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# **Gordon Institute of Business Science**

University of Pretoria

## **Technological innovation as a value creation driver; a venture capital perspective**

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## **ABSTRACT**

Venture capital has been a key driver of economic growth and employment. Venture capital funds consider many aspects when selecting targets for investment including the level of innovativeness present within the target's products and services.

This research examines what factors are considered to be most important by traditional and corporate venture capital investors during their investment decision. It continues to investigate the nature of the relationship between the level of innovativeness in products and services and the success in achieving two important steps in the venture capital value creation cycle: receiving investment funding and achieving commercial success. The research finds higher levels of innovation correlate strongly with both value-adding factors, and discovers many additional considerations prioritised by venture capital investors. An additional perspective for considering the value creation from innovation is also proposed.

## **KEYWORDS:**

Venture Capital; Innovation; Product Innovativeness

## DECLARATION

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



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Tim Hasluck

11 November 2013

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**ABBREVIATIONS**

VC .....Venture capital fund manager

SME .....Subject matter expert

## **CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM**

### **1.1 Research title**

Technological innovation as a value creation driver; a venture capital perspective

### **1.2 Research problem**

In the seminal article of venture capital theory, Tyebjee and Bruno (1984) and later Miloud, Aspelund and Cabrol (2012), suggest that the venture capital industry targets technology-based enterprises, and furthermore that radical product innovation and higher levels of product newness in the technologies of those enterprises are associated with increased value creation from venture capital investments in to such enterprises. This is because greater levels of product newness result in lower competition for those products, and therefore aggregate success in those markets where sufficient demand exists.

Contrary to this, early product development theory by Kleinschmidt and Cooper (1995), and later work by Van de Vrande, De Jong, Vanhaverbeke and de Rochemont (2009) suggest that product newness, a measure of the innovation in each product or service taken to market, can be assessed on a scale from small amounts of innovation per product or service, known as incremental innovation, to high amounts of innovation and differentiation, known as radical innovation. The theory also suggests that there is a U-shaped relationship between levels of newness and value creation from the resulting product. This suggests vastly new products and incrementally new products on the extremes of a newness scale show the greatest value creation, with lower value created by products of medium levels of newness.

In addition, the seminal work on consumer adoption of innovation (Moore and Benbasat, 1991) indicates that incremental and minor product and service innovation is more easily

adopted by customers, because of the smaller change, and more easily implemented because of lower costs. In that work, the use of technology readiness assessments showed consumers and customers more easily adapt to and accept these smaller increments of innovation than they do radical innovations.

The differing views of these theoretical bases present an area of uncertainty for innovators, where the type of innovation preferred by customers and consumers, as well as investors is not clearly defined.

The Economic Impact of Venture Capital and Private Equity in South Africa Report (SAVCA, 2009) describes venture capital, the early stage funding to start-up firms and businesses made for the launch or early development and expansion phases, as a leading promoter of economic growth. The report also states that the companies backed by venture capital have outperformed those on the Johannesburg Stock Exchange in terms of profit growth, increased employment and improved economic empowerment transformation. Significant research from the last 30 years has shown venture capital to be a key funding mechanism in the promotion of economic welfare in developing economy's society (Bertoni, Colombo and Grilli, 2011; Chakma, Samut and Agrawal, 2013; Peneder, 2010; Hoban, 1981) and additionally job growth in enterprises backed by venture capital is growing at 10% per year versus 1% per year across all non-venture capital backed enterprises (SAVCA, 2009).

There is also evidence that South African innovators are currently not utilising the venture capital market players efficiently (Rozyne, 2007). Access to capital is one of the leading factors that limit small business in developing markets such as South Africa (Rozyne, 2007). Venture capital investors, however, state the absence of appealing investment opportunities as a leading reason for not investing in a given time period (Miloud et al., 2011).

Venture capital also plays a critical role in driving Europe's economic growth and job creation (Bertoni et al., 2011; Peneder, 2010). Between the years 2000 and 2007, venture capital professionals invested more than €270 billion into 56 000 companies in Europe (EVCA, 2007). Venture capital enables companies to grow and develop, and supports companies which would have had lower growth or would not have been able to survive without it (EVCA, 2007; SAVCA, 2009). The industry's focus on improving the fundamentals of businesses' performance have resulted in it being one of the most potent forces in driving economy-wide improvements in corporate productivity (PWC, 2009). European venture capital backed-companies have also gone on to create some of the global leaders in their industries, each creating thousands of jobs. Examples of this include Skype, Mobistar and TomTom (EVCA, 2007).

This applies equally to the world's largest venture capital market (EVCA, 2007), the United States. Venture capital has been a key source of finance for commercializing incremental and radical innovation, and the engine behind innovation and economy growth in the United States, since the 1950s (Hoban, 1981; PWC, 2009).

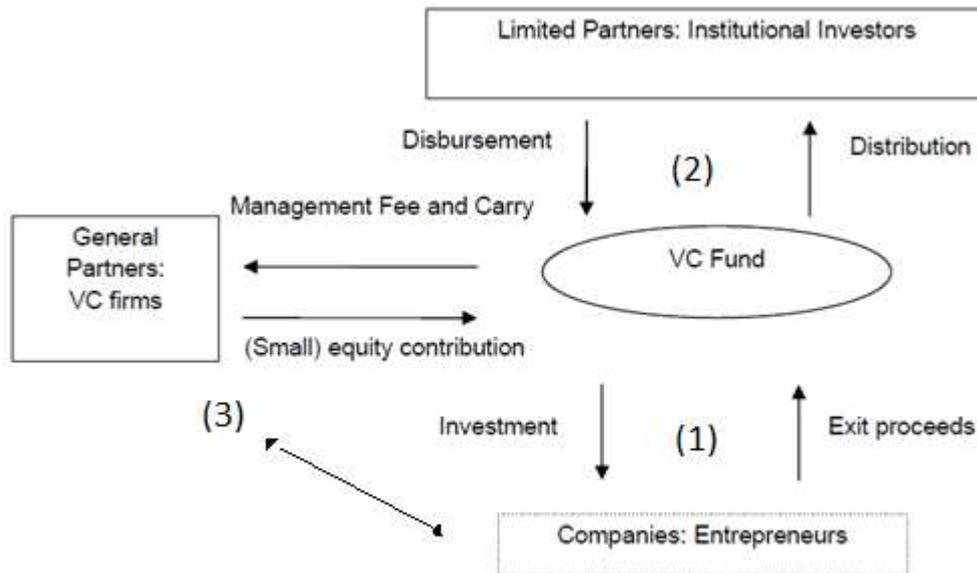
Coupled to this is the macro-economic backdrop in which public and private enterprises are currently participating. Following the Global Financial Crisis of 2008, governments are looking for ways to boost growth in employment (SAVCA, 2009). This is particularly true in developing economies and especially South Africa where unemployment amongst willing jobseekers is 25.5% (Statistics South Africa, 2013). This is supported by the contribution of venture capital in producing significant internationally competitive intellectual property, and being a strong driver behind national competitiveness (SAVCA, 2012). This has also made venture capital an increasingly important source of finance for hardest hit European high growth potential companies, considering their track record of helping business achieve their ambitions for growth through finance, strategic advice and information in critical stages of their development (EVCA, 2007).

### **1.3 Scope of research**

The study of venture capital is the study of the professional asset management activity that invests funds raised from institutional investors in promising new ventures with high growth potential (Da Rin, Hellman and Puri, 2011). In-depth information into the venture capital process will be provided later in this report, but historically research in the subject can be divided into three distinct categories (Da Rin, Hellman and Puri, 2011):

- 1) The first important set of research questions deals with the interaction between entrepreneurial companies and venture capital funds, relating to deal flow, selection, investment, effort provided by the entrepreneur and by the venture capital investor, as well as the exit strategy. This is visualised at point 1 on figure 1 below.
- 2) The second set of research questions pertains to the interaction between the venture capital fund and its investors, relating to fundraising, compensation structure, and distributions of the returns to investor, shown at point 2 on the figure below.
- 3) A third set of questions is about the organization of venture capital firms, the relationships among them and their relationships with the entrepreneurial companies in which their capital is invested (point 3 below).

Figure 1: A visual model of venture capital investments (Da Rin et al., 2011)



The research documented in this report forms part of the first category above, and studies an aspect of the investment choices of venture capital funds, as well as the resulting returns from venture capital investments. In particular the research focuses on the aspect of innovation newness, though other qualitative aspects are discussed where the research exposed relevant information.

#### 1.4 Research objectives

In summary, global economies are in as great a need of growth and job creation as ever, and venture capital has proven to be an excellent driver of both of these factors (Peneder, 2010; Chamut, Samut and Agrawal, 2013, Bertoni et al., 2011). A gap exists, however, between the kind of innovation being produced by innovators, and the nature of the innovation venture capital investors are looking to invest in. This is especially true in emerging markets such as South Africa, where venture capital markets are less mature (SAVCA, 2009).

This disparity is addressed in this research, with an aim to inform and create alignment between both innovators and venture capital investors. The intention is to do this with information about the type of innovation that has been successful in gaining investment funding and that has created value in the venture capital industry.

## CHAPTER 2: LITERATURE REVIEW

As discussed in chapter 1 above, Da Rin et al. (2011) provide a layout of the existing body of knowledge surrounding venture capital across three categories:

- 1) Venture capital fund investment choices managed by venture capital general partners;
- 2) Investment into the fund from limited partners; and
- 3) Venture capital firm organisation and the relationships among them.

This research report focuses on the first area, and this chapter tables the existing academic literature and current research issues surrounding the basics of venture capital and investment choices made by venture capital investors.

Coupled with the theory reviewed on venture capital, this report also investigates academic work on innovation and product development. The intention behind this analysis is to understand the intersection of venture capital and innovation knowledge, to help build a theoretical setting into which the research documented in this report will fit.

The theoretical backdrop to this research can be framed by reviewing the existing body of knowledge in the following areas:

- Introduction to venture capital;
- Investment considerations and the venture capital process;
- Qualitative and quantitative approaches to economic value creation by venture capital; and
- Innovation and product research & development considerations.

## 2.1 Introduction to venture capital

Venture capital is the process of the injection of capital into early stage enterprises that have typically developed products but require funding to achieve industrialisation and commercialisation (Brealey, Myers and Allan, 2007). Put another way, venture capital is defined as the provision of financial capital to high potential, high growth start-up companies, products, ideas and entrepreneurs (Metrick and Yasuda, 2011; Da Rin et al., 2011).

The investment of this capital is predominantly performed from a venture capital fund. (Da Rin et al., 2011) The capital in this fund is sourced predominantly from investors independent of the management of the fund. These investors can be private, public or institutional investors. The fund is then managed by a general partner (referred to as the VC hereafter) representative from a venture capital firm. These roles can be identified in Figure 1 in the previous chapter.

The VC has five main characteristics (Metrick and Yasuda, 2011):

- 1) A VC is a financial intermediary, meaning that it takes capital from investors and invests it directly in portfolio companies.
- 2) A VC invests only in private companies. This means that once the investments are made, the companies cannot be immediately traded on a public exchange.
- 3) A VC takes an active role in monitoring and helping the companies in its portfolio.
- 4) While other goals may exist, a VC's primary goal is to maximize its financial return by exiting investments through a sale or an initial public offering (IPO).
- 5) A VC invests to fund the internal growth of companies.

The VC is responsible for selecting the investments of choice, and managing the investment fund, as well as a small equity contribution, in return for a management fee and share of the value created by any investments (Hoban, 1981; Da Rin et al., 2011). The VC is therefore an important player in the research documented in this report.

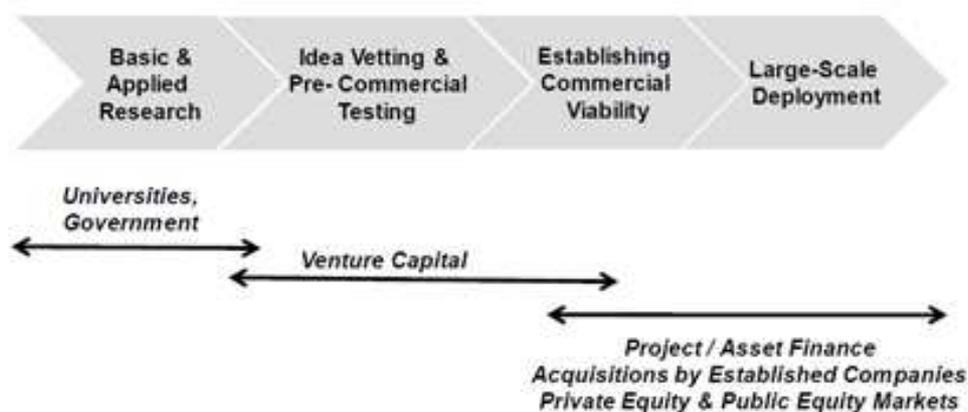
In addition to the venture capital industry described above, another form of venture capital exists within corporations and large industry firms (Metrick and Yasuda, 2011, Gompers and Lerner, 2009). In this form of venture capital, the contributor of investment capital is the corporation itself, while the benefactor of the capital is an employee or associate of the corporation where a new idea or business venture is generated (Gompers and Lerner, 2009). In many cases the origin of the idea or venture is an outcome from research and development activities in the corporate organisation itself (Tucci, Chesbrough, and Van de Vrande, 2013; Park and Steensma, 2012). Corporate venture capital can apply to new products, inventions and services, but it can also address corporate issues such as the implementation of a new organisational method in the firm's business practices, workplace, organisation or external relations (UNESCO, 2009).

In the case of corporate venture capital, significant debate exists about the role of the facilitator of the investments, or corporate VC. Tucci et al. (2013) suggest that in corporate situations, many more individuals have influence over the selection of innovation in which to invest, including Research and Development heads, executives, and senior managers. Park and Steensma (2012) however suggest that the corporate VC is often a defined role, such as innovation champion, or designate within the corporate entity. In this document, the corporate VC is defined as the person in the corporate VC process who has influence over the investment of the corporate's capital into innovation (Park and Steensma, 2012).

An additional debate in venture capital theory exists around the scope of investments which are included in the study of venture capital. Early and widely cited theory by Hoban (1981)

suggests funding classified as venture capital would be introduced only after basic and applied research was completed by a prospective venture. Funding provided during these early stages is considered seed or “angel investor” funding. The VC then plays a part in vetting the venture or products of the venture, and assists with establishing commercial viability.

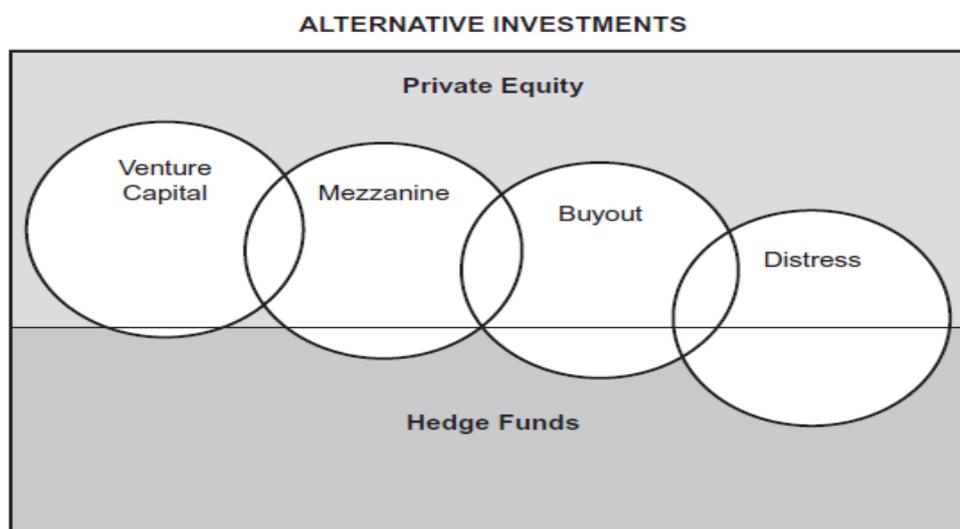
Figure 2: Scope of venture capital investments (Hoban, 1981)



This theory suggests the VC would attempt to exit the investment prior to large scale deployment, and allow other forms of financing such as project finance, private equity and public equity markets to fund the venture further.

