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Building innovation capabilities in South African organisations

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by

TJ Baloyi

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SUPERVISOR: Dr L Erasmus

CO-SUPERVISOR: Prof JHC Pretorius
1 ABSTRACT

South Africa is currently faced with many social and the economic challenges. Innovation is commonly cited as the solution to these challenges. To improve the economy and quality of life in South Africa, South African organisations need to build innovation capability to be able to compete in the global market. The purpose of this study is to compare the collaboration characteristics of the innovative and non-innovative organisations with the effort of finding a solution on how South African organisations can build innovation capabilities in their organisations. The policymakers, practitioners and scholars that need to implement interventions to the challenges of building innovation capability at the organisational level will find this study useful. This study provides the needed evidence on the relationship between innovation capability and the three characteristics of inter-organisational collaboration.

A total of 16 cases were selected and partitioned into two groups, where one group represented the innovative organisations and the other group represented non-innovative organisations. The Boston Consulting Group (BCG) 2016 report of the 50 most innovative companies in the world was used to identify the innovative organisations.

Three measuring instruments were used for this research and were set up to compare the alliance portfolio size, alliance portfolio diversity and alliance management capability of innovative and non-innovative organisations. An independent sample t-test was selected as a statistical technique to analyze the data.

The findings show that there is sufficient evidence to support that innovative organisation has both high alliance portfolio size and high level of portfolio diversity. However, there was no sufficient evidence to support that innovative organisations have a high level of alliance management capability.
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ABBREVIATION

BCG – Boston Consulting Group
BRICS – Brazil, Russia, India, China and South Africa
EU – European Union
GDP – Gross domestic product
GII – Global Innovation Index
HDI – Human Development Index
NSI – National System of Innovation
SACU – Southern African Customs Union
SADC – Southern African Development Community
SIC – Standard Industry Classification
UNDP – United Nations Development Program
VIF – Variance Inflation Factor
EFTA – European Free Trade Association
NACI – National Advisory Council on Innovation
TIA – Technology Innovation Agency
GII – Global Innovation Index
R&D – Research and Development
VRIN – Valuable, Rare, Inimitable and Non-substitutable
SPSS – Statistical Package for Social Sciences
CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

South Africa has entered into a Free Trade Agreement with some nations; the list includes countries belonging to the Southern African Customs Union, European Union, Southern African Development Community and the European Free Trade Association [1]. Free trade is an agreement between two nations or a group of nations known as a trade bloc; this policy allows partnered nations to trade freely amongst themselves without barriers such as heavy tariffs that would normally be imposed on imported goods and service [2].

Free trade comes with some benefits such as improving the economies of scale, increasing exports, providing consumers with a wider range of goods and lowering the prices for consumers [2]. However, as much as the benefits are evident, free trade also comes with several challenges such as increasing competition for the domestic companies, increasing economic dependence, jobs outsourcing to foreign nations and exploitation of less developed countries [3].

Free trade is more likely to result in uneven distribution of benefits amongst the nations in the free trade agreement, some nations can benefit by exploiting other nations [2]. Thus, nations involved in the free trade agreement needs to be competitive to leverage and gain some share of the market [3]. As indicated above, South Africa is trading with some of the most developed nations, and for this reason, South Africa need a competitive advantage to compete in the global market.

Phan [3] cite innovation as a solution to the challenges posed by free trade. Innovation can be applied as a strategy to enter a new market, increase market share and gain a competitive advantage [3]. The positive impact of innovation can be linked to the nation’s economic growth, performance and sustainability of the domestic organisation and the establishment of new industries which can result in the creation of new employment. The impact of innovation filters down to the improvement of the economy and the standard of living [4].

According to Manzini [4], there is a link between innovation, economic growth and quality of life. The current state of innovation, economy and quality of life in South Africa are explored in section 1.1.1.
1.1.1 State of South African Innovation

The importance of innovation in South Africa is indisputable, it is evident in a number of government initiatives such as the Ten-Year innovation plan [4], the establishment of government and non-government organisation such as the National Advisory Council on Innovation (NACI) [1], the Technology Innovation Agency (TIA), South Africa Innovation Summit and Innovate South Africa. Despite all the effort from these organisations to promote innovation in South Africa, the country’s innovativeness, economic growth and quality of life remain low.

The Global Innovation Index (GII) Report 2017 [5] ranks South Africa at the 57\textsuperscript{th} position out of 127 countries in the world. According to the GII Report, the top 5 innovative countries in the world are Switzerland, Sweden, Netherlands, United Kingdom and United States. The graph in figure 1, figure 2 and figure 3 benchmarks South Africa’s innovativeness and quality of life against the BRICS countries (Brazil, Russia, India, China and South Africa) and the top 5 innovative countries. Figure 1 shows that there is a correlation between innovation and quality of life as indicated by the top innovative countries having a high ranking on Human Development Index (HDI).

