0.390	-0.034	0.282	0.686
	Precision	-0.91	0.224	0.067	0.470	-0.14
	Technology and business integration	0.146	0.452	0.038	0.197	-0.219

Chapter 4. Discussion, recommendations and conclusions

4.1 Demographics and reliability testing

The sample size of 13 for this research presented a challenge from the onset. Having set up a database with identified, and in some cases willing, potential participants, the research provided the motivation to proceed with the population from which the sample was taken. However, the long time period between compiling the database to actually collecting the data, proved to be a shortfall and the reason why the response was much lower than expected. It became apparent whilst collecting data that the database had become outdated within the 15 month period which had lapsed, as most of the individuals on the database had moved companies, and their replacements were not comfortable to participate in the research. Despite reassurances of confidentiality one of the potential participants felt the information was too sensitive to divulge. It was interesting to note that the extreme opposite of those who refused to participate, were the four respondents who responded after the initial e-mail, within the stipulated time frame, were an average age of 43 years of age and had been in their posts for at least 3 years. It was possible that the new comers were the reluctant participants who were still trying to understand the culture of the company and as such were reluctant.

According to Guo, *et al.* (2013:1), it is difficult to draw meaningful conclusions from tests or studies if the sample size is too small, due to limited information available. The first challenge of having a small sample was reliability testing, using Cronbach alpha coefficient. The innovation management mode section of the questionnaire had a total of 25 questions which exceeded the 13 participants. Reliability testing on subsections using Cronbach alpha coefficient provided three sub-sections which were reliable, thus could be used for further statistical analysis. Statistical analysis together with descriptive analysis, allowed for some conclusions to be drawn about the hypotheses being tested. These conclusions applied only to the sample being tested and ascertained whether these were comparable to others findings if available.

Recommendation 1: The period of time between database compilations and actual data collections, should be reduced in order to increase the probability of finding the willing participants during data collection.

Recommendation 2: Compile the database closer to the time of conducting the research in order to increase the probability of potential participants being available.

4.2 Organisational innovativeness, innovation management mode and financial performance

Generally the companies in the sample were moderately innovative, with most of the companies introducing imitation innovations, since a majority of the companies did not innovate with their own inventions.

Statistical analysis was used for organisational innovativeness as the reliability of this section of the questionnaire was acceptable for testing the first hypothesis of: **A positive relationship exists between innovation and financial performance.** This hypothesis tested positive using Spearman's Rho correlation values, with a small to medium positive relationship between innovativeness and financial performance. This finding was supported by recent studies, which found that positive relationships existed between innovation and financial performance (Kostopoulos, 2011:1337).

Strategic innovation management mode plays the greater role in creating organisational innovativeness as compared the intuitive or systematic innovation management mode. No clear relationship was found between innovativeness and IMM in the sample used, however the high value for innovativeness for the only company within the strategic IMM zone, suggested that when strategic IMM is implemented a positive relationship exists. However, this theory would need to be retested with a larger sample, in order to ascertain if this is indeed true.

The result of the existence of a positive financial relationship between innovation and financial performance, could have lead the author to conclude that a similar

relationship existed for the strategic innovation management mode, as the literature suggested that the strategic innovation management mode increased organisational innovativeness, which in turn should have increased financial performance. Thus leading us to the last hypothesis:

Strategic innovation management mode has a greater impact on the organisations financial performance in comparison to intuitive or systematic management mode in organisations

The findings in the sample used were that there was almost a non-existent, relationship between IMM and the financial performance measures of shareholder wealth creation, profitability and survival. This was reflected in the horizontal graphs, with a slight negative slant of the descriptive analysis of all items in the questionnaire, reflecting strategic IMM as the highest value. This position was confirmed by Spearman's Rho correlation statistical analysis results on the three subsections of the questionnaire. These findings were consistent with literature, as pointed out by Kostopoulos, *et al.* (2011:1337), who found that the financial benefits of innovation were realised over time. In this current study the financial performance considered was over a three year period and for those companies that have been on the JSE for less than three years, financial data for a period of one year was used. The small to medium relationship between innovation and financial performance; and the lack of a relationship between IMM and shareholder wealth creation; return on assets for profitability; and Altman Z score for survival; could be due to the three years and one year periods of time being insufficient time frames for the financial benefits of innovation to be fully realised.

However, a positive relationship was found between IMM and the financial measures of leverage and growth. This suggested, for this sample, that companies that were closer to implementing strategic IMM appeared to implement growth strategies that utilised borrowing. Gaining a competitive advantage places demands on the company to grow; in order to grow and meet the increased demand companies will utilise internal financial resources or use borrowed money. In this sample it would appear that the organisations closer to implementing strategic IMM, were growing organisations which should reap financial benefits in the future.

Recommendation 3: The IMM mode in use should be given some consideration, together with other factors in organisations seeking to increase their innovativeness. Although it has not been categorically proven in this study, that the IMM in use affects organisational innovativeness, the results suggested that strategic IMM provides superior organisational innovativeness.

Recommendation 4: Research seeking to ascertain the financial benefits of strategic IMM and innovation, may need to use financial performance figures that span a time frame longer than three years, as the effects on financial performance may come in effect only after this time.