Later theory by Metrick and Yasuda (2011) disagrees with this and suggests venture capital funding is the earliest stage of investment in the alternative investment lifecycle. Alternative investment in this context excludes publicly traded equity investment.

Figure 3: Alternative investments landscape including venture capital (Metrick and Yasuda, 2011)



Metrick and Yasuda (2011) also describe investment into later stages of an enterprise's development as mezzanine, buyout and distress funding, with each phase overlapping with its predecessor and subsequent phase, as shown in figure 3 above. Da Rin et al. (2011) extend this theory and specify that venture capital excludes buyouts, turnarounds and mezzanine finance as investment means and activities.

## 2.2 Investment considerations and the venture capital process

The venture capital process is described as the mechanics of the injection of capital into early stage enterprises that have typically already developed products but require funding to achieve industrialisation and commercialisation (Brealey, Myers and Allan, 2007).

In the seminal work on the venture capital process, Tyebjee and Bruno (1984) formalised the venture capital process from origination through to maintenance. The process is described in five steps, describing the involvement of a VC with a single opportunity, venture or deal (Tyebjee and Bruno, 1984, pg. 1051):

- 1) Deal origination – The process through which ventures enter into consideration as investment prospects;
- 2) Deal screening – Aspects of the deal to be considered in reducing large numbers of prospects down to a smaller, manageable number;
- 3) Deal evaluation – The assessment of risk and returns of the deal;
- 4) Deal structuring – The negotiation of the terms of the deal; and
- 5) Post investment activities – the functions of the VC in the life of the deal.

Subsequent to the above process, the return realised on the transaction depends on the enterprise's success, when the deal is exited and the exit mechanism used in the transaction (Meyerson and Agge, 2008; Tyebjee and Bruno, 1984; Miloud, Aspelund and Cabrol, 2012). As a result of this, Meyerson and Agge (2008) extend the above process with an additional step:

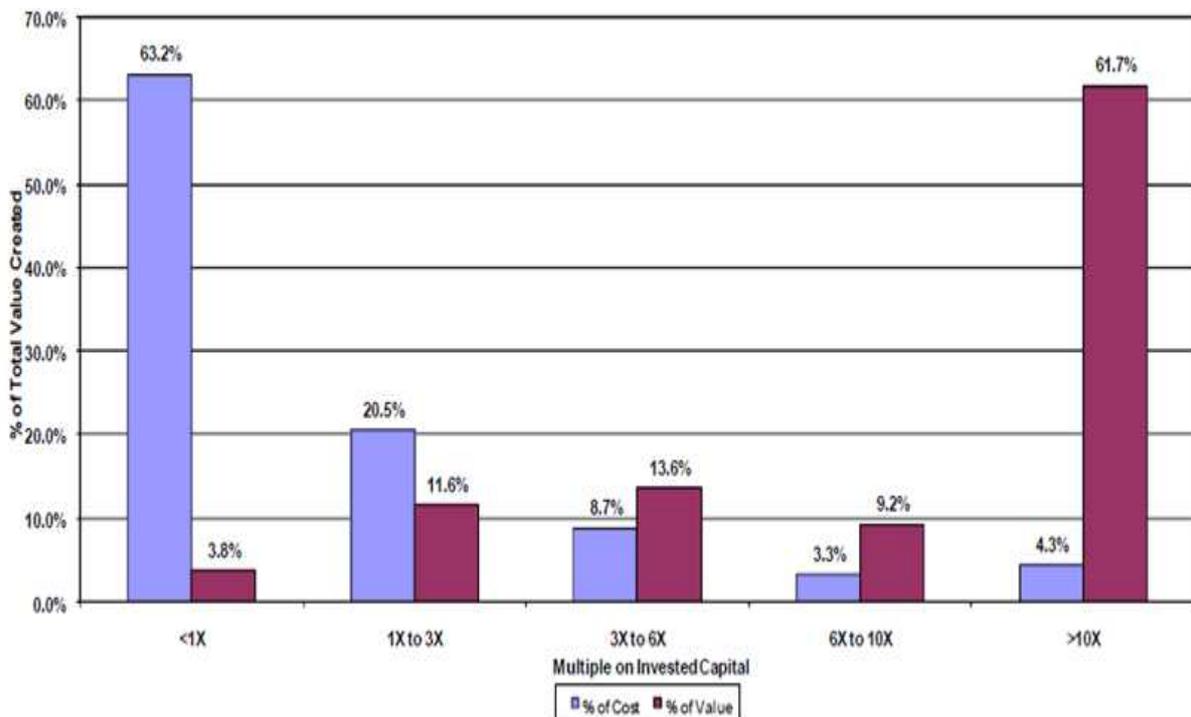
- 6) Deal Exit – the functions surrounding the exit strategy of the deal.

While the terms used differ somewhat, Berglund (2011) also suggested that the venture capital investment process can generally be said to comprise four broad phases: deal flow generation, investment, post-investment involvement, and exit. Further detail on the valuation and exit process is provided in section 2.3 below.

Investment considerations and the selection of investments can be considered part of steps 2 (deal screening) and 3 (deal evaluation) of Tyebjee and Bruno's process described above and as part of the "investment" phase of Berglund's four phases. VCs will consider all aspects of the prospective venture, its products, markets and its customers including the product newness, differentiation and innovativeness during this stage (Metrick and Yasuda, 2011; Miloud et al. 2012; Pretorius, 2007).

The selection of preferred investments by VCs, known as portfolio theory, is an important subject in the study of venture capital (Da Rin et al., 2011). Unlike other forms of external finance, a key aspect of venture capital is that it facilitates the “provision of funding to start-up firms despite the huge risks associated with unproven technologies” and “unproven business models” (Ghosh and Nanda, 2010). Since start-ups with new technologies rarely have internal cash flow to draw upon and are too risky to qualify for debt finance, they depend critically on the provision of venture capital for their survival (Ghosh and Nanda, 2010; Tullock, 2010). The incentive for VCs to take these risks is the chance of superior returns on the invested capital. The VCs are aware however, that a low proportion of investments made will produce the desired return, and therefore must choose wisely while still diversifying their risk through multiple investments (Ghosh and Nanda, 2010; Metrick and Yasuda, 2011). A larger number of investments are considered to increase the chance of a positive “tail outcome” in the investment portfolio (Ghosh and Nanda, 2010).

Figure 4: Breakdown of Tier 1 VCs portfolios in the USA (Ghosh and Nanda, 2010)



As displayed in figure 4 above, research documented by Ghosh and Nanda (2010) demonstrates that even in a combined portfolio delivering 22% annual return, the bulk of investment costs result in very poor returns, while a very small minority produce the bulk of the value creation in a portfolio of investments.

Figure 5 below displays an average planned portfolio from the same VC research, conducted across 468 investment funds throughout the USA from 1999 to 2006. On average the funds expect to realise value from only half of their investments. They must therefore create exceptional returns from at least a few investments, and have significant stakes at exit of these firms (Ghosh and Nanda, 2010) in order to realise an overall profit. This is a reason for VCs to search for radical and disruptive innovation, as they are willing to take significant risk in search of strong returns.

Figure 5: Example of pro-forma shown by VCs to their investors (Ghosh and Nanda, 2010)

Category of Outcome	Projected Value at Exit	Dollar invested per company	Share owned at Exit	Expected # investments	Total \$ invested	Total \$ Return
Early Failure	-	\$ 5 M	n/a	5	\$ 25 M	0
Complete write off	-	\$ 8-15 M	n/a	5	\$ 55 M	0
Money back	\$ 50 M	\$ 8-15 M	20%	5	\$ 55 M	\$ 50 M
Successful exit (low)	\$ 200 M	\$ 8-15 M	20%	5	\$ 55 M	\$ 200 M
Successful exit (medium)	\$ 350 M	\$ 8-15 M	20%	5	\$ 55 M	\$ 350 M
Successful exit (high)	\$ 500 M	\$ 8-15 M	20%	5	\$ 55 M	\$ 500 M
<b>Total</b>					<b>\$ 300 M</b>	<b>\$ 1,100 M</b>

Despite this, several independent factors have been shown to correlate with higher or lower levels of investment in start-up initiatives, according to Altena (2013). These include factors that increase VC investment levels:

- High perceived return/risk ratios;
- Syndication opportunities with other VCs;
- High demand for VC investment;
- Higher quality business proposals;
- High technological experience of entrepreneurs;
- High investment experience on the part of the VC;
- Match of deal size with VC appetite for investment;
- The ability to retain control of the VC's share of equity capital once invested; and
- A match in the VC and target firm's valuation estimates.

As well as factors that decrease investment levels:

- Reputational risk for the VC;
- Low supply of capital from investors to VCs;
- Geographical distance between the VC and the prospective investment target;
- High differences in legislative environment between the VC and the potential investment target; and
- Sufficient availability of alternative funding options to VC for the start-up firm.

Another, more summarised, perspective is provided by Berglund (2011) regarding assessing the potential return of a venture, and criteria for investment choices by VCs. This work suggests VCs will consider many aspects of the prospective investment target including (Berglund, 2011):

- Management team – The makeup and experience of the managers of the prospective venture;
- Risks – Any foreseeable exposures to risks for the prospect;

- Network – The contacts that the venture has outside of its own organisation that may be required for future business activities;
- Institutions – The institutional and regulatory environment under which the prospective investment target operates;
- Technological Expertise – How well the capabilities of the prospective target will be able to develop and support its new products or services; and
- Entrepreneurial experience and orientation – the amount to which the members of the prospective target are prone to entrepreneurial activity, and risk and reward profiles.

The variance in these factors between individual ventures can be quite significant (Tullock, 2010). In addition, the environment in which the venture operates can largely affect its network, and institutions. This means great differences in investment behaviour by VCs can be exhibited between those operating in developed markets, and those operating in emerging markets (Berglund, 2011; Hazarika, Nahata and Tandon, 2009). This is also a reason behind differing investment behaviour between corporate VCs and VCs operating in the non-corporate environment (Tucci et al., 2013).

In addition to aspects of the prospective company, VCs also closely examine aspects of the products or services to be provided by the new venture. The VCs have been found to examine the following product or service attributes (Berglund, 2011):

- Build aspects – features of the production process such as low cost and build quality;
- Customer fit – fit to customer's needs and ease with which the customer can relate to the product or service; and
- Product innovation / presence of new features.

The aspect of product innovation and newness are the focus areas of this research, although other factors are also considered in brief.

According to early venture capital theory, high levels of product or service innovation and newness are generally seen as an appealing aspect of a potential investment (Tyebee and Bruno, 1984). Pretorius (2007) also showed innovativeness, along with the start-up's entrepreneurial orientation as key factors for investors looking at early stage businesses. Tullock, (2010) supported this argument by stating that lack of collateral and a record of worthiness can be overlooked in the cases of significant product newness. Berglund (2011) provides reasoning behind this argument by suggesting that VCs favour radical innovation as they are able to add value to the entity through new business development ideas, processes and support, and therefore having a vastly new idea or product or service completes a venture. This research is substantiated by showing a correlation between value added in ventures and the levels of support provided by the VC funding that venture (Berglund, 2011).

Chen, Gompers, Kovner and Lerner (2009) describe VCs as preferring to invest in radical innovations because they prefer investments where informational asymmetries are high. This is also the reason why VCs often invest in start-up firms in close proximity, as information is more available to the VC who may need to mitigate the risks involved in a particular venture (Chen et al., 2009).

An alternative theory on VCs' preference of innovation level is that more radical innovation is associated with higher risk, and thus the level of innovation sought by VCs is dependent on the risk appetite of the VC (Sayed, 2010; Altena, 2013). This proposes a relationship between higher levels of newness, higher risks and higher rewards (Sayed, 2013). The relationship is also proposed in research by Altena (2013), but the research conducted could not conclusively associate the factors together. Trends in innovation support this by

showing an overall movement towards incremental innovation (Bradner, 2002). The result of this is the overall value added by incremental innovation outweighs that of radical innovation, because of the higher volume of incremental innovations produced and commercialised (Bradner, 2002). VCs however, may still prefer radical innovation in investment targets because of the greater reward potential.

Although the aggregate research in venture capital indicates a preference of VCs towards higher levels of product and service innovation, some of the works discussed above describe deviations from this. In addition, innovation theory discussed later in this report also does not align to this preference. It does however appear as though VCs often have strong technological preferences when investing (Colombo, Luukkonen, Mustar, Wright, 2010) and that there is no “one size fits all” approach (Riding, Orser and Chamberlain, 2012), and that the preference is likely to depend on growth goals, firm owner, firm size and many other factors.

### **2.3 Qualitative and quantitative approaches to economic value creation in venture capital**

The aims of the venture capital process are to allocate capital to capital poor ventures to create higher economic value (Miloud, Aspelund and Cabrol, 2012; Kelly, 2006). The scope of this research aligns to this aim and considers only the economic measure of success in venture capital. Many other social, national competitiveness and development factors can also be seen as success criteria for venture capital, but are not explored in this report. It is also notable that the aim of venture capital investments is to create value, not purely to invest in innovation (Kelly, 2006). This means that any discussion around measuring success in venture capital should involve a discussion on measuring the value created in venture capital investments. This can be performed by measuring the value of an investment at a point in time, relative to another point in time (Matrick and Yasuda, 2011).

Traditionally, the question of how to value a business or venture, and the methods used to do so, have always been a finance topic (Colombo et al., 2010). This question is considered particularly important as many VCs consider the valuation method used by both the VC and the prospective venture's management as one of the key determinants of the transaction's success (Miloud et al., 2012; Meyerson and Agge, 2011). To overcome this problem, a set of standard quantitative valuation techniques and principles is described by an industry standards body (SAVCA, 2012). The principles are applied to encourage fairness and alignment between investors and investment targets, but are also shown to help stimulate the venture capital sector by easing VC negotiations (privateequityvaluation.com, 2012). These methods can apply to the VC stage of a firm's existence, but often are discovered to be more useful once the firm has matured and established a track record on which to base the valuation. As a result, these can be found to be more useful for VC exit valuation. These techniques are also often used in corporate venture capital environments, as they are branched from pure finance theory (Gompers and Lerner, 2000; Tucci et al., 2013).

A reasonable range, but not exhaustive list of the standard techniques is described as follows (privateequityvaluation.com, 2012):

- 1) Discounted Cash Flow - According to mainstream finance theory, the economic value of any investment is the present value of its future cash flows (Brealey, Myers, and Allen, 2007). This method is widely accepted for mature companies but more difficult to apply to newer companies without solid cash flow histories from which to project forward (Colombo et al., 2010).
- 2) Multiples and bench-marks – Earnings multiples, compared to industry benchmarks, or ratios such as net assets are also favoured. Again this can apply more directly to mature companies, but the choice of correct multiple or benchmark can be a significant indicator in the VC's valuations (Miloud et al., 2012).
- 3) Market prices – Use of open capital markets, or recent transaction of a similar nature is also a useful method of quantifying venture value (Brealey et al., 2007).