![HDI Ranking vs. GII Ranking](image)

Figure 1: Global Innovation Index vs Human Development Index.

Data from [5] and [6]
The National Advisory Council on Innovation (NACI) [1] uses various indicators to monitor the innovation capacity and performance in South Africa. The indicators monitored includes expenditure on Research and Development (R&D), the number of scientific publication, the number of South African patents registered and the performance of the exported goods. When compared with other countries, South Africa is showing a positive result on some scientific publication and number of patents registered. However, South Africa is still lagging on R&D expenditure and export performance. Figure 2 shows South Africa’s performance on the export of high-technology compared with BRICS countries and the top 5 innovative countries. South Africa is the lowest.

![Figure 2: South Africa High-Technology Export Performance Benchmark against BRICS Countries and Top Innovative Countries.](image)

*Data from United Nations Development Program*

### 1.1.2 State of South African Economy

The importance of innovation on the sustainment of a nation’s economic growth is mostly cited in both innovation and economics studies [7] [8] [9]. Innovation is linked to the creation of new businesses and new industries which lead to the creation of employment. Innovation is also linked to the competitiveness of existing enterprises which allows domestic enterprises to compete in the global market and contribute to the nation’s economy [9].
Even though South Africa is classified as an upper middle-income country [6], the level of poverty and unemployment rate in South Africa is very high. According to the General Household Survey [10] published by Statistics South Africa, the number of South Africans depending on the social grant has more than doubled in the last 12 years (2003 to 2015) from 12.7% to 30.1%. The report also indicates that 46.7% of the South African household depends on the social grant as a source of income. A high percentage of an unemployment rate of 26.5% is reported in the Quarterly Labour Force Survey report [11], also published by Statistics South Africa for the last quarter of 2016. This high number of people depending on government social grant is alarming, according to the South African National treasury’s presentation [4] on the long-term fiscal study, the South African economy needs to grow by 3% annually in order to sustain the current level of government spending, but for the past 3 years the gross domestic product (GDP) has only increased at an average rate of 1.1%. Innovation is needed in South Africa to stimulate a sustainable economic growth and enable the competitiveness of domestic enterprises in the global market, which will filter down to the creation of employment and the alleviation of poverty in the country.

1.1.3 State of South Africans quality of life

Innovation and economic growth are also linked to the quality of life. Human development index (HDI) is the most accepted measure of the quality of life [1] [4]. HDI is an annual report published by the United Nations Development Program (UNDP) and ranks countries based on human achievements. HDI calculation considers health (life expectancy at birth), education (mean years of schooling and expected years of schooling) and the living standard (Gross National Income per capita) [6]. Based on the Human development report 2016 [6], South Africa is placed at 119th out of 188 countries ranked in the report. Figure 3 compares South Africa’s Human development index to other BRICS countries as well as the top 5 innovative countries in the world. South Africa’s HDI ranking is very low and is the second lowest rank when compared to the other BRICS countries. Innovation is needed in South Africa to stimulate economic growth, alleviate poverty and improve the living standard of all South Africans.
1.1.4 Conclusion

There is a strong association between the country’s economy, quality of life and innovation. Innovation can be the solution to the challenges in South Africa. There is a need for South African organisations to build innovation capability to be able to compete in the global market.

1.2 Research Objectives

The positive relationship between economic growth, quality of life and innovation is acknowledged by the scholars [7] [8] [9]. As indicated above, countries known to be the top innovators have an excellent economy and high quality of life. The state of economy and quality of life in South Africa is not pleasing. Furthermore, South Africa is lagging in high – technology export when compared with other BRICS member countries. There is a need to build innovation capabilities in South African organisations to be able to compete in the global market, stimulate the economic growth and improve the quality of life for all South Africans.
1.2.1 Research Question

Chapter one has indicated the state of economy and quality of life in South Africa. Scholars have suggested that there is a positive relationship between the country’s innovativeness, country’s economic growth and quality of life [7] [8] [9]. Furthermore, the literature review in chapter two (section 2.2) indicates that it is importance for organisations to build innovation capability before they can become innovative [12] [13] [14]. The combination of these two theories lead the research to the main research question:

1. “How can South African organisations build innovation capability?”