4.3 Conclusion

The researcher has taken a step towards understanding the nature of the relationship between organisational innovativeness (OI), innovation management mode (IMM) and organisational financial performance in the sample used, by using previous tools that have been used before in previous research, in order to add to the existing knowledge.

Conflicting results have been obtained in the past concerning the nature of this relationship. The results for organisational innovativeness versus financial performance for the sample observed, supported the hypothesis that a positive relationship existed between these two variables over the three year period. Although no conclusion could be reached on the effects of innovation management mode on organisational innovativeness, the results from the sample demonstrated that a positive relationship existed when strategic IMM was in use, which was in line with the literature that suggested that strategic management of innovation increases organisational innovativeness. The interaction between organisational financial performance and innovation management mode using SWC, return on assets and survival measure over a three year period, could not be ascertained. However, due to the delayed realisation of the benefits of innovation, it is expected that a longer period of empirical testing is required to establish the nature of this relation, with a larger sample size, in order to derive as much meaningful conclusions from the study as possible. The closer organisations get to implementing strategic IMM, the more

they grow by increasing their leveraging, as supported by the sample tested. The more competitive the organisation, the higher the demand is on the organisation to grow, in order to meet the demand placed on it. This suggests that the successful implementation of innovation, growth, and the strategic innovation management modes, are inter-related in the sample observed. The recommendations made to improve the research, are important for researchers who are keen to further explore the inter-relatedness of the above relationship.

This research has added to the body of knowledge already in existence, by providing recommendations to organisations seeking to increase their organisational innovativeness.

References

- Adams, R., Bessant, J. and Phelps, R. 2006. Innovation management measurement: A review. *International Journal of Management Reviews*, 8(1): 21–47.
- Baltzan, P. & Phillips, A. 2010. Business driven technology. New York. The McGraw-Hill.
- Baregheh, A., Rowley, J. and Sambrook, S. 2009. Towards a multidisciplinary definition of innovation. *Management Decision*, 47 (8):1323-1339
- Birnbaum, M.H. 2004. Human research and data collection via the internet. *Annual Review of Psychology*, 55:803–32
- Bisbe, J. and Malaguen, R. 2009. The choice of interactive controlsystems under different innovation management modes. *European Accounting Review*, 18(2):371–405.
- Blindenbach-Driessen, F. & van den Ende, J. 2010. Innovation Management Practices Compared: The Example of Project-Based Firms. *Journal of productive innovation management*, 27:705-724.
- Brem, A. and Voigt, K.I. 2009 Integration of market pull and technology push in the corporate front end and innovation management—Insights from the German software industry. *Technovation*, 29: 351–367.
- Carlson, M. 2013. Performance a critical introduction. Oxon. Routledge.
- Bogliacino, F., Perani, G., Pianta, M. & Supino, S. 2012. Innovation and development: The evidence from innovation surveys. *Latin American Business Review*, 13(3):219-261. Accessed online 21 October 2014.
www.tandfonline.com/doi/pdf/10.1080/10978526.2012.730023
- Carpinetti, L.C.R., Gerolamo, M.C. & Galdamez, E.V.C. 2007. Continuous innovation and performance management of SME clusters. *Creativity and innovation management*. 16(4):376-385.

Carton, R.B and Hofer, C.W. 2006. Measuring organisational performance. Metrics for entrepreneurship and strategic management research. Cheltenham:Edward Elgar Publishing Limited.

Chesbrough, H. 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology. Boston. Harvard Business School Press.

Damanpour, F., Walker R. M., & Avellaneda, C.N. 2009. Combinative effects of innovation types and organisationorganisational performance: A longitudinal study of service organisations. *Journal of management studies*. 46(4):650-675.

Dankbaar., B. 2003. Innovation Management in the Knowledge Economy . Series on technology management: v, 7. London, Imperial College Press.

Drucker, P. 1991. The discipline of innovation. (*In Harvard Business Review* paperback No. 90072. ed. Innovation. Boston. Harvard Business School. p. 3-8).

DuBrin, A.J. 2009. Essentials of management, 8th edition. London. Cengage Learning.

du Plessis, M. 2007. The role of knowledge management in innovation. *Journal of knowledge management*. (11) 4: 20 – 29.

Dyck, & Neubert, 2009. Principles of management. Mason, Ohio: South Western.

Hoover, R. nd. Investing in Africa. Accessed online 10 June 2013.

<http://www.investinginafrica.net/list-of-companies-on-the-johannesburg-stock-exchange-a/>

Ellis, S.M. & Steyn, H.S. 2003. Practical significance (effect sizes) versus or combination with statistical significance (p-values). *Management Dynamics*, 12(4):51-53.

Ederer, F. & Manso, G. 2012. Is Pay-for-Performance Detrimental to Innovation? Accessed online on 20th July 2012 <http://faculty.haas.berkeley.edu/manso/em.pdf>

Eisenbeiß, S.A. & Boerner, S. 2010. Transformational leadership and R&D innovation: taking a curvilinear approach. *Creativity and innovation management*, 19(4):364-372.

Flynn, M., Dooley, L., O'Sullivan, D. & Cormican, K. 2003. Idea management for organisational innovation. *International journal of innovation management*, 7(4):417-442.

Gebreeyesus, M. 2011. Innovation and microenterprise growth in Ethiopia. (In Szimari, A. Naud, W. and Goedhuys, M. ed. Entrepreneurship, innovation and economic development. Oxford. Oxford University Press. p. 122-146).