These methods provide structural assistance in valuing firms, but often do not factor in potential growth from early stage technology-based companies (Miloud et al. 2012). As these companies mature, VC valuations become less relevant, as more mature organisations try to finance a greater portion of their capital using debt, because of a lower cost of capital associated with borrowing (Mkhawane, 2010; Machio, 2011). This is supported by Colombo et al. (2010), whose study of valuation accuracy showed the accuracy of predicting transaction value using quantitative techniques such as those above is greatly diminished in early stage investments. This was attributed to the large number of unknowns regarding start-up organizations when attempting to use this method. The study goes on to show more accurate value predictions using qualitative methods, which are discussed further below.

The qualitative assessment of the value of a start-up firm includes all the factors assessed by the VC and the prospective investment target in valuing the venture, that are not described by an exact currency value, but more accurately described by people, process or other softer issues (Miloud et al., 2012). Three commonly used perspectives for qualitatively assessing start-up value are:

- 1) Industry organization economics (Porter, 1979, Miloud et al., 2012) – This theory considers the structure of firms and their interactions with each other and the markets. The theory considers strong competitive forces to devalue the prospects for the firm. It is noticeable from this research that industry organization economics places a premium value on high levels of innovation, as this creates differentiation in the market thus reducing competitive forces. This theory also highlights the importance of industry structure in determining firm performance (Miloud et al., 2012).
- 2) The resource-based view of the firm (Chen et al., 2009; Metrick and Yasuda, 2011; Miloud et al., 2012) – This view on venture value suggests the competitive advantage of a firm lies in the application of the resources available to the firm, be they tangible

or intangible. Resources could refer to financial, human capital or other resources (Metrick and Yasuda, 2011). This theory emphasises the importance of internal resources in determining firm performance.

- 3) Network theory (Metrick and Yasuda, 2011; Ferrary and Granovetter, 2009; Gulati and Higgins, 2003) – Acting as somewhat of a bridge between these two theories, network theory describes the value of a firm as a complex network between itself, external forces including competitors and allies, and internal resources, staff and stakeholders.

In addition to these formal theories, VCs have been shown to count multiple other factors in valuing ventures, for both deal origination and deal exit purposes. These include perceptions of the venture's likely product success rate, perception of likely profitability, business efficiency, product differentiation, likely future market share and technical success rating (Kleinschmidt and Cooper, 1995; Van de Vrande et al., 2009). Other academic work suggests even more considerations such as technical specialisation (Gompers et al., 2009), legal and contract management competency (Sayed, 2012), sustainable research and development competency (Tucci et al, 2013), market sentiment and trust (De Vries and Block, 2011), cultural factors (Hazarika et al., 2013) and many others.

When reviewing all of the above methods of quantifying the value of venture capital investments, we see that quantitative methods often used in finance theory are difficult to apply to early stage finance, and qualitative methods, while useful in isolation, do not account for exact values and are largely subjective. In practice, VCs often form a perception of the value of an investment using a combination of these techniques, on both a conscious and subconscious level. This perception formed is most often expressed as an opinion on whether or not they believe the products and services of the target firm are likely to be successful in terms of total consumer uptake, and profitability

(Kleinschmidt and Cooper, 1995). In this research, we refer to this assessment as the “commercial success” of the product or service. Because of the wide span of factors included in this perception, this measure is used in this research report as the VC’s perception of the value of the firm.

## 2.4 Innovation, product and research and development considerations

The level of innovation in products and services produced by a firm, be it an established corporation or a new technology start-up, is not an accidental occurrence, but instead it is a strategic decision made by the firm, management, innovator or entrepreneur (UNESCO, 2009; Verma, 2010; Lipuma, Prange and Park, 2011; Kotelnikov, 2012; Ottenbacher and Harrington, 2007). In the risk linked venture capital environment, this means entrepreneurs make a choice on their risk profile when they choose the kind of products or services they develop and offer (Koekemoer, 2005). This is supported by Ansoff’s Matrix, which describes innovation and product differentiation as a strategic differentiation choice (Ottenbacher and Harrington, 2007).

Figure 6: Ansoff’s Matrix (Ottenbacher and Harrington, 2007)

	Existing Products	New Products
Existing Market	Market Penetration	Product Development
New Market	Market Development	Diversification

The matrix describes the firm's and entrepreneur's willingness to develop products and services, and to diversify, as a conscious choice along the X axis above. Ventures seeking vastly new products and services, and vast diversification, will conduct technological research and development towards radical innovation to align with this intention (Ottenbacher and Harrington, 2007).

The produce of these development activities was classified as one of the following innovation categories (Ottenbacher and Harrington, 2007; Booz Allan Hamilton, 1982):

- 1) New to world products;
- 2) New industry product lines;
- 3) Additions to existing industry product lines;
- 4) Improvements and revisions to existing products;
- 5) Repositioning of products; and
- 6) Cost reductions.

A further development of these categories by the United Nations Educational Scientific and Cultural Organization (UNESCO) in 2009 considers repositioning of products and cost reduction as marketing innovations, and therefore created a technological classification based on the above as follows (UNESCO, 2009):

- 1) Diffusion;
- 2) New to the firm;
- 3) New to the market;
- 4) New to the world; and
- 5) Disruptive innovations.

This practical model for classification considers diffusion to be minor, incremental innovation, on the low end of the innovation scale, with the level of innovation increasing

numerically until new to the world and disruptive innovation which are considered radical and at the high end of the innovation scale (UNESCO, 2009; Kotelnikov, 2012).

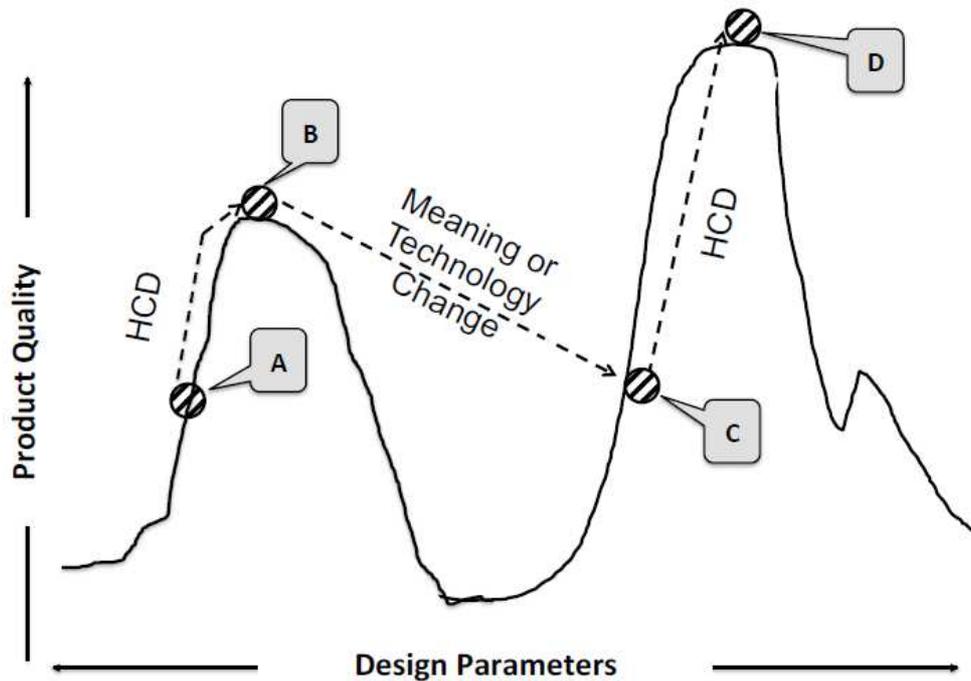
Another theory describing this scale of innovativeness is using the concept of resource fit (Olsen, 2006). This perspective describes innovation from the innovator's perspective. It states that incremental innovation by a firm is that which, while new in some respects, can be easily implemented with existing resources and skill sets of that firm, while radical innovation will be an extension or addition to the resource set already existing within the firm (Olsen, 2006). This theory associates radical innovation very closely with disruptive innovation, as new structural elements within the firm and market will be required to support the new innovation.

Norman and Verganti (2012) suggest an alternative approach to defining radical or new products and services as opposed to incremental products and services based on the philosophy used to create them. This is explained using the Hill Climbing Paradigm (Norman and Verganti, 2012) which describes incremental innovation as looking at the current aspects of an existing product, and looking for improvements on this. This approach is likened to a climber who reaches the top of a summit by taking marginal steps towards it. This is depicted by movements from points A to B and from C to D in the figure 7 below (Norman and Verganti, 2012).

Truly new innovation is described as finding a different hill or reality altogether, which may lead to an overall higher potential, but introduces the risk of a lower immediate resulting quality in the product or service (Norman and Verganti, 2012). This movement is demonstrated by the move from points B to C in the diagram below. This approach does not always lead to product innovation in the short term, but may lead to a realm in which higher overall innovation levels can be reached using further incremental innovation in the

new reality (Norman and Verganti, 2012). This approach suggests that true newness cannot be measured on a sliding scale but is distinct from incremental newness.

Figure 7: The Hill Climbing Paradigm (Norman and Verganti, 2012)



The weakness of this theory is considered by Moore and Bassat (1991) and in Binze and Reichle (2007) who suggest the consumer response to a product or service is a reflection of its innovativeness. The consumer of the product or service is not considering the design approach to the product, only the benefits received, relative to other competing products and services. It is notable that both Moore and Bassat (1991) and Binze and Reichle (2007) consider incremental innovation in products and services to be significantly better received by consumers, conflicting with venture capital theory from earlier in this report.

Another aspect of product newness to be considered is the declining newness levels of an innovation over time (Mugge and Dahl, 2013). This phenomenon describes the maturity of

a market over time, as well as the effect of positioning on market perception of newness of a product. Entry of new products emulating innovations, and market adoption of innovations affects the relative newness of the innovation over time and should also be considered or accounted for in any measurement of newness (Mugge and Dahl, 2013).

Additional methods of identifying incremental and radical innovations, at either end of the innovation scale could be identified by their development lifecycle (Kotelnikov, 2012). The radical innovation lifecycle is somewhat volatile and often characterised as the following (Kotelnikov, 2012):

- Long-term, highly uncertain and unpredictable;
- Sporadic – starts and stops, dead ends and revivals;
- Nonlinear – detours, recycling back through activities in response to discontinuities and setbacks; and
- Stochastic – waxing and waning of interest and funding, key players come and go, priorities change.

In contrast, the incremental innovation process is usually less risky and therefore somewhat more orderly. It is therefore often as follows (Kotelnikov, 2012):

- A potential marketable improvement to an existing product/service/process is quickly placed within a clearly defined, time-tested process designed to prove or disprove its value to the company;
- The process has organizational sponsorship, funding, and the assignment of a development team; and
- Development and commercialization are directed along a formal phase-gate process.

Considering these scales and definitions of innovation, it has been proposed that innovation in a product or service can be measured using 'product innovativeness', the degree to which a product or service is seen as possessing beneficial, new and unique attributes compared to other products or services offered in that market (Wu, Balasubramanian, and Mahajan, 2004). This measure has been used as a standard innovation indicator when assessing product or service newness, and has proven reliable as a measure (Wu et al., 2004; Fu, Jones and Blander, 2008; Gunday, Ulusoy, Kilic and Alpkhan, 2011).

## **2.5 Implications**

The review of existing research in this chapter has indicated that during the venture capital process, VCs regularly use the innovativeness of a potential investment's products and services, among many factors, as criteria for investment consideration (Berglund, 2011). The venture capital theory reviewed goes on to suggest that in some cases, VCs prefer more radical innovation present in potential target investments (Tulloch, 2010), but also that VCs associate high innovation with higher risk (Ghosh and Nanda, 2010), and thus preferred innovation levels may depend on the risk appetite of the investor (Sayed, 2010; Altena, 2013). In addition, product innovation theory (Moore and Bassat, 1991; Binze and Reichle, 2007) suggests incremental innovation is favoured from a consumer response perspective. The combination of these research pieces creates some uncertainty regarding VCs' preferred levels of product or service innovation.

Additional venture capital theory suggests the ability to understand the valuation of ventures before, during and after the complete venture capital process is a critical success factor for the execution of the venture capital process. This makes valuation important in achieving the positive effects of entrepreneurship on the macroeconomic environment (Miloud et al. 2012). In the case of venture capital, quantitative means of measuring investment value are very difficult, and many factors add qualitatively to the value of a

venture. Each of these factors contributes in part to the overall perception held by VCs of the prospective investment target's value, and thus the VC's perception of the value is an aggregate, although qualitative measure of the value itself (Kleinschmidt and Cooper, 1995; Van de Vrande et al. 2009).

Product innovation theory reviewed indicates that the intention of the innovator, the innovation process as well as the product or service attributes determine a product or service's newness (UNESCO, 2009; Kotelnikov, 2012). In addition, a product or service's level of innovation can be measured using an attribute known as 'product innovativeness', an inclusive indicator of the newness of that product or service (Wu et al., 2004; Fu, Jones and Blander, 2008; Gunday, Ulusoy, Kilic and Alpkan, 2011).

### CHAPTER 3: RESEARCH QUESTIONS

Following the literature review above, three research questions have been developed. Two of these are hypotheses that will be statistically tested during this research, and the third is an exploratory research question.

The first hypothesis investigates whether a significant, positive and linear association exists between the amount of product innovation in a venture's products or services, and the perceived likelihood of that venture securing venture capital funding. For this research, the null hypothesis is stated as such:

*H<sub>0</sub>1: There **is no** positive linear relationship between the degree of technological innovation in start-up ventures' products and services and ventures' likelihood of acquiring venture capital funding.*

And the alternative hypothesis:

*H<sub>1</sub>1: There **is** a positive linear relationship between the degree of technological innovation in start-up ventures' products and services and ventures' perceived of acquiring venture capital funding.*

The second hypothesis investigates whether an additional positive and significant linear association exists between the amount of product innovation in a venture's products or services and the perceived likelihood of that product reaching commercial success and the associated valuation as a result of this. It is stated as such:

*H<sub>0</sub>2: There **is no** positive linear relationship between the degree of technological innovation in start-up ventures' products and services and the perceived valuation of those ventures.*

*H<sub>12</sub>: There is a positive linear relationship between the degree of technological innovation in start-up ventures' products and services and the perceived valuation of those ventures.*

In addition to these hypotheses, an additional question regarding VC investment selection was asked during this research. The intention of this research question is to explore what attributes of start-up company's products and services VCs consider most important.

*Research Question 3: What attributes of start-up ventures' products and services are considered most important during the investment selection process performed by VCs.*

The metrics, methods and techniques used to conduct the research into these three questions are described in chapter 4 below.

## **CHAPTER 4: RESEARCH METHODOLOGY**

### **4.1 Introduction**

The research questions asked during the research detailed in this report consist of a hypothesis testing component and an exploratory component. As a result, this report includes a description of both the quantitative methodology used for the hypothesis testing component, and the qualitative methodology used for the exploratory component.

### **4.2 Quantitative research component**

#### ***4.2.1 Research design***

The quantitative research documented in this report was deductive in nature in that it tested a theoretical construct by using a research strategy designed specifically for this test (Saunders and Lewis, 2012). The deductive method was seen to be appropriate for this research as the existing theory base was discovered to argue theoretical arguments regarding VCs' preference in venture product or service innovativeness, and a specific test was used to attempt to confirm or refute these.

The research was descriptive in nature. This means it attempted to identify and discuss relationships that exist between certain variables (Saunders and Lewis, 2012). Explanatory research was also considered for this study, but was found to be inappropriate because of the inability to control or measure a very large number of independent variables other than newness in the venture capital process. Descriptive research was also selected because it is able to describe the relationship between product and service innovativeness and certain aspects of venture capital success without attempting to explain causation.