A systematic literature review by Marisa et al [15] indicates that there are several factors that can influence the organisational ability to develop innovation capability. The factors include variables such as organisational culture; organisational structure; knowledge management; management style and leadership; and inter-organisational collaboration. A literature review in chapter 2 reveals the lack of decisive conclusion on the relationship between innovation capability and inter-organisational collaboration. While some scholars found the positive relationship [16] [17] [18] [19], some scholars suggest that the relationship is negative [16] [15] [20]. The current research was narrowed down to understand the effect that inter-organisational collaboration has on the organisational innovative capability to understand the discrepancies found in the literature review. The three characteristics of inter-organisational collaboration (alliance portfolio size, alliance portfolio diversity and alliance management capability) were investigated to answer the following three sub-research questions:

1.1. “Is there a difference between the alliance portfolio size of innovative and non-innovative organisation?”

1.2. “Is there a difference between the alliance portfolio diversity level of innovative and non-innovative organisation?”

1.3. “Is there a difference between the alliance management capability level of innovative and non-innovative organisation?”

1.2.2 Research Aim

The current research aims to contribute to the solution of building innovation capabilities in South African organisations. Several scholars have studied the antecedents of innovation capability in the organisations and found different factors that influence organisations ability to develop innovation capabilities, some of the antecedents include factors such as
organisation; organisational structure; knowledge management; management style and leadership; and inter-organisational collaboration [15]. Although it has been acknowledged that innovation capability does not depend on a single factor [15], the current research will only focus on the relationship between inter-organisational collaboration and innovation capability. More particularly, the current research aims to find out whether the three-collaboration characteristic of the innovative and non-innovative organisations have a significant difference. The links to the other factors will not form part of the research scope.

1.2.3 **Significance of research**

Although the importance of innovation is well-known, innovation studies in the context of South Africa are limited. More research work is needed in South Africa to promote innovation in the organisations. This research contributes to the innovation capability building body of knowledge in the context of South Africa. Different researchers commonly cite Inter-organisational collaboration as one of the determinants of innovation capabilities [15] [21] [22]; the current research contributes to the innovation collaborating theory by testing the relationship between inter-organisational collaboration and innovation capability. The findings of the current research will provide some sight to business leaders and policymakers willing to incorporate inter-organisational collaboration in their strategy to build innovation capability in their organisations.
CHAPTER 2: LITERATURE REVIEW

INTRODUCTION

The purpose of this chapter is to understand the context in which the problem for the current research existing. The drawing on Figure 4 was used as a map to guide the literature review.

Figure 4: Literature Review Map

2.1 INNOVATION RESEARCH IN THE CONTEXT OF SOUTH AFRICA

Below the innovation studies in the context of South Africa are reviewed to get an overview of issues addressed in the past and issues that are ongoing. Although the importance of innovation in South Africa is well-recognised, only few research papers addressing the innovation issues in South Africa could be found. A simple search on Sabnet SA ePublication database with the keywords “Innovation” and “South Africa”, resulted in the research papers below.
The most common theme of research in the topic of innovation in South Africa is the National System of Innovation (NSI). For example, Manzini [4] argues that prior research on the NSI is not adequate due to three reasons: (1) it only focuses on technological innovation; (2) it only focuses on measuring inputs rather than outputs; and (3) it does not conduct analysis on the regional or sectoral level. Manzini proposes new metrics to measure innovation activities in South Africa at the national level. Rooks and Oelemans [23] also studied the innovation in South Africa at the national level and found that innovation in South Africa is hindered by the inefficiency of the functioning institutions. In addition to the studies at the national level, Perrot et al [24] contributed to South African innovation studies by analysing the impact of government R&D on the South African macroeconomy, where they found out that the gain of economic value does not depend on the expenditure, but rather on the result achieved, measured in the well-being of the society, economic growth and development.

The other lot of South African innovation studies focus on the various issue. For example, Rooks et al [23] studied the innovation behaviour of South African companies by comparing them to the European companies and found out that innovation output of South African companies is comparable to those of European companies, but they found South African companies to be spending less on innovation activities than those in Europe. The drawback about this research is that it is unclear which variables were used to measure the innovation performance of the benchmarked companies. Bara et al [7] found a positive relationship between innovation and economic growth in the Southern African Development Community (SADC). Lamperti [25] studied the innovation continuity and knowledge flow in Africa and found a positive flow of knowledge from the developed countries, which supports the continuity of innovation in Africa.

The other types of innovation studies in South Africa are product specific, for example, Ismail and Masigae [26] studied the innovation of mobile banking, and Brigid et al. [27] studied Grassroots innovation.