García-Morales, V.J., Llorens-Montes, F.J. & Verdu-Jover, A.J. 2007. Influence of personal mastery on organisationorganisational performance through organisationorganisational learning and innovation in large firms and SMEs. *Technovation*, 27:547–568.

Graham, B. s.a. The altman z-score. Accessed online 30th October 2014.
<http://www.grahaminvestor.com/articles/quantitative-tools/the-altman-z-score/>

Guo, H., Pohl, E. & Gerokostopoulos, A. 2013. Determining the right sample size for your test: theory and application, 2013. Paper presented at the Annual Reliability and Maintainability Symposium, Orlando FL, USA. January 2013. Accessed online on 2nd November 2014.
http://www.reliasoft.com/pubs/2013_RAMSDeterminingRightSampleSize.pdf

Hidalgo, A. & Albors, J. 2008. Innovation management techniques and tools: a review from theory and practice. *R&D management*, 38(2).113-127.

Hipkin, I. 2013. Nuclear electricity generation in South Africa: a study of strategic innovation for sustainability. *Corporate Governance*, 13(5):6296-636.

Hughes, A. 2001. Innovation and business performance. Small entrepreneurial firms in the UK and EU. *New Economy*: 157-162

Hull, C.E . & Rothenberg, S. 2008. Firm performance: The interactions of corporate social performance with innovation and industry differentiation. *Strategic Management Journal*, 29:781-789.

Hunter, L. 2012. Challenging the reported disadvantages of e-questionnaires and addressing methodological issues of online data collection. *Nurse Researcher*, 20(1):11-20.

Igartua, J.I., Garrigós,J.A., and Hervás-Oliver, J.L. 2010. How innovation management techniques support open innovation strategy. *Research technology management*, May-June: 41-52.

Kuczmarski, T.D. 1996. What is innovation? The art of welcoming risk. *Journal of consumer marketing*. 13(5). p. 7-11

Levinthal, D. A., & March, J. G. 1993. The myopia of learning. *Strategic Management Journal*, *Special winter issue, Organisations, decision making and strategy*.14:95–112.

Lethbridge, T.C., Sim, S.E. & Singer, J. 2005. Studying Software Engineers: Data Collection Techniques for Software Field Studies. *Empirical Software Engineering*, 10:311–341.

Love J. H., Roper S., & Hewitt-Dundas, N. 2010. Service Innovation, embeddedness and business performance: evidence from Northern Ireland. *Regional Studies*, 44, 983–1004.

Löf, H. & Heshmati, A. 2006. On the relationship between innovation and performance: a sensitivity analysis. *Economics of innovation and new technology*, 15(4-5):317-344.

Lund research Ltd. 2012. Purposive sampling. Accessed online 3rd November 2013. <http://dissertation.laerd.com/purposive-sampling.php>

Mansury, M.A. & Love, J.H. 2008. Innovation productivity and growth in US business services: A firm level analysis. *Technovation*, 28:52-62.

Martins, E.C. and Terblanche, F. 2003. Building organisational culture that stimulates creativity and innovation. *European journal of innovation management*, 6(1):64-74.

Mayer, H. 2011. Organisational innovation management approaches in South Africa. Accessed online 19th January 2013.

http://www.innocentrix.co.za/sites/default/files/Organisational%20Innovation%20Management%20Approaches%20-%20Spring%20Survey%20Sept%202011_t_.pdf

Moneyhub.net. Accessed online 12th June 2013.

http://www.moneyhub.net/scripts/cgiip.exe/WService%3Dglobalone001/globalone/htm/company_list.r?picountry-id=60&pcsort=Alphabetic

Neely, A., Gregory, M. and Platts, K. 2005. Performance measurement system design A literature review and research agenda. *International Journal of Operations & Production Management*, 25(12):2005

OECD. 2007. Innovation and growth, rationale for an innovation strategy.

Organisation for Economic Co-Operation and Development.

Accessed online 8th November 2013. www.oecd.org/science/inno/39374789.pdf

Ojasalo, J. 2008. Management of innovation networks: a case study of different approaches. *European journal of innovation management*. 11(1). p. 51 – 86.

Ortt, J.R. & van der Duin, P.A. 2008. The evolution of innovation management towards contextual innovation. *European Journal of innovation management*, 11(4):522-538.

Park, Y. & Kim, S. 2005. Linkage between knowledge management and R&D management. *Journal of Knowledge Management*, 9(4):34-44.

Panayides, P. 2006..Enhancing innovation capability through relationship management and implications for performance. *European Journal of Innovation Management*, 9(4):468-469.

Pallant, J. 2010. SPSS survival manual, 4th ed. Berkshire: McGraw Hill Education.

Quinn, J.B. 1991. Managing innovation: controlled chaos. (*In* Harvard Business Review paperback No. 90072. ed. Innovation. Boston:Harvard Business School. 17-19).

Rothwell, R. 1994. Towards the Fifth-generation Innovation Process. *International Marketing Review*, 11(1):7-31

Roussel, R.A., Saad, K.N. & Erickson, T.J. 1991. Third generation R&D: Managing the link to corporate strategy. United States of America:Arthur D. Little, Inc..

Schilling, M.A., 2010. Strategic management of technological innovation. 3rd ed. New York : McGraw-Hill.