#### **4.2.2 Research parameters**

Both hypotheses to be tested in this research make reference to the perceived level of innovation in a product or service. For the qualitative component of this research, the variable selected to measure this value was 'product innovativeness', the degree to which a product or service is seen as possessing beneficial, new and unique attributes when compared to competing products or services (Wu, Balasubramanian, and Mahajan, 2004). This measure has been used multiple times in prior research that have proven its reliability (Wu et al., 2004; Fu, Jones and Blander, 2008; Gunday, Ulusoy, Kilic and Alpkın, 2011). This measure also takes a broad spectrum of innovation features into account which strengthens its validity as a method of measuring a level of innovation (Gunday et al., 2011).

Additional parameters defined for this research are the perceived valuation of a venture, and the perceived likelihood of a venture receiving venture capital funding. In both cases, these variables are perceptions, and thus are measured directly through opinions of VCs. The perception of the overall valuation is defined using the potential for "commercial success" of the venture's products or services (Kleinschmidt and Cooper, 1995; Van de Vrande et al. 2009).

An additional component of the quantitative sector of this research was used to partially address research question 3. The question aims to explore which features VCs value in start-up company's products and services, as well as rank them in order of importance where possible. To assist in answering this question, a list of features already known to be considered by VCs, compiled by Berglund (2011) is used:

- Low cost;
- Ease for consumers to relate to;
- New features;

- Customer reliability; and
- Quality.

Although the qualitative component of this research will further explore other possible features, these already defined features are used in the quantitative component to assist with priority and ranking.

#### **4.2.3 Research instrument**

The data collection strategy used for the quantitative component of the research was a self-completion survey regarding aspects of investment into innovative start-up ventures. This exact survey content can be found in appendix A of this document. The survey was used to gather data from the respondent in three separate sections. Of the 15 questions included in the survey, only nine were used in the quantitative research component.

The survey was initiated with an electronic consent form to ensure consent from all respondents as per the ethical research guidelines. This included contact details of the researcher and research supervisor to allow respondents to escalate any concerns (Saunders and Lewis, 2012).

The first part of the first section of the survey collected some biographic data about the respondents, asking them to specify their level of influence on investment into innovation (Qu. 1). This question aimed to measure the validity of the results, to ensure respondents had the correct contextual background. An additional question required respondents to specify if they were from public or private enterprise, or specify an alternative (Qu. 2). This was also to supply contextual information about the respondent. The first section of the survey also requested respondents to supply a direct answer as to their level of conscious agreement with the alternative hypotheses for hypothesis 1 and 2 described in chapter 3

(Qu. 3). Answers to this direct question were considered in conjunction with the more experimental approach used in section 2 of the survey.

Since all responses that required measurements on a scale on this survey were perceptions of the respondents, a Likert-type scale was used to collect all responses relating to a level of agreement with a presented statement. This was seen as appropriate because a Likert-type scale is seen as likely to produce a high reliability, and is easy to read and complete for participants (Bertram, 2007). The scale offered five response points, including (1) strongly disagree, (2) somewhat disagree, (3) Neutral, (4) somewhat agree and (5) strongly agree.

The final question in section 1 of the survey (Qu. 4) requested respondents to rank the aspects of start-up ventures' products and services, as described by Berglund (2011) and described earlier in this chapter, in the order they considered to be most important. A ranking scale was used with option 1 as the highest ranking, and 5 as the lowest. Because this data was determined entirely by the respondent's preference, and there are no stimuli, for this section of the survey, the unit of study was a single VC who is able to influence investment into innovation. This was represented by the respondent answering the survey.

Section 2 of the survey attempted to use a more experimental approach to test hypothesis 1 and 2. In this section the respondent was exposed to a short description of a venture's product or service. The respondent was then asked to respond to a batch of seven statements using a Likert-type response scale. The first five statements are the sub-components of the product innovativeness scale defined by Wu et al. (2004). They are defined by Wu as follows:

- Testing new features - The preannounced product included innovative product features.

- Testing innovation quality - High-quality technological innovations were embedded in the preannounced product.
- Testing radical nature - Compared to similar products developed by our competitors, the preannounced product offered unique features/attributes/benefits to customers.
- Testing differentiation - In terms of the embedded technology, the preannounced product was substantially more innovative compared to existing products available in the market.
- Testing incremental nature (reversed) - The preannounced product was only a minor product improvement / incremental modification over existing products over (reverse coded).

These components were used to create an overall score for the respondent's perception of the level of product innovation for each product or service as a summative measure, pending an internal consistency test across the sub-scales. The sixth and seventh questions collected direct perceptions of the respondent on how likely they are to invest in the venture (Hypothesis 1) and how likely it is to become a commercial success, a measure of its value (Hypothesis 2).

This data was collected for each respondent across each of five innovations. In this way, the unit of study defined for this experimental component of the research is an innovative product or service. The selection of these innovations and these respondents, as well as the collection, coding and processing of the data is described later in this document.

Section 3 of the survey is described in section 4.3 of this document as it was using a qualitative data gathering technique.

The survey was then put through pilot testing through a sample of corporate and traditional VCs. Alterations were made to question structure and grammar, according to the feedback given from the pilot testing audience.

#### ***4.2.4 Sampling***

Two instances of sampling were used during the execution of this research. The first was the selection of the innovative ventures' products and services used in the experimental component for this research. These products and services were used to assess relationships between perceived levels of innovation, and perceived venture value and funding likelihood. Because all the parameters being tested were perceptions of respondents, the actual nature of the innovations used did not need to be specific. A great deal of sensitivity was discovered when requesting information for the public domain from innovators, however, as innovators are sensitive to the rights surrounding their intellectual property (Park and Steensma, 2012).

One consideration when selecting innovations was the decrease in relative newness of an innovation over time (Mugge and Dahl, 2013). Taking this effect into account, although the population for this sample was defined as all new venture products and services, the sampling frame was defined as all new venture products and services that had been announced within the public domain at a given point in time. Because of this, and the difficulty acquiring sample innovations, a subset of products and services that were entered into an innovation competition (held by Gauteng province's "The Innovation Hub") were selected as a purposive sample. This competition required entrants to put forward an innovation in either the Green Energy, or Mobile categories. The entrant's information was released on the same day, removing any effects of degradation of newness over time. A random selection from the entrants was used for the survey, by numbering each innovation and randomly selecting five numbers from the pool.

Another instance of sampling was performed when selecting respondents to complete the survey. As this survey considers traditional and corporate venture capital, the population was defined as any individual who was able to influence or play the facilitator role into investment into innovation. Geographical limitations confined the sampling efforts to organizations within South Africa. One major obstruction was the closed and protective nature of the venture capital community. This is because venture capital organisations' value is driven through the protection of intellectual property, and thus the firms are not necessarily willing to participate or share information (SAVCA, 2012). As a result contacts were established through the two channels, the first being South African Venture Capital and Private Equity Association (SAVCA), and the second being a list of people designated to direct investment into innovation at Rand Merchant Bank, an organization to whom the researcher belonged, and thus was accessible. Contacts from these organisations therefore form the sampling frame for this component of the research. Using the purposive sampling method, a list of 28 venture capital organisations from the SAVCA list, and a list of 65 designates from Rand Merchant Bank were emailed the link to the electronic survey. It is acknowledged that this sample is not necessarily representative of the full population and results of the data collected and analysed should be interpreted as such (Saunders and Lewis, 2012).

#### ***4.2.5 Data collection and analysis***

The survey was distributed through an online data collection platform, [www.surveymonkey.com](http://www.surveymonkey.com). The survey was loaded onto the platform prior to pilot testing. A total of 34 responses were received for this survey, 33 of which were complete. This represents a response rate of 37%, although it is noted that the survey link could have been forwarded to a larger audience.

It is also noted that a much larger sample size would strengthen the reliability of the results (Saunders and Lewis, 2012), but the sample size is considered to be reasonable considering the moderate size, and closed nature of the venture capital industry, and the timelines and budget restraints of this research. In addition, the experimental component of the research, this meant five different innovations were scored a total of 33 times, meaning the hypothesis could be tested multiple times.

The data was downloaded in granular format from the survey tool used. A small quantity of data clean-up was required as one response was incomplete and one required modifying. The incomplete response was excluded, leaving a complete sample of 33 responses. One response had also specified that respondent's role as neither public nor private enterprise but has specified their organisation as the University of Pretoria. For the purposes of this research this was considered to be public enterprise and the data was adjusted as such.

The data was coded on all Likert-type scale responses with a numeric digit to represent the response as follows:

- 0 = Strongly disagree
- 1 = Somewhat disagree
- 2 = Neutral
- 3 = Somewhat agree
- 4 = Strongly agree

Descriptive statistics were then performed on the biographic data collected, as well as the direct questions regarding hypothesis 1 and 2 (Qu. 3). Details of the results produced for this and all analysis are detailed in chapter 5 of this document. Descriptive information was also compiled on the ranking information collected for question 4 of the survey. This includes average ranking and frequency of ranking per product or service aspect.

For each of the sub-scales used in questions 5, 7, 9, 11 and 13, each respondent had indicated their level of agreement on the Likert-type scale mentioned above. The fifth sub-scale in each case was reverse coded as it was used reverse indicator (Wu et al., 2004). A Cronbach's Alpha test was then performed on each sample to confirm the reliability of the overall innovation score given by each respondent to each innovation. Once this was confirmed, this data was then tested for correlation with the respondent's scores for commercial viability and willingness to invest, the parameters used for hypothesis 1 and 2.

Descriptive statistical analysis was also undertaken for each of the five innovations analysed. This was not a primary objective of the research but the results are relevant in the context of the breadth the sample covered.

#### **4.2.6 Research limitations**

Several factors have been identified as limitations of the research methodology. These are detailed below.

- Sampling:
  - The overall sample size is small, and a larger one would have improved the validity of the research
  - The sample is not truly representative. Additional information better defining the population and its members would have allowed for better sampling. The research is susceptible to bias from the current respondents as result of this.
- Innovation nature:
  - Additional data could have been gleaned from this research if additional variables of the innovations used had been controlled. For example, intentionally varying the innovation score would have been able to show a certain quantity of causation in the results.

- A wider sample of innovations from different fields would have strengthened the results by removing the possibility of bias in Green or Mobile innovations.
- Instrument distribution
  - Although IP address verification was performed, using the online survey tool allows the same respondent to answer the survey multiple times from different locations. This introduced the opportunity for an invalid skewness in the results.
  - Although respondents were asked to state their level of influence on the investment activities, the opportunity exists for individuals not suitable for the survey to complete it without being identified in the results.

Additional ideas for enhancing the research are provided in chapter 7 of this document.

### **4.3 Qualitative research component**

#### ***4.3.1 Research design***

The primary focus of this research was the quantitative component; however some qualitative techniques were used to generate exploratory information. This was used for:

- Contrasting against the quantitative results, as well as
- Addressing research question 3 in exploring what aspects of a venture's products or services VCs consider to be the most important.

The qualitative approach was considered appropriate, particularly for research question 3, because the question aims to make unknown aspects known. Ethical boundaries were well considered, and ethical consent was acquired by each contact person, to agree on data sensitivity and bring comfort to both the contact person and the interviewer (Saunders and Lewis, 2012).

### **4.3.2 Research method**

The qualitative research consisted of two components:

- 1) Open-ended questions included in the survey detailed in section 4.2 of this document.
- 2) Four face to face interviews with traditional and corporate venture capital subject matter experts (SMEs).

The six open-ended questions included in the survey consisted of five questions requesting respondents to describe any concerns regarding investing into the specific innovations, and what kind of mitigation would ease the concern, and one additional contextual question. The intention of these five questions was to uncover an array of aspects about a venture's products that VCs consider important. The contextual question was the final question (section 3) of the survey, and created an open opportunity for respondents to discuss the main motivations behind their investments into innovation.

The interview component of the qualitative research consisted of four, half-hour interviews with SMEs. The interviews were semi-structured, with open topics tabled by the interviewer, while still trying to create as much room as possible for the interviewee to surface new ideas. Strict ethical boundaries were observed. Each interviewee was required to sign an appropriate consent form (template attached in Appendix B of this document) prior to the interview, and interviewees were not required to divulge any confidential information.

### **4.3.3 Interview sampling**

The sample population defined for the interviews was SMEs in the field of investment into innovation. Experts within the Gauteng area of South Africa were considered; due to the location of where the research was conducted. Using the purposive sampling method, interviewees were selected to give a slightly different perspective to the survey data collected. With an aim to understand a point of view closer to the innovators, two groups were identified:

- 1) Corporate innovation program heads – these heads play a facilitator role between the innovator and investor in the corporate venture capital scenario (Park and Steensma, 2011).
- 2) University Technology Transfer Offices (TTOs) – South African legislation requires publicly funded research institutions to maintain an office to facilitate the commercialisation of innovation from that institution.

A set of two respondents was identified from each of the above categories. Both TTOs were from major universities in the Gauteng area. Although 10 innovation program heads were contacted with interview requests, only 10 responded positively and were thus self-selecting. The unit of analysis for this section is the perception of a subject matter expert.

### **4.3.4 Data collection and analysis**

The qualitative data collected from the survey component was collected as per the methods documented in section 4.2.5 of this document. The data collected was aggregated by research question and used to augment the quantitative data collected for each research question.

Data collected from interviews was also aggregated and provides ideas and commentary for each research question. The interview data was measured for frequency of topic occurrence, and for themes that agree or disagree with the results of the quantitative results.

#### ***4.3.5 Research limitations***

The qualitative component of this research was intended only as a supporting function, but it quickly became obvious that scope exists for a full qualitative study on the subject matter. A significantly larger sample of interviewees from each category is required, as well as additional categories covering the investor's point of view. In addition, if interviews were repeated with the benefit of hindsight, the interview would be split into an initial open section, and then a second section, guided with much tighter questions and options to illicit preferences and choices.

## **CHAPTER 5: RESULTS**

The data collected with the methods and analysis techniques described in Chapter 4 of this document has been presented below. The information has been presented under each of the three research questions investigated in this report:

*H1: There is no positive linear relationship between the degree of technological innovation in start-up ventures' products and services and ventures' likelihood of acquiring venture capital funding.*

*H2: There is no positive linear relationship between the degree of technological innovation in start-up ventures' products and services and the perceived valuation of those ventures.*

*Research Question 3: What attributes of start-up ventures' products and services are considered most important during the investment selection process performed by VCs.*

In addition descriptive statistics have been used to provide an overview of the sample data in section 5.1.

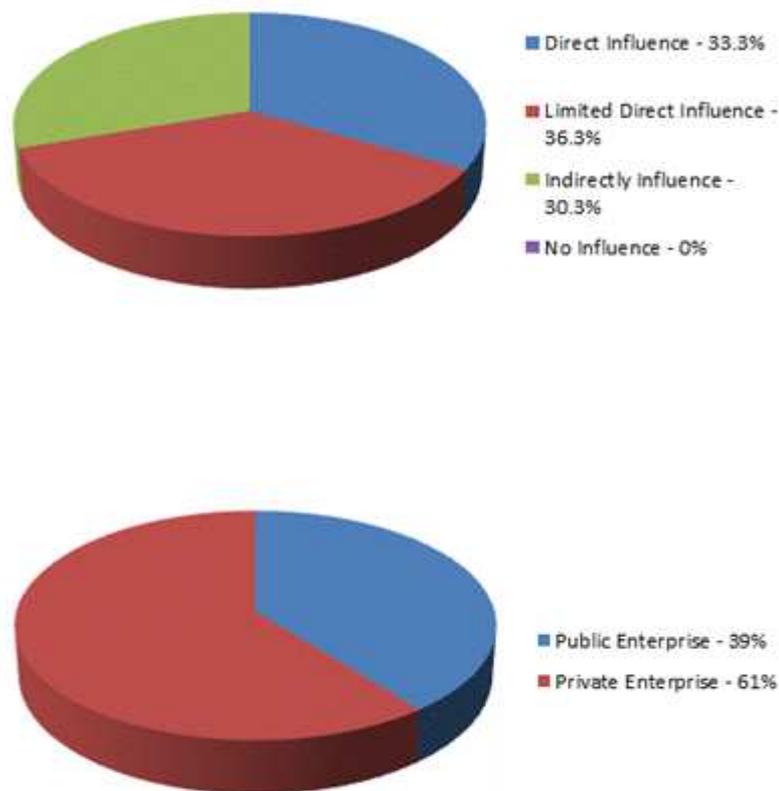
### **5.1 Sample data and descriptive statistics**

#### ***5.1.1 Profile of survey respondents***

The purposive method used for selecting individuals to be interviewed for the qualitative component of this research is described in chapter 4 above. Additional data was collected for the quantitative components describing the 33 individual respondents to the survey. This data is displayed visually as preliminary analysis has been shown to be greatly aided by visual presentation (Albright, Winston and Zappe, 2009).