As it is indicated in the background section, there is a need to promote and build innovation capabilities in the South African organisation to improve the economic state and the well-being of the society. However, a clear majority of innovation scholars in South Africa focus on innovation at the national level and neglects innovation at the organisational level. There is a need to understand the nature of innovation on the organisational level to build the innovation capabilities of the South African organisations.
2.2 UNDERSTANDING INNOVATION

2.2.1 What is innovation?

Innovation is the driver for business sustainability, competitiveness and growth. Joseph Schumpeter is commonly cited as a pioneer in the studies of innovation [28] [29] [17].

The definition of innovation concept is not consistent amongst the scholars. The discrepancy is commonly found in the variables used in the definition. For example, (a) it is not clear how creativity relates to innovation, (b) it is not clear how new a product/service need to be in order to be recognised as being innovative, (c) the is no consensus on the classification of the different types of innovation, and (d) the use of the terms radical and incremental innovation is not consistent. The drawing in Figure 5 visualises the discrepancy surrounding the definition of innovation found in the literature.

Figure 5: Discrepancies in the definition of Innovation
How new does something have to be to be recognised as innovation? Baregheh et al [30] defines innovation as “the invention and implementation of a management practice, process, structure, or technique that is new to state of the art and is intended to further organisational goals”. This definition qualifies innovation as something that is completely new to the world. In contradiction to Baregheh et al [30] ‘s definition of the newness of innovation, some scholars qualify anything that is new to the organisation as innovation, regardless of the fact that it might have already existed elsewhere in the world [12]. Furthermore, Bay and Çil [31] points out that not everything that is new is innovative and suggest that any new creation (product or service) must demonstrate commercial value before it can be recognised as being innovative.

The current research adopts Scarbrough et al [32] and Saunila et al [12] definition for the newness, that is, a product/service is innovative if it is new to the organisation. The reason behind adopting [32] and [12] definition is because products/service does not have to be completely new to the world to add value.

Innovation is commonly defined in relation to creativity [33] [30] [34]. Several scholars describe creativity as the initial stage where novel ideas are generated and innovation as the second stage where generated ideas are implemented [33] [30] [34]. This understanding suggests that creativity and innovation are linear processes, implying that creativity has to happen before innovation can be realised. Some scholars disagree with this view, for example, Scarbrough et al [32] argues that creativity does not only occur at the initial stage but suggest that creativity is an iterative process which can occur in both stages of idea generation and idea implementation. Bay and Çil [31] support Scarbrough ‘s view and argues that innovation is a non-linear process and suggest that innovation occurs because of the interactive relationship and feedback loop between different elements. Furthermore, instead of using stages to differentiate between creativity and innovation, some scholars link creativity to the individual effort and links innovation to the team effort [35]. On the other hand of the argument, some scholars see no boundary between creativity and innovation and defines innovation as both stages of idea generation and implementation [13].

Since more researchers suggest that process between creativity and innovation is not linear, the current research studies innovation at the higher level and is not concerned about the boundary between creativity and innovation.

Another contradicting matter on the topic of innovation is the lack of consensus on the classification or categorisation of the different types of innovation. For example, Luecke [35]
describe radical and incremental innovation as the main two types of innovation, while [36] list: incremental innovation; modular innovation; architectural innovation; and radical innovation as the types of innovation. On the other hand, Popadic et al [28] suggest exploration and exploitation as the two types of innovation. Although there is no consistency on the classification of innovation, more scholars seem to have adopted the Oslo Manual classification of innovation types, which are product innovation, process innovation, organisational innovation and marketing innovation [14] [3] [12]

The use of the two terms radical and incremental innovation is not consistent amongst the scholars. Some scholars use the terms radical and incremental to refer to the newness of innovation, where radical innovation is referred to something that is completely new and incremental innovation refers to the improvement of something that exists [36]. Some scholars refer to radical and incremental innovation as the main types of innovation which add to the inconsistency in the classification of the different types of innovation [35]. In the current research, the terms radical and incremental are used to describe the degree of novelty (newness).

Since there is no consensus on the classification or categorisation of the different types of innovation, the current research does not focus on any particular type of innovation but rather studies innovation as a concept that encapsulate all types of innovation.

Baregheh et al [30] attribute the variation in the definition of innovation to the diversity in the topic of innovations studies. Innovation is a diverse field and span across multiple domains. Thus, each discipline defines innovation based on their perception. However, Baregheh et al [30] warns that the variation on the definition undermines common understanding of innovation.

2.2.2 What is innovation capability?

According to Saunila and Ukko [12], organisations must develop their innovation capabilities before they can be innovative. Saunila and Ukko find organisations devoted to building innovation capabilities having a better chance to succeed in the future. Several scholars have confirmed the positive relationship between innovation capability and organisational performance.