Siguaw, J.A., Simpson, P.M. & Enz, C.A. 2006. Conceptualising innovation orientation: a framework for study and integration of innovation research. *Journal of Product Innovation Management*, 23(6):556-74.

Simrie, M., Herrington, M., Kew, J., & Turton, N. 2012. GEM South Africa 2011 report. Accessed online 8th January 2013.

<http://www.gemconsortium.org/docs/2313/gem-south-africa-2011-report>

Simsek, Z., Lubatkin, M.H. & Floyd, S.W. 2003. Inter-Firm Networks and Entrepreneurial Behavior: A Structural Embeddedness Perspective. *Journal of management*, 29(3):427–442.

Smit, P.J., Cronje, G.J, Brevis,T. & Vrba, M.J. 2011. Management principles: a contemporary edition for Africa. Cape Town. Juta.

Stockopedia. 2011. The Altman Z-Score: Is it possible to predict corporate bankruptcy using a formula?. *Business insider*. Accessed online 5th November 2014.

<http://www.businessinsider.com/the-altman-z-score-is-it-possible-to-predict-corporate-bankruptcy-using-a-formula-2011-4>

Read more: <http://www.businessinsider.com/the-altman-z-score-is-it-possible-to-predict-corporate-bankruptcy-using-a-formula-2011-4#ixzz3IAj6tS8P>

Szimari, A., Naud, W., & Goedhuys, M. 2011. Entrepreneurship, innovation and economic development. Oxford. Oxford University Press

Talke, K., Salomo, S. & Kock, A. 2011. Top management team diversity and strategic innovation orientation: The relationship and consequences for innovativeness and performance. *The Journal of product innovation and management*, 28(6):819-832.

Teece, D.J. 2010. Business models, business strategy and innovation. *Long Range Planning*, 43(2010):172-194.

Tidd and Bessant , 2009. Managing innovation; Integrating technological, market and organisational change. 4th edition. West Sussex: John Wiley & Sons, Ltd.

Verhaeghe, A. and Kfir, R. 2002. Managing innovation in a knowledge intensive technology organisation (KITO). *R&D Management*, 32 (5), 409-417.

Voeten, J. de Haan, J. & de Groot, G. 2011. Can small firms innovate? The case of clusters of small producers in Northern Vietnam. (In Szimari, A. Naud, W. and Goedhuys, M. ed. Entrepreneurship, innovation and economic development. Oxford. Oxford University Press. p.96-121).

von der Gracht, H.A., Vennemann, C.R. & Darkow. 2010. Corporate foresight and innovation management: a portfolio approach in evaluating organisationorganisational development. *Futures*, 42(4):380-393.

Wang, C.L. & Ahmed, P.K. 2004. The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management*, 7:303-313.

Welman, C., Kruger, F. & Mitchell, B. 2003. Research methodology. 3rd Edition. Cape Town: Oxford University Press.

Wikipedia. 2011. Altman Z score. Accessed online 30th October 2014.
http://en.wikipedia.org/wiki/Altman_Z-score

Witcher, B.J., Chau, V.S. & Harding, P. 2007. Top executive audits: strategic reviews of operational activities. *Managerial Auditing Journal*, 22 (1):95 - 105

Zabala-Iturriagaggoitia, J.M. 2013. Can SME's in traditional industries be creative. (In Brem, A and Viardot, E. ed. *Evolution of innovation management. Trends in an international context*. UK. Palgrave. Macmillan. p.75-94)

Appendices

Appendix 1- Email sent after initial telephone contact

From: Zelda Kaitano [mailto:23256222@nwu.ac.za]

Sent: 21 June 2013 01:32 PM

To:

Subject: Research on Innovation / Research and Development management and JSE

Dear

I am writing to you after speaking to one of your colleagues over the telephone with regards obtaining the details of the individual who manages innovation or new product development in your organisation.

I am a final year MBA student at the North West University, Potchefstroom Business School and as part fulfillment of my degree I am required to complete a research study and produce a dissertation.

I have chosen to investigate whether a relationship exists between innovation management or research and development (R&D) management and the financial performance of organisations listed on the JSE. The research will research all aspects of innovation (formal or informal, structured or unstructured and centralised and decentralised) undertaken in organisations.

I am currently compiling a database of individuals who are involved in managing innovation and these people include innovation managers/ research and development managers, new product/business development managers or strategy managers, directors responsible for strategy formulation, marketing managers, CIO's etc, of companies listed on the JSE. A questionnaire will be compiled and issued to the individuals on the database in three months time. Statistical analysis of a snapshot of the organisations financial performance and the data collected will be undertaken to establish:

1. To what extent innovation management is used in formulating an organisations strategy
2. Whether a relationship exists between innovation management and financial performance or innovation management tools that have the greatest impact on innovation and financial performance

The results of this study will be available to interested participants of the study.

I trust this clarifies the purpose of the study and places you in a better position to answer the questions or direct me to the correct person in your organisation.

Thank you for your assistance and if you have further queries please do not hesitate to contact me on above email or on 0833674541.