When asked to describe their role in as either, directly influencing, having limited direct influence on, indirectly influencing or having no influence on investment into innovation, no respondents chose the latter option. The respondents were relatively evenly split between the remaining levels of influence, with limited direct influence marginally the most common.

Figure 8: Breakdown of respondents by level of influence on investment into innovation and by public or private enterprise.



The respondents also indicated they were from both public and private institutions, with a slight majority from private enterprise.

### 5.1.2 Profile of innovations used for experiment

In the experimental component of the research survey, respondents were exposed to innovations discovered in an innovation competition. Respondents were asked to rate the innovations on the five sub-scales of the product innovativeness measure. The internal consistencies across these sub-scales were then measured using the Cronbach's Alpha test, the most common measure of reliability for this kind of scale (Weiers, 2011).

Figure 9: Cronbach's alpha reliability scores for each innovation

Innovation A Reliability Statistics		Innovation B Reliability Statistics	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.836	5	.785	5

Innovation C Reliability Statistics		Innovation D Reliability Statistics	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.897	5	.813	5

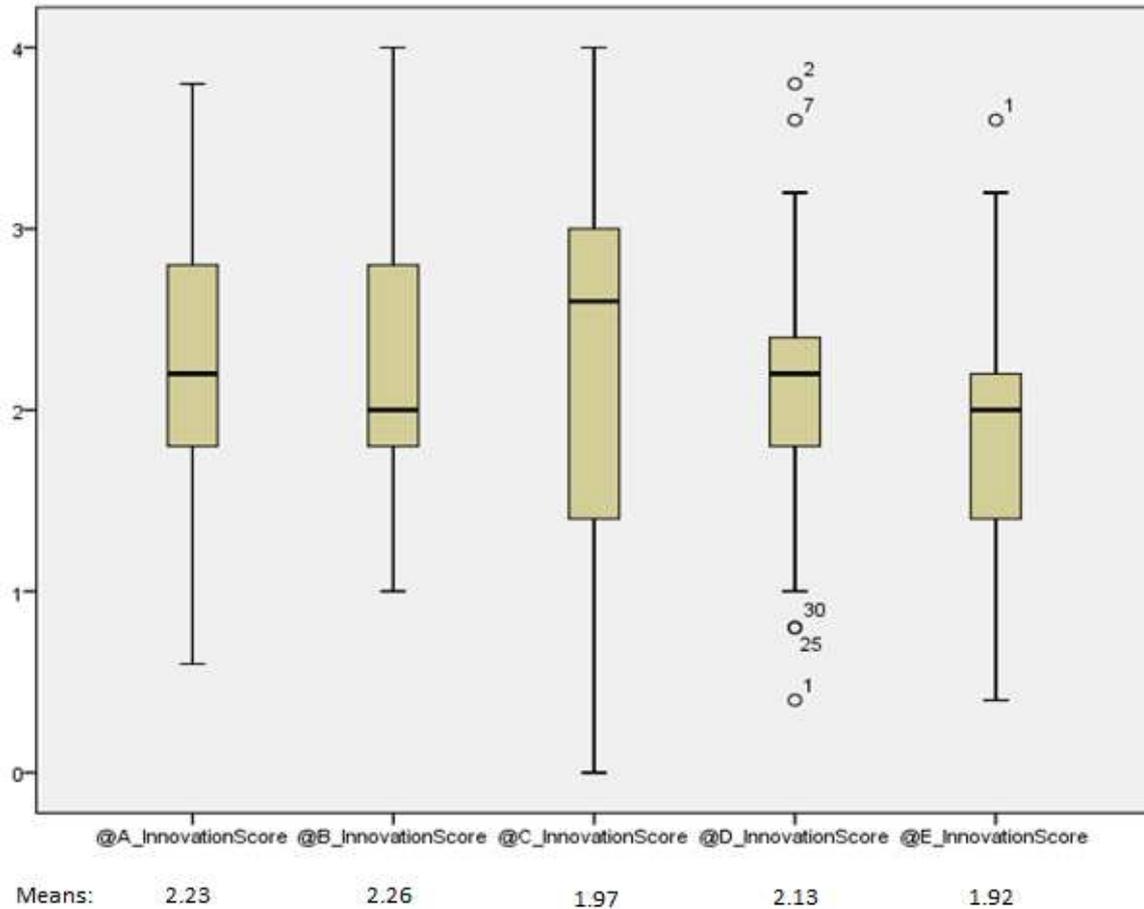
  

Innovation E Reliability Statistics	
Cronbach's Alpha	N of Items
.815	5

The Cronbach's Alpha reliability scores for each of the five samples are all greater than 0.7, and it is therefore considered sufficiently reliable (Weiers, 2011) to use the average overall

innovation score as an indication of the product or service’s overall product innovation. Box plots of each of the five samples innovation scores are shown in figure 10 below.

Figure 10: Mean and distribution of the product innovativeness scores for each sample



The above box-plots indicate that the median innovation score for each of the innovations lies between a score of 2 and 3; however the distributions are quite different, and the means show some variation. Data points 2 and 7, as well as 1, 30 and 25 are detected as outliers for innovation D, and data point 1 as an outlier for innovation E. Nevertheless these data points are included as they are considered valid results from the survey. A notable feature of the above distributions is the large range for each of the innovation. This improves the reliability of the Pearson correlation tests performed later in this chapter, as

the restriction from range is reduced (Weiers, 2011). This data will be correlated with the respective innovation's scores for respondents' willingness to invest, and for perceived likelihood of commercial success and associated valuation. The distributions of these scores are described below.

Figure 11: Mean and distribution of willingness to invest by innovation

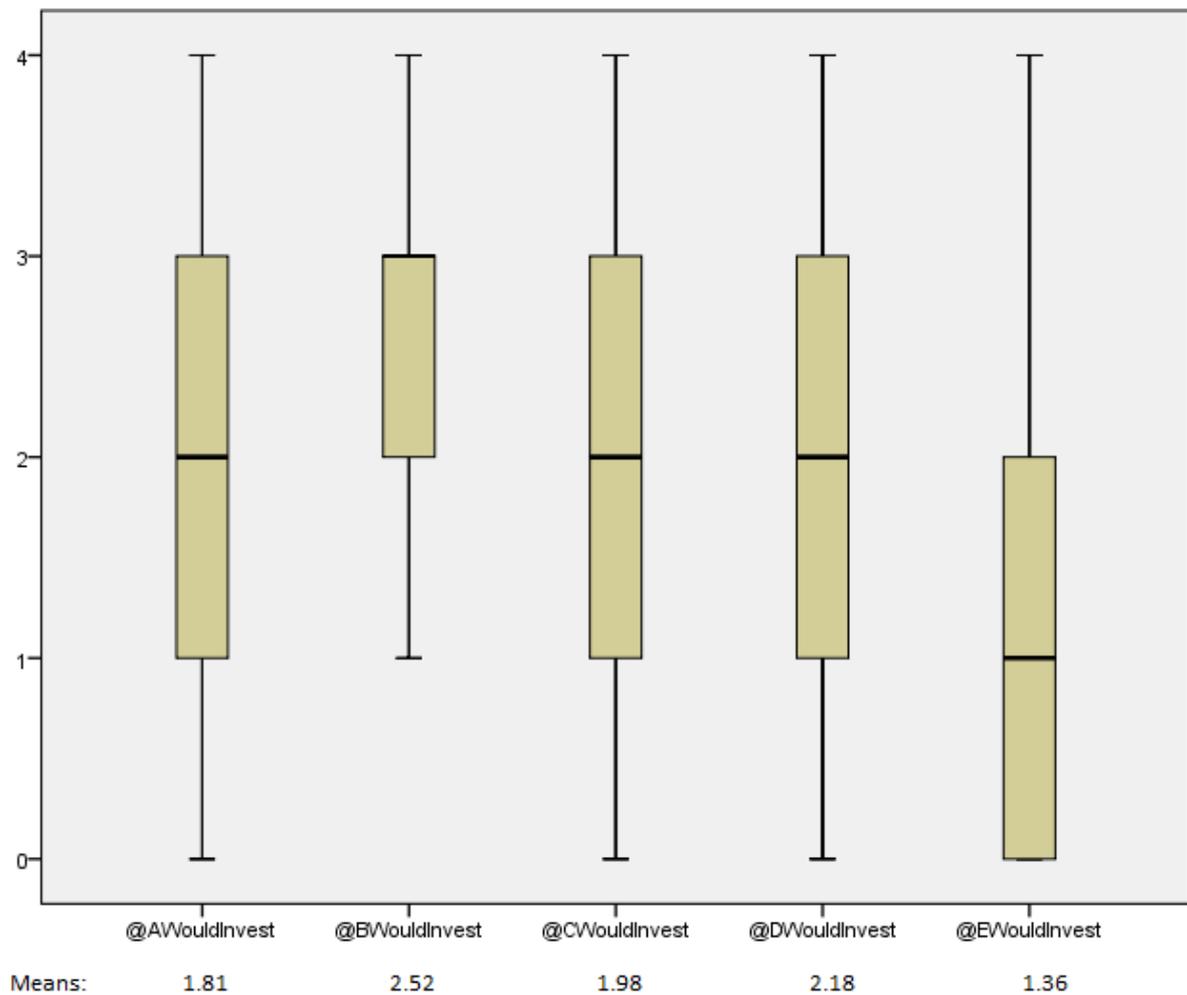
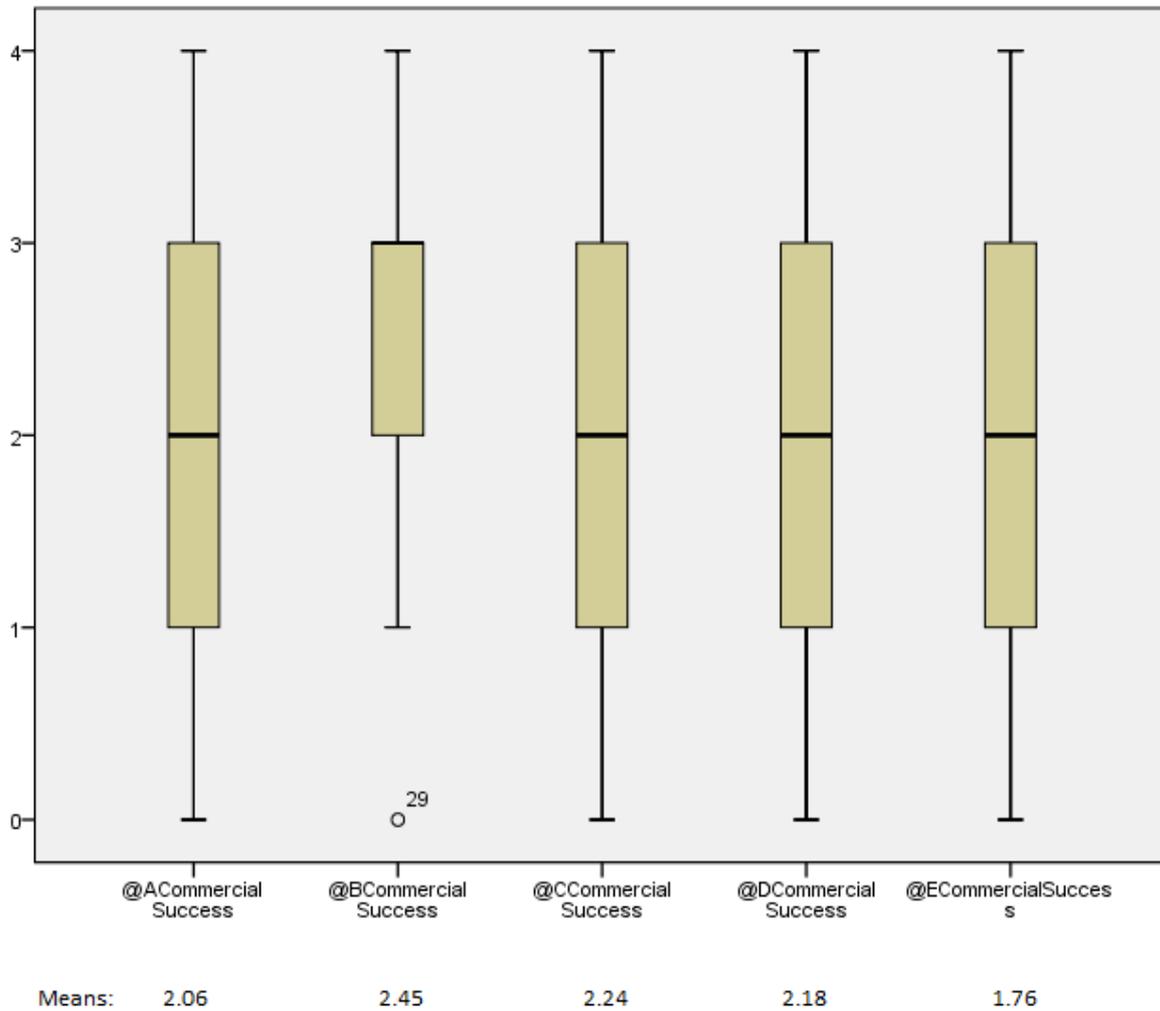


Figure 12: Mean and distribution of the perceived potential for commercial success by innovation



Both data sets for the respondents show large ranges, and while the mean and median values for likelihood of commercial success are relatively consistent, the mean values for willingness to invest show a range of greater than 1, and the medians vary from 1 to 3. Again, this large range and variation will strengthen the hypothesis testing performed later in this chapter.

## 5.2 Hypothesis 1: Relationship between the degree of technological innovation and likelihood of acquiring venture capital funding

### 5.2.1 Quantitative analysis

In order to test this hypothesis, the overall innovation score for each innovation was tested against the willingness of survey respondents to invest in that innovation. The test used was a bivariate correlation analysis using Pearson's correlation coefficient. The level of significance set was 0.01 (high sensitivity) using a one tailed test of significance as we were also testing for a positive correlation only. The results for the five separate tests for this hypothesis are shown below.