The definition of innovation capability is common amongst the scholars. Lawson and Samson [14] define innovation capability as the organisational sustainable ability to convert knowledge
and ideas into new valuable processes and products. Saunila and Ukko [12] define innovation capability as factors influencing organisational ability to manage innovation. Saunila and Ukko [12] defines innovation capability as the organisational ability to exploit its intangible properties to develop new products. Drawing from the above definitions, innovation capability can simply be defined as the organisational potential to be innovative.

Saunila and Ukko [12] categorise factors influencing organisational capability into leadership and decision-making processes; organisational structures and communication; collaboration and external links; organisational culture and climate; and individual creativity and the know-how. The current research will focus on collaboration and external links as the determinant of innovation capability, the rest of the factors will not form part of the current research scope.

2.2.3 Measuring Innovation Capability

It is commonly accepted that innovation does not occur due to luck, but rather occurs due to dedicated management. It is also commonly argued that you cannot manage what you cannot measure. Phat [3] points out that the ability to measure innovation can help organisations understand their capabilities and identifies areas that need improvement. Saunila and Ukko concur with Phat but points out at the difficulties of measuring innovation capability and attributes this challenge to the intangible nature of innovation capability.

There are two streams of research on the measurement of innovation capability, one stream focuses on the inputs and the other stream focuses on the outputs. Input measures use indicators such as the expenditure on R&D and education to measure the innovativeness of an organisation [12]. Input measures are commonly criticised for three drawbacks. First, input measures only show what is invested, but does not show the return on that investment; secondly, input measures do not account for small innovation; and thirdly input measures disadvantage small organisations since they do not have funds to invest in R&D [12]. Gotsch and Hipp [13] concur with this view and argues that the use of monetary input as an indicator for innovation is misleading since technological change does not only depend on the R&D. The use of R&D to measure innovation performance creates an impression that service sectors are not innovative due to low values in the R&D statistics. Output measures use indicators such as patents and licenses to measure the innovativeness of an organisation [12]. Output measures are commonly criticised for lacking the ability to evaluate different kinds of organisation and different types of innovation [12] Gotsch and Hipp [13] point out that due to the intangible nature of innovation and the challenges of meeting the requirement to obtain patent protection,
it is not possible to use a number of the patents to measure innovation performance in the service sector. As a result of these challenges, Gotsch and Hipp [13] propose the use of trademark registration to measure the innovation performance in the service sector.

2.3 INTER-ORGANISATIONAL COLLABORATION

Inter-organisational collaboration is defined as two or more organisations working together to increase their competitiveness by sharing resources, joint decisions and shared benefits [16]. Scholars use different terms to refer to inter-organisational collaboration, Pangarka et al [16] refers to inter-organisational collaboration as a strategic alliance and define it as “voluntary arrangement between independent organisations to share a resource with the aim to achieve mutual strategic development.” Some other terms used to refer to inter-organisational collaboration includes terms such as Joint Venture, Alliance, Network, inter-firm cooperation, inter-firm partnership and strategic business network [21].

2.3.1 Why do organisations engage in collaboration?

Literature offers various reasons to explain why organisations decide to engage in collaboration with other organisations. Hardy et al [21] describe the need to develop a competitive advantage as the main motive behind organisations entering into a partnership. Also [21] lists the need for resources, the desire to spread risk and the need to enter a new market as the other objectives for some organisation entering into a partnership. Hardy [21] suggest three motives for collaborations and list them as a strategic effect, learning effect and political effect. [37] categorise the motivation into cost-economising and strategy. Cost-economizing involves the sharing of the capital cost to minimise risk [21]. Wassmer [37] list The need for resources, the desire to minimize risk, the need to enter new market, the need for new knowledge, the need for political connection, the need to develop political connection and the need to minimize transactional cost as some of the motivations organisations deciding to enter into an inter-organisational collaboration. Jenssen and Nybakk [29] identifies constraints such as financial and human resources as the motive for Small and Medium Size Enterprise to engage into an inter-organisational collaboration to find missing resources.

2.3.2 Relationship between Inter-Organisational Collaboration and Innovation capability

The scholarly findings of the relationship between inter-organisational collaboration and innovation capability are contradicting. While some scholars find a positive relationship, some
scholars find a negative relationship, and some scholars suggest that the relationship depends on certain conditions. The arguments are discussed below and grouped into (1) positive relationship, (2) negative relationship and (3) factors that influence the success of the inter-organisational collaboration.

2.3.2.1 Positive Relationship

Collaboration amongst organisations is believed to be the major source of competitive advantage. Various theories are used to describe the positive relationship between collaboration and competitive advantage. Amongst other theories, the resource-based view theory, the learning organisation theory, the dynamic capability theory and the transactional cost theory are most commonly used theories by researchers to motivate the positive relationship between inter-organisational collaboration and competitive advantage [29] [37] [18]. These theories are discussed below.