Kindest regards

Zelda Kaitano

Appendix 2 Data collecting e-mail, cover letter and questionnaire

Research on Innovation / Research and Development management and JSE

From: Zelda Kaitano
To:
Date: Wednesday - October 1, 2014 4:47 AM
Reply Requested: Wednesday - October 8, 2014
Subject: Research on Innovation / Research and Development management and JSE
Attachments: Cover Letter 30092014.pdf; Innovation management questionnaire.doc; Text.htm

Dear

My name is Zelda Kaitano and I am a final year MBA student at North West University (Potchefstroom Business School). I contacted your company last year with regards research we are conducting on innovation management and financial performance.

This research is directed to innovating companies listed on the JSE, specifically managers of innovation, new product development or research and development. To this end please complete the attached questionnaire, or forward it to the relevant individual in your company to complete, by 8th of October 2014. Additional information is provided in the attached cover letter.

Your assistance in the above would be greatly appreciated.

Kindest regards,

Zelda Kaitano

23256222

Vrywaringsklousule / Disclaimer: <http://www.nwu.ac.za/it/gov-man/disclaimer.html>

Dear Participant:

My name is Zelda Kaitano I am a student at North West University in the Potchefstroom Business School under the supervision of Mr Johan Jordaan. You are invited to participate in a research project entitled “The role of different innovation management modes on organisational financial performance in South Africa”. The purpose of this survey is to establish whether organisations under strategic innovation management produce more innovations and provide shareholders more value for their investments than intuitive and systemic innovation management modes. This study has been approved by North West University, Faculty Committee of Economics and Management.

The following survey was developed to ask you a few questions regarding the innovation management mode your organisation operates under. It is our hope that this information can add to the body of knowledge of innovation management. The study will benefit you in particular by identifying your organisations innovation management mode and assist you improving innovation management in your organisation. There are no identified risks from participating in this research as the names of organisations will not appear in the final write up but your individual results can be made available to you upon request.

The survey will be conducted anonymously. Participation in this research is completely voluntary and you may refuse to participate without consequence. The survey will take approximately 15 to 20 minutes to complete. You will receive no compensation for participating in the research study. However the results of the study can be made available to you on request. Responses to the survey will only be reported in aggregated form to protect the identity of respondents, the results will be used to complete a mini dissertation as part fulfilment of my master's degree in business administration. Neither the researcher nor the University has a conflict of interest with the results.

Further information regarding the research can be obtained from the principal researcher Zelda Kaitano, 23256222@nwu.ac.za, phone number 018 290 8357 or my faculty advisor

(Mr. Johan Jordaan, jordan.johan@nwu.ac.za, North West University, Potchefstroom Business School, 11 Hoffman Street, Potchefstroom, 2531, Phone number: 018 299 1338).

If you would like to know the results of this research, contact myself or Mr Johan Jordaan .Thank you for your consideration. Your help is greatly appreciated.

Yours sincerely,

Zelda Kaitano

Student number 23256222

Innovation management questionnaire

	<u>Demographics</u>		
1.1	Sex:	Male	1
		Female	2
1.2	Age (in years)		
1.3	Position in organisation: Please select from list below		
1.3.1	Strategy manager		
1.3.2	Marketing manager		
1.3.3	Research and Development manager		
1.3.4	Innovation manager		
1.3.5	New product development manager		
1.3.6	Director		
1.3.7	Chief executive officer/Chief strategic officer		
1.3.8	New services development manager		
1.3.9	Technical manager		
1.3.10	Quality control manager		
1.3.11	Business analyst		
1.3.12	New business development manager		
1.3.13	Other please state:		
1.4	Duration in position (in years):		
<u>1.</u>	<u>Organisation Information</u>		
2.1	Name of organisation:		
2.2	Give an indication of number of employees in your organisation:		
2.3	Industry of organisation as listed on JSE: Please select <u>most applicable</u> one from list below.		
2.3.1	Chemicals		
2.3.2	Forestry and paper		
2.3.3	Industrial metals and mining		
2.3.4	Mining		
Industry			
2.3.5	Oil and gas		

2.3.6	Construction materials	
2.3.7	Industrial goods and services	
2.3.8	Electronic and electrical equipment	
2.3.9	Beverages	
2.3.10	Food producers	
2.3.11	Healthcare and equipment	
2.3.12	Pharmaceuticals and biotechnology	
2.3.13	Food and drug retailer	
2.3.14	General retailers	
2.3.15	Media	
2.3.16	Travel and leisure	
2.3.17	Banks	
2.3.18	Non-life insurance	
2.3.19	Life insurance	
2.3.20	Financial services	
2.3.21	Software and computer services	
2.3.22	Technology hardware and equipment	