Figure 13: Correlation test scores for innovation versus willingness to invest

Innovation A correlations			
		@AInnovationS core	@AWouldInvest
@AInnovationScore	Pearson Correlation	1	.711**
	Sig. (1-tailed)		.000
	N	33	33
@AWouldInvest	Pearson Correlation	.711**	1
	Sig. (1-tailed)	.000	
	N	33	33

Innovation B correlations			
		@BInnovationS core	@BWouldInvest
@BInnovationScore	Pearson Correlation	1	.698**
	Sig. (1-tailed)		.000
	N	33	33
@BWouldInvest	Pearson Correlation	.698**	1
	Sig. (1-tailed)	.000	
	N	33	33

**Innovation C correlations**

		@CInnovationS core	@CWouldInvest
@CInnovationScore	Pearson Correlation	1	.688**
	Sig. (1-tailed)		.000
	N	33	33
@CWouldInvest	Pearson Correlation	.688**	1
	Sig. (1-tailed)	.000	
	N	33	33

**Innovation D correlations**

		@DInnovationS core	@DWouldInvest
@DInnovationScore	Pearson Correlation	1	.635**
	Sig. (1-tailed)		.000
	N	33	33
@DWouldInvest	Pearson Correlation	.635**	1
	Sig. (1-tailed)	.000	
	N	33	33

**Innovation E correlations**

		@EInnovationS core	@EWouldInvest
@EInnovationScore	Pearson Correlation	1	.680**
	Sig. (1-tailed)		.000
	N	33	33
@EWouldInvest	Pearson Correlation	.680**	1
	Sig. (1-tailed)	.000	
	N	33	33

\*\* . Correlation is significant at the 0.01 level (1-tailed).

Each test of hypothesis 1 produced evidence of correlations with Pearson coefficients of higher than 0.63 across each of the tests. The certainty of these results is high as the p value generated in the test is less than the designated  $\alpha$  value, and the chance of this result

occurring by random is very low. Because of this, we can reject the null hypothesis for hypothesis 1 and conclude that the positive linear correlation between the factors does exist.

### 5.2.2 Qualitative analysis

In order to further investigate this question, survey respondents were asked to indicate their level of agreement on a Likert-type scale to the statement that radical innovation was more likely to gain investment funding than incremental innovation. The mean response after data coding for this question was 2.33/4, and the modal response 3.0/4. This indicates some level of agreement with the statement from the survey respondents. The frequencies of the responses are shown below.

Figure 14: Distribution of responses to direct question for hypothesis 1

	Frequency	Percent	Valid Percent	Cumulative Percent
.0	2	6.1	6.1	6.1
1.0	7	21.2	21.2	27.3
2.0	5	15.2	15.2	42.4
3.0	16	48.5	48.5	90.9
4.0	3	9.1	9.1	100.0
Total	33	100.0	100.0	

This data is viewed in isolation and quantitative conclusions cannot be drawn from it, but it is notable that in this case the majority of responses, 57.6%, were either the “somewhat agree” or “strongly agree” option. Nearly half the responses were “somewhat agree” alone. Less than 7% of respondents strongly disagreed with the statement. This creates an overall picture that respondents felt radical innovation was more likely to gain funding than incremental.

During the interviews of SMEs, however, two out of four interviewees felt that incremental innovation was more likely to gain investment funding, while the remaining two did not feel that either incremental or radical innovation was a significant advantage. "I disagree that new products have to be game changers to be successful." said one subject matter expert. This was particularly true in corporate venture capital scenarios. One corporate venture capital programme head indicated that in the corporate environment, radical innovations may need to be broken into multiple incremental ones, in order to make the "funding pill easier to swallow." All four interviewees did feel that other factors besides the product or service innovativeness were again significant. These will be investigated in depth in research question 3.

### 5.3 Hypothesis 2: Relationship between the degree of technological innovation and perceived overall valuation

#### 5.3.1 Quantitative analysis

The overall innovation score for each innovation analysed was tested against the perceived likelihood of commercial success for that innovation. As with hypothesis 1, the test used was a bivariate correlation analysis using Pearson's correlation coefficient. The level of significance,  $\alpha$ , was set to 0.01 using a one tailed test of significance as testing was performed for a positive correlation only. This value was selected to ensure a high sensitivity in the test. This created five separate quantitative tests for this hypothesis. The test results are shown below.

Figure 15: Correlation test scores for innovation versus commercial success

		@AlInnovationS core	@ACommercial Success
@AlInnovationScore	Pearson Correlation	1	.605**
	Sig. (1-tailed)		.000
	N	33	33

	Pearson Correlation	.605**	1
@ACommercialSuccess	Sig. (1-tailed)	.000	
	N	33	33

#### Innovation B correlations

		@BInnovationS core	@BCommercial Success
@BInnovationScore	Pearson Correlation	1	.716**
	Sig. (1-tailed)		.000
	N	33	33
@BCommercialSuccess	Pearson Correlation	.716**	1
	Sig. (1-tailed)	.000	
	N	33	33

#### Innovation C correlations

		@CInnovationS core	@CCommercial Success
@CInnovationScore	Pearson Correlation	1	.670**
	Sig. (1-tailed)		.000
	N	33	33
@CCommercialSuccess	Pearson Correlation	.670**	1
	Sig. (1-tailed)	.000	
	N	33	33

#### Innovation D correlations

		@DInnovationS core	@DCommercial Success
@DInnovationScore	Pearson Correlation	1	.662**
	Sig. (1-tailed)		.000
	N	33	33
@DCommercialSuccess	Pearson Correlation	.662**	1
	Sig. (1-tailed)	.000	
	N	33	33

#### Innovation E correlations

		@EInnovationS core	@ECommercial Success
@EInnovationScore	Pearson Correlation	1	.658**
	Sig. (1-tailed)		.000
	N	33	33
@ECommercialSuccess	Pearson Correlation	.658**	1
	Sig. (1-tailed)	.000	
	N	33	33

\*\* . Correlation is significant at the 0.01 level (1-tailed).

In each test performed a significant correlation was evident, with Pearson coefficients for all the tests conducted scoring 0.6 or higher. The significance values are extremely small in each of the five tests, meaning that the chance of this correlation occurring by random is very small in each case. Because the p values are less than the  $\alpha$  values for each of the five tests we can reject the null hypothesis and conclude that a positive linear correlation between the tested factors does exist.

### 5.3.2 Qualitative analysis

In addition to the quantitative analysis above, qualitative interviews were conducted and a direct question regarding this hypothesis was asked in the survey. When asked directly if radical innovation was more likely to become a commercial success than incremental innovation, with responses given on a Likert-type scale, the mean response was 1.91, a marginal tendency to disagree with the statement. In addition the modal response was 1 – slightly disagree. Frequencies of the responses are given below.

Figure 16: Distribution of responses to direct question for hypothesis 2

	Frequency	Percent	Valid Percent	Cumulative Percent

.0	4	12.1	12.1	12.1
1.0	10	30.3	30.3	42.4
2.0	8	24.2	24.2	66.7
3.0	7	21.2	21.2	87.9
4.0	4	12.1	12.1	100.0
Total	33	100.0	100.0	

While this data cannot be quantitatively measured in isolation, it is notable that a cumulative 42.4% of respondents slightly or strongly disagreed with the statement, while only 33.3% slightly or strongly agreed, with the remainder being neutral.

Interviews with SMEs revealed an additional perspective on the first hypothesis. Of the four SMEs interviewed, two regarded incremental innovation as more likely to be successfully commercialised, one suggested radical innovation is more often a commercial success while one respondent claimed this was not a significant factor. "New inventions, radical ones, they are the ones that make it." said this individual, who later went on to say most returns to innovators in her experience were made by radical inventions. Disagreeing with this, one corporate VC interviewee claimed that "it will be your incremental changes by a long shot," when asked whether radical or incremental innovation was more often commercially successful.

Although the individuals interviewed in this research did not precisely agree, it was a unanimous message from all interviews that the commercial success of products and services depends more on other factors than it does on the level of innovation. Additional factors said to have a more important role are discussed in research question 3.

**5.4 Research question 3: What attributes of these products and services are considered most important during investment selection?**

**5.4.1 Quantitative analysis**

The first part of analysis of the data collected for research question 3 was the ranking requested of survey respondents regarding five aspects of products and services defined by Berglund (2011). Each survey response included a ranking from 1 (most important) to 5 (least important) for each of the aspects. The frequencies of each rank per aspect are tabled below.

Figure 17: Ranking frequencies for each of Berglund’s (2011) product aspects

	Easy for consumer to relate to		Speaks to a customer need		Low Cost		Quality		New Features	
1	4	12%	21	64%	0	0%	2	6%	6	18%
2	12	36%	7	21%	6	18%	3	9%	5	15%
3	6	18%	1	3%	6	18%	16	48%	4	12%
4	9	27%	0	0%	10	30%	8	24%	6	18%
5	2	6%	4	12%	11	33%	4	12%	12	36%
Total	33	100%	33	100%	33	100%	33	100%	33	100%
Modal Rank	2		1		5		3		5	
Mean Rank	2.8		1.8		3.8		3.3		3.4	

The quantity to which a product or service speaks to a customer’s need, or the customer fit, is clearly prioritised by the survey respondents as 64% of all respondents ranked it as the most important feature. Although new features received the second highest proportion of number 1 rankings, the modal and mean rank for the ease with which consumers relate to a product or service shows it as the second most important feature to the survey respondents. This could also be considered a measure of the product-customer fit. The

quality and new features in a product or service proved to be ranked as the next most important, while low cost was notably ranked least important.

#### 5.4.2 Qualitative analysis

The survey mechanism was also used to collect open-ended responses allowing respondents to express their concerns with the innovations used in the experimental part of the survey. This facility uncovered additional aspects of the discussed innovations that respondents felt were important during the investment decision.

Figure 18: Aspects of products or services noted as important by survey respondents

Aspect	Count	%
Newness	25	23%
Costs	19	17%
Competition	16	15%
Market Demand	11	10%
<i>Business Model Design</i>	6	5%
<i>Supply Chain</i>	6	5%
<i>Technical</i>	6	5%
<i>Politically Controversial</i>	5	5%
Customer Fit	4	4%
Quality	3	3%
<i>Design</i>	3	3%
<i>regulatory/legislative</i>	2	2%
Relatability	2	2%
<i>Competitive force from influential opponents</i>	1	1%
<i>Low technical barrier to entry</i>	1	1%
	110	100%

The results from this component of the survey are listed above. In total 110 responses mentioning an aspect for evaluation were surfaced. The features of newness, quality, costs, market demand and competition, as well as customer fit concepts featured prominently, as

expected. In addition, new aspects discussed included technical barriers to entry, influencing powers of competitors, regulatory and legislative issues, design issues and possible business models were also discussed as considerations in the investment process.

During the interview component of the qualitative research, SMEs de-prioritised technical factors about the products and services, and placed an emphasis instead on factors surrounding the people innovating and commercialising the products, although the quality and costs of the innovation were mentioned as important factors by the corporate venture capital participants. All four interviewees discussed the ability of the innovator to communicate and the relationships held by the innovator as most important. This theme of relationships of the innovator was expanded on across each of the interviews with relationships with innovation sponsors, consumers and other innovators discussed as key factors.

When pressed for product specific factors, two of the four SMEs mentioned product-consumer fit, market saturation levels, innovativeness and differentiation as aspects they would consider important in gaining investment. Other factors mentioned once-off included the ease with which an innovation could be patented or protected, as well as how well it would lend itself to a licensing model, which was seen as appealing by the relevant interviewee.

## **5.5 Summary**

In this chapter, the data collected and tests performed on this data is comprehensively described. Statistical tests for hypothesis 1 and 2 of this research were successfully completed and the results are detailed above. Qualitative data for hypothesis 1 and 2, as well as multiple qualitative discoveries for research question three are also described. An in-depth discussion of all of these components is included in the next chapter.

## **CHAPTER 6: DISCUSSION OF RESULTS**

### **6.1 Introduction**

The research documented in this report explored the relationship between aspects of a start-up venture's products and services and the perceived success of that venture in gaining investment funding and achieving commercial success. The research focussed on the innovativeness aspect of the products and services, and tested this aspect's relationship with the two criteria mentioned above. Previous studies and literature regarding this relationship provide mixed evidence. In addition, additional aspects of products and services were surfaced, and to some extent prioritised. A detailed discussion of the results for each research question is presented below.

### **6.2 Hypothesis 1: Relationship between the degree of technological innovation and likelihood of acquiring venture capital funding**

The research tested for a positive linear correlation between the perceived level of product innovativeness and the intention of responding VCs to invest in the product or service. This was tested on each of the samples gathered from each of the five experimental innovations. Each test produced a positive correlation with Pearson correlation coefficients ranging between 0.63 and 0.72. Interpreting the exact strength of the correlation is very difficult as the respondents' perceptions were used, allowing for the influence of social factors on the responses, however, Miloud et al. (2012) consider the range from 0.6 to 0.79 as a strong but not perfect positive correlation for an experiment of this nature. Each test produces a p value lower than the  $\alpha$  set of 0.01. Because of this, we can with high certainty reject the null hypothesis. We therefore state that as per the alternative hypothesis, a positive, linear correlation exists between the degree of technological innovation in a product or service and the VC's willingness to invest in that product or service.

This result does not suggest causation of one factor by the other, but shows the nature of the relationship between them. Tyebjee and Bruno (1984) as well as Miloud et al. (2012) proposed that more innovative products and services were more likely to receive venture capital funding, and this result agrees with this early literature.

The research component asking survey respondents directly if they agreed with the hypothesis created further affirmation that the relationship does exist. The average response of 2.33/4, an overall level of agreement, shows the overall sentiment was that more innovative products and services are more likely to get investment funding.

Interview data collected, however, was not as clear cut, with some SMEs agreeing and some disagreeing that the relationship is clearly evident. The qualitative research was found to suggest two themes. The first was that other factors such as risk appetite and personality types of the involved parties are more important during the investment decision than product innovativeness. This echoes sentiment from previous studies that multiple factors affect the investment decision (Sayed, 2010; Altena, 2013; Riding et al., 2012).

The second notable feature from the interview data collected was that the corporate VC interviewees articulated a preference for incremental innovation during their investment decision, while the non-corporate VC SMEs showed a preference for radical. The sample size for this this was vastly insufficient to conclude any difference, but influences from the corporate environment and the non-corporate environment may potentially have an altering effect on risk appetite, which may have a knock-on effect on the product innovativeness preference (Sayed, 2010). Alternatively, the isolation of extreme radical, and extreme incremental innovations as the likely most successful innovation-types agrees with the theory provided by Kleinschmidt and Cooper (1995), suggesting a U-shaped relationship between the factors. This theory suggests the value add from low cost on the incremental

end, while the competitive edge from radical innovation creates greater results than the mid-level innovation types.

The two themes from the qualitative interviews: influence of other factors besides innovation, and the opinions that both incremental and radical innovation may be successful, may explain why the product innovativeness and willingness to invest were not more closely correlated (did not produce a higher Pearson correlation coefficient) is the quantitative test.

While these new ideas introduced from the qualitative component, and subject matter experts' mixed responses, provide new and interesting ideas for further study, the overall finding for this hypothesis was that the positive linear relationship does exist and more innovative products and services are more likely to receive investment funding than less innovative equivalents.

### **6.3 Hypothesis 2: Relationship between the degree of technological innovation and perceived overall valuation**

Hypothesis 2 was also tested across each of the five innovations to establish Pearson correlation coefficients between the perceived level of product innovativeness and the perceived likelihood of achieving commercial success. Perceived likelihood of achieving commercial success is used as a proxy for the overall perceived valuation (Kleinschmidt and Cooper, 1995; Van de Vrande et al. 2009). The results showed a positive correlation with Pearson correlation coefficients ranging between 0.6 and 0.72. Again, this is considered a strong but not perfect correlation (Miloud et al., 2012). In each case the p value produced was lower than the  $\alpha$  set of 0.01. This means we can with high certainty reject the null hypothesis and state that as per the alternative hypothesis, a positive, linear correlation

exists between the degree of technological innovation in a product or service and the VC's perceived valuation of the venture providing that product or service.