Resource-Base View theory is used to study how organisations achieve sustainable competitive advantage [37], the theory conceptualise an organisation as a bundle of resources and capabilities, which differentiate one organisation from its competitors [37], the theory suggests that competitive advantage is gained through the potential to access resources that are valuable, rare, inimitable and non-substitutable (VRIN) [18].

Resources from an individual organisation are not sufficient to provide an organisation with a competitive advantage; the competitive advantage is usually gained through the potential to access external resources [37]. Jenssen et al [29] suggest that it is rare to find a single organisation in possession of all resources and capabilities that are needed to roll out an innovative high-technology project. Even a larger organisation with sophisticated R&D resources (Research and development) needs external connection as a source of knowledge. Inter-organisational collaboration plays a critical role in providing partnering organisation with access to the mass volume of critical resources. The benefits of having access to more critical resources provide organisations with the ability to embark on the complex project [21] [37] [18]. Organisations that put together their resources to embark on an innovation project are found to be more innovative than other organisations [22]. In an inter-organisational collaboration, organisations with limited resources can benefit from having access to their external partner’s resources [22]. The lack of certainty and the requirements of huge investment for innovation projects makes innovation attempt a risky business for any individual organisation [22]. Inter-organisational collaboration allows the risk to be spread across the
partnering organisations using sharing resources and cost. The sharing of cost makes expenses for an individual organisation to be considerable low, which in turn enable the organisation to embark on other innovation projects at the same time. The sharing of resources allows the fast-tracking of the innovation project and pushing high-quality products or services to the market within the desired time [22].

Organisational learning theory suggests that an organisation can accumulate knowledge and experience by collaborating with other organisations [16].

Dynamic capability theory suggests that the organisation’s competitive advantage depends on the organisational ability to adapt to its environment quickly. Inter-organisational collaboration is believed to be effective in helping organisation cope with the rapid changes in the technology and the market [38].

Inter-organisational offers partnering organisations with the opportunity to invest in relation to the induced relational rates. Inter-organisational collaboration provides partnering organisation with the benefits of accessing each other’s assets or resources in a cost-effective manner [22].

2.3.2.2 Negative Relationship

Scholars that found a negative relationship between inter-organisational collaboration and innovation capabilities cites the risk of losing control, the risk of opportunistc behaviour and challenges of knowledge transfer.

Inter-organisational collaboration has a risk of creating inter-dependency between partners. More particularly, when organisations of different size collaborate, smaller organisations are more at risk of becoming dependent on their larger organisational partner [38]. Pangarkar et al [16] concur with [38] and finds a larger organisation to be dominant in partnership and may force other small partners to follow in a less desired direction. As a result of this inter-dependency, small organisations are vulnerable to losing total control and may find it difficult to engage in multiple alliances to spread and minimise their risk [22].

Inter-organisational collaboration exposes the smaller organisation to the risk of opportunistic behaviour when they collaborate with a larger organisation that also happens to be their competitor. In addition, Inter-organisational collaboration exposes the organisation to the risk of losing their core knowledge and competitive advantage [22].

The benefit of knowledge sharing that is mostly cited by the scholars as a motivator for inter-organizational collaboration is not guaranteed and may be limited due to other influencing
factors such as the (a) organisational capability to absorb and manage knowledge, (b) discrepancies in the partners organisational structure which limits the flow of knowledge, and (c) the ability of the organisation to recognise valuable knowledge and utilize it in a beneficial manner [22].

2.3.2.3 Factors that influence the success of the inter-organisational collaboration.

In the same debate of the relationship between inter-organisational collaboration and innovation capability, some scholars neither reject nor accepts that the association exist, but rather suggest that the outcome of the relationship depends on the condition of antecedent variables. For example, Wassmer [37] suggest that the relationship between the innovation capability and inter-organisational collaboration depends on the success of the alliance portfolio configuration, which is comprised of the variable of various dimensions of alliance configuration. Wassmer [37] lists four dimensions of the alliance portfolio configuration that should be studied to understand the antecedents of a successful inter-organisational collaboration. These dimensions are alliance portfolio size, alliance portfolio structure, alliance portfolio relation and partner-related characteristics. Jenssen and Nybakk [29] argues that the success of inter-organisational collaboration depends on network size, network structure, partner’s relationship strength, the competence of the partners and organisation of the partnership. Other scholars suggest that the relationship depends on the geographical distance between the collaborating partners [38], the capability to select the right partner [38] and duration and occurrence of the collaboration [16].