Innovation management questions

<u>Innovation management questions</u> Statement	Strongly	Agree	Disagree	Strongly
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		agree			disagree
Section 3.1 Organisation's Innovativeness “We” refers to the listed company and all its subsidiaries.					
1.	During the last three years we (listed company and its subsidiaries) have introduced more new products than any other company in our industry.	Strongly agree	Agree	Disagree	Strongly disagree
2.	In comparison with the industry average in new products we are often first to market	Strongly agree	Agree	Disagree	Strongly disagree
3.	The percentage of own inventions in our product portfolio is much higher than the industry average.	Strongly agree	Agree	Disagree	Strongly disagree
Section 3.2 Innovation management mode					
3.2.1 Resource allocation (“Executive management” refers to CEO and his immediate reporting level)					
1.	The executive management team is only involved in allocating resources for innovation or R&D.	Strongly agree	Agree	Disagree	Strongly disagree
2.	The executive management team is highly involved in the decisions regarding resource allocation to specific innovation project lines.	Strongly agree	Agree	Disagree	Strongly disagree
3.	I am only responsible for managing the resources allocated for innovation (and provide no input as to how the resources were allocated).	Strongly agree	Agree	Disagree	Strongly disagree
4.	We have mechanisms in place to ensure early involvement of all relevant departments in developing new products and services.	Strongly agree	Agree	Disagree	Strongly disagree
Section 3.2.2 Recognition of innovation projects					
1.	In our organisation we have an established framework within which innovation always takes place.	Strongly agree	Agree	Disagree	Strongly disagree
2.	Spontaneous personal initiatives disrupt the existing framework in the organisation.	Strongly agree	Agree	Disagree	Strongly disagree
3.	In our organisation innovation is encouraged outside set innovation frameworks.	Strongly agree	Agree	Disagree	Strongly disagree
4.	Innovation often arises from spontaneous personal initiatives.	Strongly agree	Agree	Disagree	Strongly disagree
5.	One of the key roles of the business management team in the organisation is to personally <u>identify</u> innovative initiatives.	Strongly agree	Agree	Disagree	Strongly disagree
6.	One of the key roles of the business management team in the organisation is to personally <u>support</u> innovative initiatives.	Strongly agree	Agree	Disagree	Strongly disagree
Statement		Strongly agree	Agree	Disagree	Strongly disagree

Section 3.2.3 Innovation Project Portfolio					
1.	When a specific project has to be approved, the decision is based on <u>the features of that specific project</u>	Strongly agree	Agree	Disagree	Strongly disagree
2.	The results of innovation projects are measured based <u>on the features of the specific individual project.</u>	Strongly agree	Agree	Disagree	Strongly disagree
3.	Innovation projects are evaluated based on the specific <u>features of individual innovation project.</u>	Strongly agree	Agree	Disagree	Strongly disagree
4.	When a specific project has to be approved, the decision is based on <u>the projects position in our project portfolio.</u>	Strongly agree	Agree	Disagree	Strongly disagree
5.	The results of innovation projects are measured based on the projects <u>position in our projects portfolio.</u>	Strongly agree	Agree	Disagree	Strongly disagree
6.	Innovation projects are evaluated based on the <u>projects position in our project portfolio.</u>	Strongly agree	Agree	Disagree	Strongly disagree
3.2.4 Precision					
1.	For each individual project, we always quantify precise objectives (e.g. time, cost, quality).	Strongly agree	Agree	Disagree	Strongly disagree
2.	We measure our progress in relation to set objectives.	Strongly agree	Agree	Disagree	Strongly disagree
3.	It is common that for some projects we do not quantify precise objectives.	Strongly agree	Agree	Disagree	Strongly disagree
3.2.5 Technology business integration “ <u>innovation manager is position held by participant</u> ”					
1.	Our organisation has a unit /units that are dedicated to innovation.	Strongly agree	Agree	Disagree	Strongly disagree
2.	Innovation manager plays a major role in shaping the overall vision of the business.	Strongly agree	Agree	Disagree	Strongly disagree
3.	Innovation manager plays a major role in the global organisation-wide innovation policy.	Strongly agree	Agree	Disagree	Strongly disagree
3.2.5 Tradeoffs “Globally refers to the listed company including all its subsidiaries”					
1.	Decision about which particular innovation project should go ahead is taken within each business area.	Strongly agree	Agree	Disagree	Strongly disagree
2.	Innovation projects from different business areas are <u>compared</u> for a decision to be made organisation-wide.	Strongly agree	Agree	Disagree	Strongly disagree
3.	Innovation projects from different business areas are <u>prioritised</u> for a decision to be made globally.	Strongly agree	Agree	Disagree	Strongly disagree

Adapted from Bisbe and Malagueno (2009:403)

Appendix 3 Tables with financial data for SWC calculation

FINANCIAL RESULTS 2013/ 2014
 * Trading on stock exchange for just two years

Name of company	Ticker	Working capital =current assets - current liabilities	Retained earnings	Operating Earnings	Total assets	Market capitalisation	Total liabilities	Total net income	Sales	Z Score	liability/assets	ROA	Growth of assets	SWC 3	*SW C1
		ZAR	ZAR	ZAR	ZAR	ZAR	ZAR	ZAR	ZAR						
SPANJAARD LIMITED	SPA	18,077	41,860	18,576	71,532	36,969	25,091	4,974	111,045	4.42	0.35	0.07	0.17	0.37	
DRDGOLD LIMITED	DRD	305,965	1,426,535	523,395	2,668,256	2,275,068	450,873	87,254	2,076,496	5.34	0.17	0.03	0.09	0.79	
SIBANYE	SGL	- 38,760,000	9,421,200	6,997,000	19,959,100	8,887,105	5,730,400	1,645,200	19,331,200	1.39	0.29	0.08	0.01	1.02	0.91
NAMPAK LIMITED	NPK	4,066,500	7,071,900	2,674,400	18,826,100	18,496,576	12,571,000	1,172,700	19,361,800	3.17	0.67	0.06	0.34	-0.36	
ELLIES HOLDINGS LIMITED	ELH	809,248	958,467	389,094	1,455,803	2,698,168	732,360	223,278	1,996,053	6.05	0.50	0.15	0.63	-0.07	
CLOVER INDUSTRIES LIMITED	CLR	971,594	2,113,116	912,506	3,975,735	3,145,944	2,221,675	290,660	7,996,461	4.66	0.56	0.07	0.12	-	0.11
OCEANA GROUP LIMITED	OCE	1,022,087	1,728,614	938,310	2,747,788	8,350,595	1,274,729	525,460	4,997,354	8.20	0.46	0.19	0.34	1.18	
ADCOCK INGRAM HOLDINGS LIMITED	AIHLE	527,741	3,635,989	1,133,030	5,368,604	10,242,759	2,898,894	677,541	5,445,639	4.897	0.54	0.13	0.2	-1.41	