When asked directly about whether this relationship exists, however, respondents to the survey gave an average scale response of 1.91, showing an overall level of disagreement that more innovative products and services were more likely to gain commercial success. This is reinforced by the fact that nearly 10% more of the respondents showed some level of disagreement, than those that showed agreement. It was not clear whether the respondents felt a U-shaped relationship, as described by Cooper and Kleinschmidt (1995), or an inverse linear relationship or any other type was thought to exist by these respondents. It is notable that the average score for this component indicated that respondents did not believe this relationship existed, while the same respondents under experimental conditions produced data indicating it is very likely the relationship does in fact exist. This could be caused by the perceived information asymmetry under the experimental conditions, which VCs are known to prefer when assessing the value of prospective investments (Chen et al., 2009.) It is also interesting to note the overall level of disagreement with this statement, while in hypothesis 1 there was an overall level of agreement shown to innovativeness being associated with likelihood of funding. The net effect of this was that respondents indicated a high level of innovation would be related to higher chance of receiving investment funding, but not achieving commercial success.

Overall the interview data collected showed mixed results, with half the SMEs disagreeing directly with the result of the quantitative test, although one other respondent did agree that the positive linear relationship was likely. The two SMEs who believed incremental, not radical, innovation was more likely to be commercialised had opinions aligned to the resource fit concept of innovation described by Chen et al. (2009), Metrick and Yasuda (2011) and Miloud et al. (2012). The concept describes innovations that align closely to the resources the firm already has in place, as incremental innovation. These are likely to be

more successful as the competencies required to implement are already in existence (Chen et al., 2009).

One opinion the qualitative data did surface consistently from all interviewees was that the innovativeness of a product or service was not the most important determining factor in the product achieving commercial success, and that many factors cause a great variation in achieving commercial success with a product or service. This agreed to the literature mentioning significant variation in commercial success criteria (Tulloch, 2010). This may account for the large range experienced in the results for each of the research parameters used.

It is notable that the quantitative test and qualitative data collected do not agree. A possible explanation for this is that the influences of other factors outweigh the product innovativeness effects. This would mean although overall higher product innovativeness can be associated with higher likelihood of achieving commercial success; the noise introduced by other effects can lower the strength of the correlation, and should be investigated further. This is also visible in the large distribution of both variable scores for each innovation, as the effects of other factors may lead to the very different perceptions for the same innovation.

Overall the mixed response to this research question from the qualitative component does not detract from the firm result from the quantitative component. This adds weight to those studies which do show innovation in start-up ventures' products and service as positively relating to an increased likelihood of gaining investment funding, though additional items were uncovered for further investigation. These are described in greater detail in chapter 7.

#### **6.4 Research question 3: What attributes of these products and services are considered most important during investment selection?**

The third research question was intended to uncover aspects of products and services that VCs consider to be most important when assessing a start-up venture as a possible investment target. This was done using qualitative techniques to uncover different attributes, as well as a quantitative ranking of known aspects discussed in existing studies.

The ranking provided a clear indication that the degree to which the product or service is speaking to a customer need is considered the most important aspect of the features discussed by Berglund (2011). This result was emphasised by the large margin (53% of first place rankings) by which this aspect was considered the most important. Another reinforcing factor was that the second most important aspect (on aggregate) was considered to be the ease with which customers relate to a product or service, which is also considered a “customer fit” factor (Berglund, 2011). This means customer fit was strongly indicated as the most important aspect by survey respondents. This reinforces the customer-oriented nature of investors when performing an investment decision, described by Miloud et al. (2012).

Relevant to the overall theme of this research, newness of products and services, an innovation factor was considered second from least important of the five factors on aggregate, although it received highest priority by the second most respondents. This shows respondents overall did not prioritise these factors, but of those that did many considered it of particular importance. This may reflect the work by Ghosh and Nanda, (2010) that VCs searching for extremely large returns may search for radical innovation. This may also have been evident in the open question responses discussed below where many survey respondents discussed the product or service newness as a key area for consideration. The low ranking of newness by respondents emphasises the opinions

discussed above stating newness is a secondary factor in determining venture capital decision-making, behind many other factors.

Apart from the Berglund's (2011) five features, respondents to the survey provided many additional considerations through the open-ended format questions. The responses emphasised that the effects of the aspects of a venture's products and services are not practically considered in isolation of the business context of the product and service. Survey respondents surfaced prime areas for consideration as market demand, business model design, supply chain, political controversy and regulatory and legislative environments, all of which prioritise the impact of aspects external to the products themselves. Combining this with qualitative data from hypothesis 1 and 2, we see that product and non-product related aspects must be considered equally to better understand the VC investment decision.

It is notable that aspects such as technical aspects of the product, reliability, quality and design align strongly to the resource based view of the firm (Metrick and Yasuda, 2011), where respondents believed the competencies of the start-up and the fit to the consumer were the keys factors to consider. Another theme complementing this was the frequent mention of factors such as legislative, political, competitive forces and market demand, which strongly resonate with network theory (Metrick and Yasuda, 2011; Ferrary and Granovetter, 2009; Gulati and Higgins, 2003), and the relationships of the start-up firm determining its success.

Network theory was again described as a key factor in the interview data collected, with SMEs repeatedly confirming that innovation without the relationships, support, market contacts and environmental awareness is not favoured during the investment decision.

In addition to network theory, the SMEs' overall insight was that the investment decision is hugely complex, with a great deal of factors for consideration, spanning a great deal of

subject matters. All interviewees were in agreement that the levels of innovation present in a venture's products or services were a factor, but the significance was not greater than many other considerations. The weighting of these considerations is largely dependent on the environment and circumstance of a particular situation, and are difficult to generalise. Further detailed study is required for each of these factors.

## **6.5 Conclusion**

The findings for of the research therefore reject the null hypothesis for hypothesis 1 and 2 and establish with high certainty that a positive linear relationship does exist between the level of innovation in a venture's products and services and the likelihood of that venture receiving funding, as well as between the level of innovation in a venture's products and services and the perceived valuation of that venture. The research also surfaced a large number of factors VCs consider during the investment decision, and is able to rank five of them in response to research question 3. The research also produces a strong opinion across all research questions that multiple factors besides innovation levels have significant value driving effects that may outweigh the overall effect of product innovativeness.

## **CHAPTER 7: CONCLUSION AND RECOMMENDATIONS**

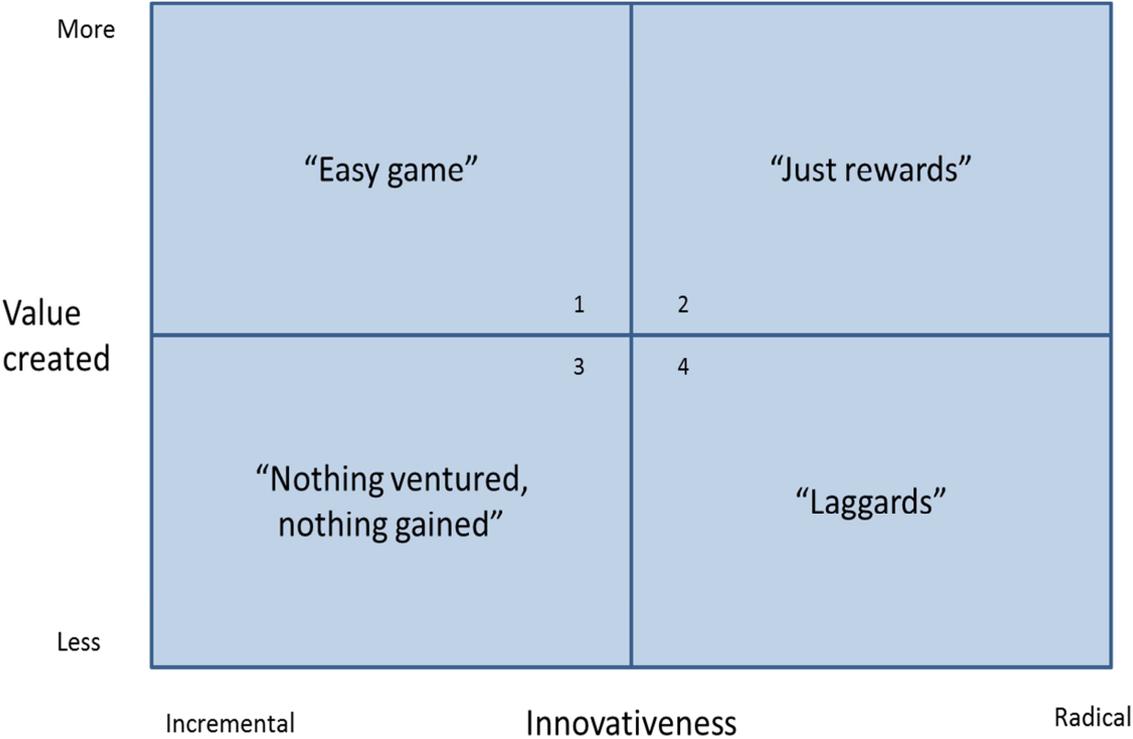
### **7.1 Conclusions**

The purpose of this research was to investigate the breadth of aspects of innovation and the relationship between a specific aspect, product innovativeness, and value creation in venture capital. The research found high levels of innovation in products and services to be positively and linearly correlated with the likelihood of receiving venture capital funding and the perceived value of the venture providing those products and services. The research also found however, that both incremental and radical innovation were considered to be value creation under certain conditions, and that many other factors besides level of innovativeness are considered by venture capital fund managers and subject matter experts to be value creating.

Factors such as customer fit, and quality were quantitatively shown to be considered more important by venture capital investors, than innovativeness, while many factors including costs, market demand, business model concerns, political, regulatory and legislative concerns, supply chain issues, innovator relationship network and technical issues were all considered in addition to innovativeness.

Taking all of this information into account, this report acknowledges that while a positive linear correlation between the above factors has been proven to exist, value creating innovation can occur as both incremental and radical innovation. Following from this, the overall relationship between innovativeness and value creation in venture capital could be viewed as a matrix described in figure 19 below, rather than solely as a linear relationship.

Figure 19: A matrix proposed for understanding value creation and innovativeness in venture capital



In the above diagram, the products and services offered by start-up ventures can be visualised in one of the four quadrants. The research has revealed that although more value creating innovations are often correlated to more radical innovation, the qualitative research suggests both incremental (quadrant 1) and radical innovation (quadrant 2) is considered to be value creating and therefore desirable. The risk theory discussed in this research indicates that innovation that is very incremental, and therefore low risk, but still high value creating would be the most desirable, but the relationship proven to exist indicates this would be very uncommon. Investors with lower risk appetite are more likely to fund innovations in quadrant 3, where lower innovativeness results in lower return. Radical innovation could be found to create high value and reward the higher risk profile; however, radical innovation that created low return would be considered very undesirable.

This model explains the array of innovation found in this research, but would require additional testing to confirm its validity.

## **7.2 Recommendations**

The research has implications for innovators in need of funding. The research suggests radical innovation correlates to the innovation most likely to receive venture capital investment; however innovators would be best served to consider the complete list of factors identified in the qualitative component of this research when considering their approach.

Implications are also identified for national policymakers. Public and private funding looking to promote the secondary goals of national competitiveness, economic growth and employment creation would be best rewarded through pursuit of radical innovation, and consideration of the factors surfaced in this report.

## **7.3 Future research**

The research followed a descriptive approach and detailed relationships that exist between certain factors, without suggesting causation. A useful extension to this research would be to use the established relationships and perform explanatory research to attempt to discover the existence of causation between the factors.

In conjunction with this, the inclusion of the additional explanatory variables surfaced as part of research question 3, and the use of regression analysis could greatly extend the understanding of the relationships between these factors. Understanding the extent to which manipulating certain factors affects the value add in the venture capital domain would also be practically useful for innovators and policymakers.

The qualitative study conducted could also be extended. The many factors identified in research question 3 require additional exploratory understanding, and larger samples from more diverse venture capital environments would greatly strengthen this understanding.

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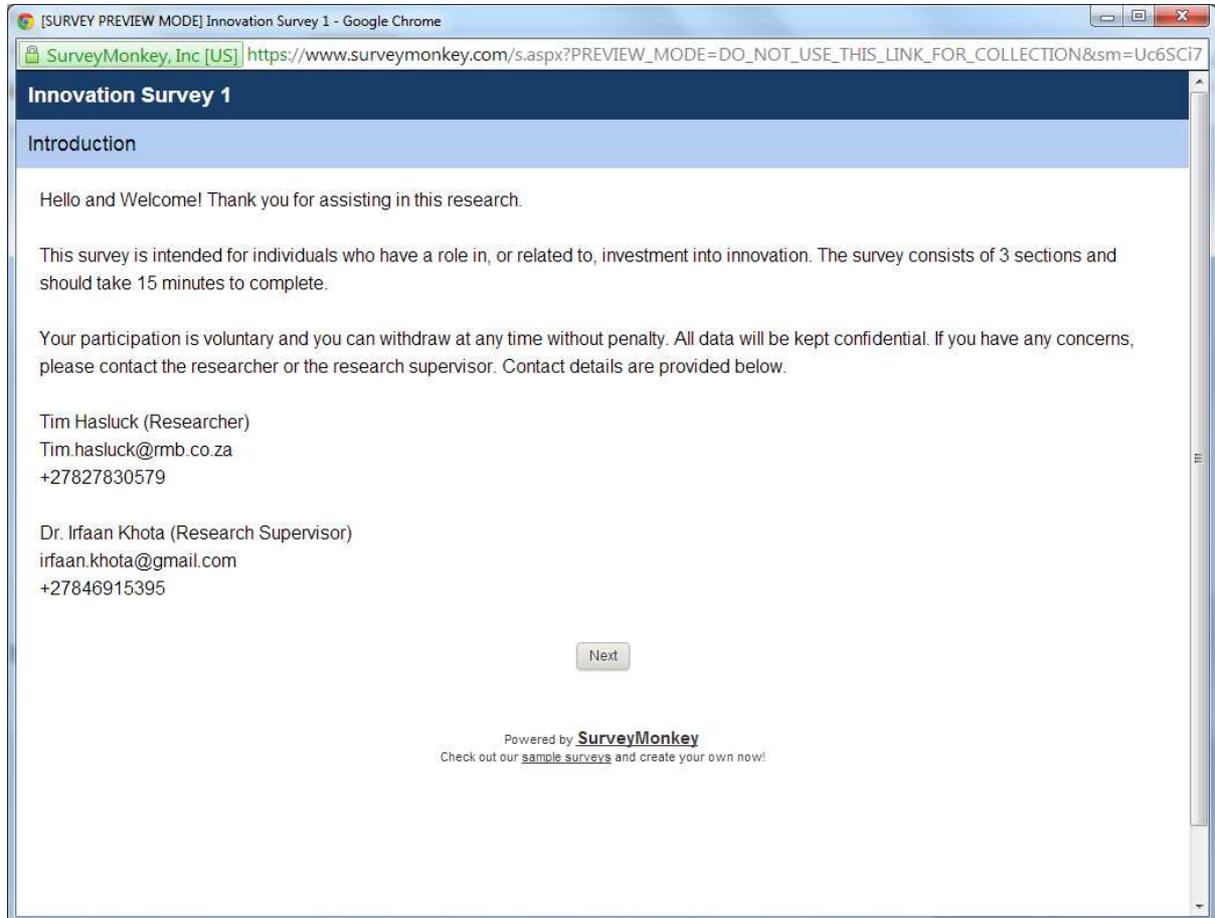
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## APPENDIX A – Data collection instrument – VC survey



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### Innovation Survey 1

#### Section 1

SECTION 1

This section has FOUR questions in total. Please take time to give the best answer to each question.