The scope of the current research is limited to the two dimensions proposed by Wasser, namely, the alliance portfolio size and alliance portfolio diversity. In addition, since management capability is commonly cited by researchers as the central antecedent of a successful inter-organisational collaboration and innovation capability [37] [39] [40], the current research also focuses on alliance management capability as an antecedent of a successful inter-organisational collaboration and innovation capability.

2.4 The characteristics of inter-organisational collaboration

Scholars have identified inter-organisational collaboration as the driver for building innovation capability and points at the importance of alliance portfolio configuration as the source of innovation in business organisations [19] [28]. Alliance portfolio refers to the focal company’s past and present partners [37]. Alliance portfolio configuration in this context refers to the different dimensions that make up the alliance portfolio. Wassmer [37] identifies four
dimensions of Alliance portfolio configuration, the alliance portfolio size dimension, the structural dimension, the rational dimension and the partner-related characteristics dimension. The quantity, diversity and quality of benefits that are reaped from inter-organisational collaboration depend on the configuration of the alliance portfolio [19] [28] [37]. However, according to Popadic et al [28], there is still a lack of understanding of what works and what does not work when it comes to the configuration of alliance portfolio. The debate on the configuration of alliance portfolio as an independent variable and innovation success as the dependent variable revolves around Alliance portfolio size, alliance portfolio diversity and alliance management capability. The debate on alliance portfolio size, alliance portfolio diversity and alliance management capabilities is discussed below.

### 2.4.1 Alliance Portfolio size

The scholars studying the relationship between alliance portfolio size and the performance of inter-organisational collaboration do not offer any conclusive finding on whether a larger alliance portfolio has a positive or negative effect on inter-organizational collaboration, but merely point out at the benefits and drawbacks of the relationship.

#### 2.4.1.1 The benefits of a larger alliance portfolio

The size of an alliance portfolio is believed to have an impact on the performance of the inter-organisational collaboration. Organisations can increase their resources and knowledge by increasing their alliance portfolio size [16] [17]. A newly added alliance partner is expected to bring new assets, skills and knowledge which can be used to complement the resources of the existing alliance to create new knowledge which will lead to the creation of new products or services [16]. A new alliance may be the solution to the challenges and limitations currently faced with the existing alliance [16]. A larger alliance portfolio allows the focal organisation to pursue multiple projects at the same time with minimal risk. A larger alliance that is comprised of different partners with different capabilities offers the focal organisation with the ability to create diverse knowledge [16] [17]. According to [17], organisations with larger alliance portfolio has higher success rate when compared with an organisation with the single alliance. Furthermore, [17] links dynamic capability to the benefit of a larger alliance portfolio and suggest that an organisation with multiple alliances is able to be flexible in the event of the disruptive condition in both technology and market.
2.4.1.2 The Drawbacks of a larger alliance portfolio

A large alliance portfolio comes with some challenges. The processes that need to be managed becomes too complex; this is due to the high number of relationships that have to be monitored and controlled at the same time [16]. Trust is very important in inter-organisational collaboration, but when an organisation engages in multiple alliances with the different organisation at the same time, it compromises the trust between itself and its partners [16]. This risk is attributed to three points, firstly, an organisation might not be able to sufficiently invest and fairly distribute resources to all of its partners, secondly, there is a high probability that some of the partners will be rivals in the portfolio when it is too large, and thirdly, there will be overlaps between the alliance partners when an organisation engage in a multiple collaboration simultaneously [16]. As a result, having rivals and overlaps in the portfolio will introduce conflicts and jeopardises the whole collaboration process. In addition, a larger alliance portfolio exposes the focal organisation to the vulnerability of opportunistic behaviour, in an attempt to counter attack this risk, the focal organisation might find itself implementing preventative mechanisms (such as drawing contract) and operational mechanisms(such as closely monitoring the partners ) which will end up hindering the overall alliance performance [16]. Lahiri et al [17], concur with Pangarkar et al [16] and suggest that multiple alliance can also depreciate the focal organisation’s core capabilities which in turn may harm the organisation’s ability to exploit new opportunities. In addition, as the alliance portfolio increases, it becomes difficult to locate useful knowledge which is supposed to be the major benefit of the collaboration [17].

2.4.2 Alliance Portfolio Diversity

The main objective for organisations deciding to enter into inter-organisational collaboration is to gain new skills and resources from their partners [18]. Jiang et al [18] point out at the importance of alliance portfolio diversity and suggest that organisations should consider the characteristics of potential partners when selecting partners to ally with for innovation. Both [18] and [41] define alliance portfolio diversity as the variation found in the characteristics of the partnering organisations

On the positive side: The benefits of alliance portfolio diversity are drawn from the resource-based view theory; knowledge and learning; and social network theory. The resource-based view theory suggests that organisations can gain access to diverse and non-redundant resources and information by collaborating with different external organisations [18]. These resources
can be used in a complementary manner to promote innovation [20]. The overall pooled resources create a synergy which can strengthen the alliance portfolio performance [20]. Alliance portfolio diversity provides the focal organisation with a competitive advantage since the value of heterogeneity created by the combination of unique resources cannot be replicated [18] [19].