Non-production companies

Name of company	Ticker	Working capital =current assets - current liabilities	Retained earnings	Operating Earnings	Total assets	Market capitalisation	Total liabilities	Total net income	Sales	Z Score	liability/assets	ROA	Growth of assets	SWC 3
ALLIED TECHNOLOGIES LIMITED	ALT	1,060,000	4,741,000	2,243,000	11,244,000	2,231,797	7,801,000	-361,000	25,049,000	1.533	0.69	0.03	0.15	1.55
ARB HOLDINGS LIMITED 2014	ARH (2014)	596,442	712,936	235,886	1,136,382	1,534,550	334,414	150,320	2,216,659	4.946	0.29	0.13	0.31	2.54
VERIMARK HOLDINGS LIMITED (2014)	VMK	87,505	115,177	67,562	141,850	72,287	45,202	17,841	430,473	4	0	0	-0.09	-0.45
CAXTON CTP PUBLISHERS & PRINTERS LD	CAT	1,174,342	5,347,330	882,893	6,675,939	7,392,271	1,046,053	506,120	5,156,911	6.0090	0.157	0.08	0.08	1.48
COMAIR LIMITED	COM	-114,727	1,021,200	989,983	3,560,713	1,150,116	2,497,325	276,277	5,386,581	2	1	0	1.000	-2.77

Name of company	Ticker	Working capital	Retained earnings	Operating Earnings	Total assets	Market capitalisation	Total liabilities	Total net income	Sales	Z Score	liability/assets	ROA
SPANJAARD LIMITED	SPA	17,570	34,182	11,299	59,657	27,116	22,546	2,503	90,922	4.03	0.38	0.042
DRDGOLD LIMITED	DRD	104,194	1,550,131	273,269	2,439,140	1,339,396	347,054	87,254	1,990,522	4	0	0
SIBANYE 2012	SGL	- 19,681,000	- 9,668,100	5,428,100	19,674,400	1,000	23,445,800	2,952,500	16,553,500	-0	1	0
NAMPAK LIMITED	NPK	1,355,200	5,340,800	2,463,100	12,491,600	10,613,618	7,285,300	1,113,000	18,545,500	3.74	0.58	0.09
ELLIES HOLDINGS LIMITED	ELH	271,544	517,253	161,850	542,454	591,837	271,476	69,084	1,156,477	6.36	0.50	0.13
CLOVER INDUSTRIES LIMITED (LISTED DEC 2010) 2012 INF.	CLR	805,577	1,894,244	903,423	3,499,484	2,457,417	1,615,172	326,915	7,223,863	4.86	0.46	0.09
OCEANA GROUP LIMITED 2010	OCE	620,591	1,212,130	652,275	1,818,518	3,092,415	724,433	313,432	3,423,219	6.97	0.40	0.17
ADCOCK INGRAM HOLDINGS LIMITED	AIHLE	1,933,016	2,914,655	1,363,555	4,309,229	9,585,535	1,837,168	661,069	4,440,654	6.69	0.43	0.153

ALLIED TECHNOLOGIES LIMITED	ALT	1,226,000	4,745,000	2,392,000	9,573,000	2,739,815	6,281,000	986,000	22,336,000	1.93	0.66	0.103
ARB HOLDINGS LIMITED	ARH(2011)	459,045	527,328	124,423	780,130	780,200	167,524	89,988	1,256,330	4.97	0.23	0.115

VERIMARK HOLDINGS LIMITED (2011)	VMK	55,576	80,626	89,848	154,187	161,031	92,316	34,123	461,654	4	1	0
CAXTON CTP PUBLISHER S & PRINTERS LD	CAT	1,994,129	4,917,384	678,071	6,177,220	6,202,287	1,062,133	362,406	4,087,277	5	0	0

$Z\text{-Score} = ([\text{Working Capital} / \text{Total Assets}] \times 1.2) + ([\text{Retained Earnings} / \text{Total Assets}] \times 1.4) + ([\text{Operating Earnings} / \text{Total Assets}] \times 3.3) + ([\text{Market Capitalization} / \text{Total Liabilities}] \times 0.6)$

$Z\text{-Score} = ([\text{Working Capital} / \text{Total Assets}] \times 1.2) + ([\text{Retained Earnings} / \text{Total Assets}] \times 1.4) + ([\text{Operating Earnings} / \text{Total Assets}] \times 3.3) + ([\text{Market Capitalization} / \text{Total Liabilities}] \times 0.6) + ([\text{Sales} / \text{Total Assets}] \times 1.0)$