**\* 1. In my role, the ability to which I can influence monetary investment in innovation (such as technology, system, process improvement etc.) is best described as: (Choose the best option)**

Direct influence  
 Limited direct influence  
 Indirectly influence  
 No influence

**\* 2. My role or organisation is best described as:**

Public enterprise  
 Private enterprise  
 Other (please specify)

**\* 3. Please select the most appropriate answer to the following:**

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Vastly new products and innovations (i.e. radical innovation) is more likely to gain investment funding than incremental products and innovations.	<input type="radio"/>				
Vastly new (radical) innovations become commercial successes more often than incremental innovations.	<input type="radio"/>				

**\* 4. Please rank the following in order of what you perceive to be most important in a new product or innovation for it to achieve the required financial performance (1 being the most important):**

Easy for Consumers to relate to  
 New features  
 Low cost  
 Quality  
 Speaks to a customer need

Prev Next

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### Innovation Survey 1

Section 2 part 1

SECTION 2

In this section, please look at each of the innovations or products presented and then answer the questions related to it. There are 5 innovations listed. For each question, mark the appropriate block. The final question for each innovation requires a response in the form of comments.

**\* 5. Innovation A – Web Text Simplification**

This innovation uses a patented technology to automatically simplify any web text, enabling people of different reading levels to communicate or understand web information more easily. The tool can be used on PCs or mobile devices.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The product described above included innovative product features.	<input type="radio"/>				
High-quality technological innovations were embedded in the above product.	<input type="radio"/>				
The above product offers unique features/attributes/benefits to customers.	<input type="radio"/>				
In terms of technology, the above product was substantially more innovative compared to existing products widely available in the current market.	<input type="radio"/>				
The above product was only a minor product improvement/modification over existing products widely available in the market.	<input type="radio"/>				
I believe this product or innovation is likely to become a commercial success.	<input type="radio"/>				
I would invest in this product/innovation.	<input type="radio"/>				

**\* 6. Please state any major reservations you could have about influencing an investment consideration into the product mentioned in Qu 5 and what additional information would help mitigate this concern.**

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### Innovation Survey 1

#### Section 2 part 2

SECTION 2 - CONTINUED

In this section, please look at each of the innovations or products presented and then answer the questions related to it. There are 5 innovations listed. For each question, mark the appropriate block. The final question for each innovation requires a response in the form of comments.

**\*7. Innovation B – Low Energy LED Lighting**

This innovation is a wide range of drop-proof, low heat emitting LED lighting solutions designed for low power environments such as solar, making them useful in rural areas or informal settlements.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The product described above included innovative product features.	<input type="radio"/>				
High-quality technological innovations were embedded in the above product.	<input type="radio"/>				
The above product offers unique features/attributes/benefits to customers.	<input type="radio"/>				
In terms of technology, the above product was substantially more innovative compared to existing products widely available in the current market.	<input type="radio"/>				
The above product was only a minor product improvement/modification over existing products widely available in the market.	<input type="radio"/>				
I believe this product or innovation is likely to become a commercial success.	<input type="radio"/>				
I would invest in this product/innovation.	<input type="radio"/>				

**\*8. Please state any major reservations you could have about influencing an investment consideration into the product mentioned in Qu 7 and what additional information would help mitigate this concern.**

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### Innovation Survey 1

#### Section 2 part 3

SECTION 2 - CONTINUED

In this section, please look at each of the innovations or products presented and then answer the questions related to it. There are 5 innovations listed. For each question, mark the appropriate block. The final question for each innovation requires a response in the form of comments.

**\*9. Innovation C – Landfill Waste to Bioethanol**

**This innovation is a commercial cellulosic bio-ethanol plant which utilises acid mine drainage waste, soft agricultural waste and landfill mass as input to generate ethanol as an output for the medical, fuel, and cosmetics sectors**

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The product described above included innovative product features.	<input type="radio"/>				
High-quality technological innovations were embedded in the above product.	<input type="radio"/>				
The above product offers unique features/attributes/benefits to customers.	<input type="radio"/>				
In terms of technology, the above product was substantially more innovative compared to existing products widely available in the current market.	<input type="radio"/>				
The above product was only a minor product improvement/modification over existing products widely available in the market.	<input type="radio"/>				
I believe this product or innovation is likely to become a commercial success.	<input type="radio"/>				
I would invest in this product/innovation.	<input type="radio"/>				

**\*10. Please state any major reservations you could have about influencing an investment consideration into the product mentioned in Qu 9 and what additional information would help mitigate this concern.**

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### Innovation Survey 1

Section 2 part 4

SECTION 2 - CONTINUED

In this section, please look at each of the innovations or products presented and then answer the questions related to it. There are 5 innovations listed. For each question, mark the appropriate block. The final question for each innovation requires a response in the form of comments.

**\* 11. Innovation D – Mobiguard**

**Uses location information on cellphones to reduce the response time for emergency services and automatically assist users to avoid and exit dangerous areas.**

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The product described above included innovative product features.	<input type="radio"/>				
High-quality technological innovations were embedded in the above product.	<input type="radio"/>				
The above product offers unique features/attributes/benefits to customers.	<input type="radio"/>				
In terms of technology, the above product was substantially more innovative compared to existing products widely available in the current market.	<input type="radio"/>				
The above product was only a minor product improvement/modification over existing products widely available in the market.	<input type="radio"/>				
I believe this product or innovation is likely to become a commercial success.	<input type="radio"/>				
I would invest in this product/innovation.	<input type="radio"/>				

**\* 12. Please state any major reservations you could have about influencing an investment consideration into the product mentioned in Qu 11 and what additional information would help mitigate this concern.**

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**Innovation Survey 1**

Section 2 part 5

SECTION 2 - CONTINUED

In this section, please look at each of the innovations or products presented and then answer the questions related to it. There are 5 innovations listed. For each question, mark the appropriate block. The final question for each innovation requires a response in the form of comments.

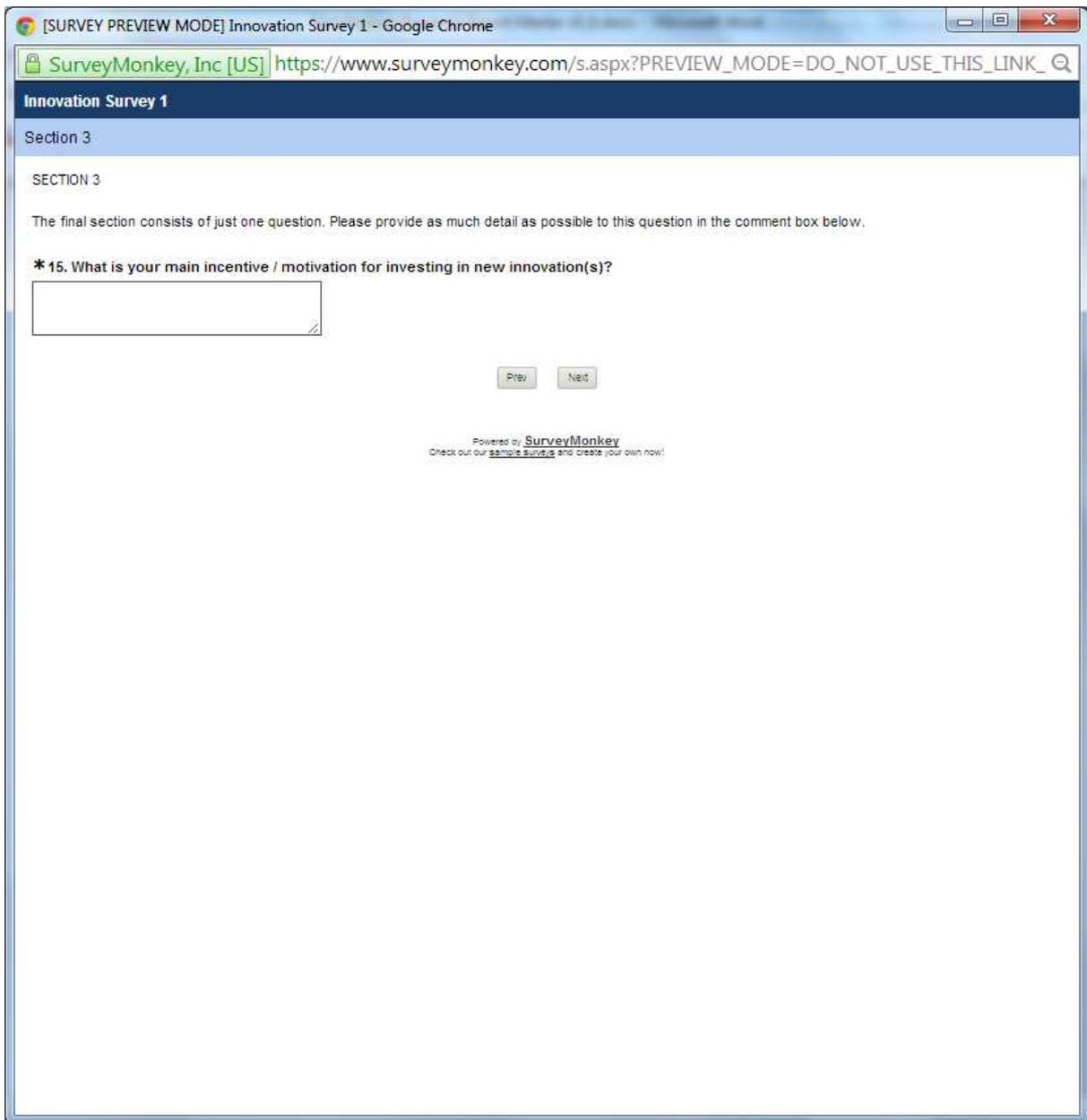
**\* 13. Innovation E - eGov Connect**

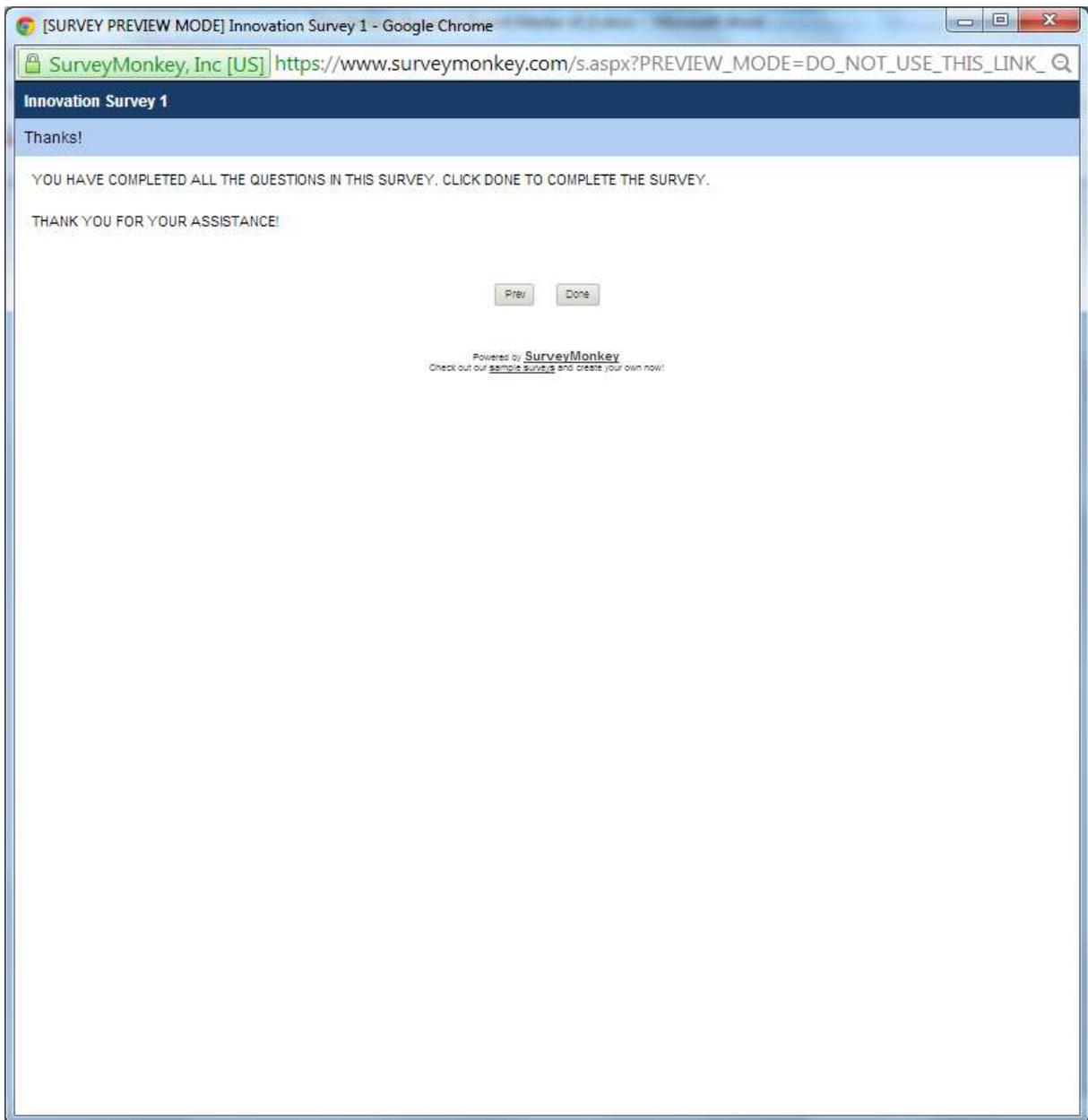
**Pulls citizen-government communication, fault reporting and social media into a unified user experience, enabling easy interaction with public officials.**

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The product described above included innovative product features.	<input type="radio"/>				
High-quality technological innovations were embedded in the above product.	<input type="radio"/>				
The above product offers unique features/attributes/benefits to customers.	<input type="radio"/>				
In terms of technology, the above product was substantially more innovative compared to existing products widely available in the current market.	<input type="radio"/>				
The above product was only a minor product improvement/modification over existing products widely available in the market.	<input type="radio"/>				
I believe this product or innovation is likely to become a commercial success.	<input type="radio"/>				
I would invest in this product/innovation.	<input type="radio"/>				

**\* 14. Please state any major reservations you could have about influencing an investment consideration into the product mentioned in Qu 13 and what additional information would help mitigate this concern.**

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## APPENDIX B – Interview consent forms

### Proposed Letter of Consent – Technology Transfer Officers

I am conducting research on Innovation as a value creation driver in venture capital. I am trying to find out the level of innovation Research Institutions technology offices find desirable when attempting to commercialize ventures. This interview is expected to take between 30 minutes and an hour to complete. **Your participation is voluntary and you can withdraw at any time without penalty.** All data will be kept confidential. If you have any concerns, please contact me or my supervisor. Our details are provided below.

Tim Hasluck

Dr. Irfaan Khota

Tim.hasluck@rmb.co.za

irfaan.khota@gmail.com

+27827830579

+27846915395

Signature of participant: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of researcher: \_\_\_\_\_

Date: \_\_\_\_\_

## Proposed Letter of Consent – Corporate Innovation Programme Heads

I am conducting research on Innovation as a value creation driver in venture capital. I am trying to find out the level of Innovation Corporate Innovation Programmes find desirable when attempting to commercialize ventures. This interview is expected to take between 30 minutes and an hour to complete. **Your participation is voluntary and you can withdraw at any time without penalty.** All data will be kept confidential. If you have any concerns, please contact me or my supervisor. Our details are provided below.

Tim Hasluck

Dr. Irfaan Khota

Tim.hasluck@rmb.co.za

irfaan.khota@gmail.com

+27827830579

+27846915395

Signature of participant: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of researcher: \_\_\_\_\_

Date: \_\_\_\_\_