Appendix 4 Coded questionnaire

Innovation management questions

Positive = strategic is 1 systematic = inbetween :negative = intuitive is 4

<u>Innovation management questions</u> Statement		Strongly agree	Agree	Disagree	Strongly disagree
Section 3.1 <u>Organisation's Innovativeness</u> “We” refers to the listed company and all its subsidiaries.					
1.	During the last three years we (listed company and its subsidiaries) have introduced more new products than any other company in our industry. (positive)	Strongly agree strategic	Agree	Disagree	Strongly disagree Intuitive
2.	In comparison with the industry average in new products we are often first to market. (positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree Intuitive
3.	The percentage of own inventions in our product portfolio is much higher than the industry average. (positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree Intuitive
Section 3.2 <u>Innovation management mode</u>					
3.2.1 Resource allocation (“Executive management” refers to CEO and his immediate reporting level)					
1.	The executive management team is only involved in allocating resources for innovation or R&D. (negative)	Strongly agree Intuitive	Agree	Disagree	Strongly disagree strategic
2.	The executive management team is highly involved in the decisions regarding resource allocation to specific innovation project lines. (positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree Intuitive
3.	I am only responsible for managing the resources allocated for innovation (and provide no input as to how the resources were allocated). (negative)	Strongly agree Intuitive	Agree	Disagree	Strongly disagree Strategic
4.	We have mechanisms in place to ensure early involvement of all relevant departments in developing new products and services. Positive	Strongly agree Strategic	Agree	Disagree	Strongly disagree intuitive
Section 3.2.2 Recognition of innovation projects					
1.	In our organisation we have an established framework within which innovation always takes place. Positive	Strongly agree strategic	Agree	Disagree	Strongly disagree
2.	Spontaneous personal initiatives disrupt the existing	Strongly	Agree	Disagree	Strongly

	framework in the organisation. negative	agree intuitive			disagree
3.	In our organisation innovation is encouraged outside set innovation frameworks. positive	Strongly agree strategic	Agree	Disagree	Strongly disagree intuitive
4.	Innovation often arises from spontaneous personal initiatives. positive	Strongly agree strategic	Agree	Disagree	Strongly disagree Intuitive
5.	One of the key roles of the business management team in the organisation is to personally <u>identify</u> innovative initiatives. positive	Strongly agree strategic	Agree	Disagree	Strongly disagree Intuitive
6.	One of the key roles of the business management team in the organisation is to personally <u>support</u> innovative initiatives. positive	Strongly agree strategic	Agree	Disagree	Strongly disagree Intuitive
Statement		Strongly agree	Agree	Disagree	Strongly disagree
Section 3.2.3 Innovation Project Portfolio					
1.	When a specific project has to be approved, the decision is based on <u>the features of that specific project</u> (negative)t. negative	Strongly agree systematic	Agree	Disagree	Strongly disagree strategic
2.	The results of innovation projects are measured based <u>on the features of the specific individual project</u> . (negative)	Strongly agree systematic	Agree	Disagree	Strongly disagree strategic
3.	Innovation projects are evaluated based on the specific <u>features of individual innovation project</u> . (negative)	Strongly agree systematic	Agree	Disagree	Strongly disagree strategic
4.	When a specific project has to be approved, the decision is based on <u>the projects position in our project portfolio</u> . (positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree Systematic
5.	The results of innovation projects are measured based on the projects <u>position in our projects portfolio</u> . (positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree Systematic
6.	Innovation projects are evaluated based on the <u>projects position in our project portfolio</u> . (positive)	Strongly agree	Agree	Disagree	Strongly disagree

		Strategic			Systematic
3.2.4 Precision					
1.	For each individual project, we always quantify precise objectives (e.g. time, cost, quality). Positive	Strongly agree strategic	Agree	Disagree	Strongly disagree intuitive
2.	We measure our progress in relation to set objectives. Positive	Strongly agree strategic	Agree	Disagree	Strongly disagree intuitive
3.	It is common that for some projects we do not quantify precise objectives. Negative	Strongly agree Intuitive	Agree	Disagree	Strongly disagree
3.2.5 Technology business integration “<i>innovation manager is position held by participant</i>”					
1.	Our organisation has a unit /units that are dedicated to innovation. Negative	Strongly agree Intuitive	Agree	Disagree	Strongly disagree strategic
2.	Innovation manager plays a major role in shaping the overall vision of the business. Positive	Strongly agree strategic	Agree	Disagree	Strongly disagree
3.	Innovation manager plays a major role in the global organisation-wide innovation policy. Positive	Strongly agree strategic	Agree	Disagree	Strongly disagree
3.2.5 Tradeoffs “Globally refers to the listed company including all its subsidiaries”					
1.	Decision about which particular innovation project should go ahead is taken within each business area. negative	Strongly agree Intuitive	Agree	Disagree	Strongly disagree
2.	Innovation projects from different business areas are <u>compared</u> for a decision to be made organisation-wide.(positive	Strongly agree Strategic	Agree	Disagree	Strongly disagree
3.	Innovation projects from different business areas are <u>prioritised</u> for a decision to be made globally. Positive)	Strongly agree Strategic	Agree	Disagree	Strongly disagree

Adapted from Bisbe and Malagueno (2009:403)