On the negative side: The drawbacks of alliance portfolio diversity are drawn from the attention-based view theory [15] and transactional-cost view theory [15] [20]. Attention-based view theory suggests that there will be challenges related to (1) high influx of information, the focal organisation might find it difficult to absorb the knowledge and ideas that are generated from the alliance portfolio; (2) the ideas and knowledge might reach the organisation at the wrong time, and (3) when too many ideas are generated, the focal organisation might find it difficult to separate the good ones from the bad ones [15]. Transactional-cost view theory suggests that the cost of managing an alliance portfolio will increase as portfolio size increases. The cost includes transactional cost such as searching and monitoring. These excessive increases in the transactional cost may lead to a limitation in the allocation of resources, which in turn will hinder the performance of the alliance portfolio [20].

2.4.3 Alliance Management Capability

Niesten and Jolink [39] define alliance management capability as “the ability of a firm to capture knowledge regarding the alliance management, to store and share this knowledge and apply this knowledge in the ongoing and future alliance.” De Man [40] define Alliance management capability as “the mechanisms or routines that are purposefully designed to accumulate, store, integrate, and diffuse relevant organisational knowledge acquired through individual and organisational experience of alliances”. Both of these definitions highlight the importance of the knowledge management in inter-organisational collaboration.

Several scholars have identified alliance management capability as a necessity for organisations to succeed in the inter-organisational collaboration environment. Some researchers have found alliance experience to be the major factor that influences the success of alliance management capability, researchers have found evidence to show that alliance performance of organisations increases as the organisation gains more experience [39] [40] [37]. However, in contrast, Wassmer [37], indicate that some scholars argue that alliance management capabilities are not built by accumulating more experience, but rather by effectively utilising the experience that has been acquired in the past.
2.5 **CONCEPTUAL FRAMEWORK**

As depicted in Figure 6, the current research is interested in the following concepts: Innovation Capability, Alliance Diversity, Alliance Portfolio Size and Alliance Management Capability

![Figure 6: Variables of innovation capability building](image)

As indicated in the literature review above, the existing literature findings on the relationship between innovation capability and the three variables of inter-organisational collaboration is mixed, while some scholars found a positive relationship, some scholars found negative relationship.

The objective of the current research is to contribute to promoting and building innovation capability in South African organisations as well as contributing to the theory about the relationship between alliance portfolio size and innovation capability, by testing the proposition below. The overall propositions are summarized in Figure 7.

**Proposition 1:** A larger alliance portfolio size has a positive effect on the innovation capability of an organisation.

**Proposition 2:** A high level of alliance portfolio diversity has a positive effect on the innovation capability of an organisation.

**Proposition 3:** A high level of management capability has a positive effect on the innovation capability of an organisation.
2.6 CONCLUSION OF LITERATURE REVIEW

Research work on building innovation capability at the organisational level is very limited in the context of South Africa. A vast majority of innovation scholars in South Africa focus on studying innovation at the national level and neglects innovation at the organisational level. There is a need to understand the nature of innovation on the organisational level to build the innovation capabilities of the South African organisation.

Innovation is a diverse field and span across multiple domains, and as a result, various definitions of innovation has been proposed in the existing literature. The discrepancies in the definition revolve around the newness of products/services, categorisation of innovation, how innovation is related to creativity concept and how the terms radical and incremental are used to describe innovation. As Baregheh et al [30] indicated, the variation on the definition undermines common understanding of innovation. There is a need for more studies to consolidate the various definitions and produce one definition that can be used across different domains to study innovation.

There is a consensus amongst the scholars of innovation that organisations need to build their innovation capability before they can be innovative. Many factors can influence organisations ability to develop innovation capability; the current research focuses on inter-organizational collaboration as the antecedent of innovation capability. The literature review on the subject of inter-organisational collaboration and innovation capability reveals that inter-organisational collaboration is composed of three variables, the alliance portfolio size, alliance portfolio...
diversity and alliance management capability. However, it does not provide a clear indication on whether the relationship is positive or negative between innovation capability and the three variables of inter-organisational collaboration.

The following research gaps have been found of the literature:

1. Most Innovation studies in South Africa focus on innovation at the national level. More studies focusing on the organisational level is required in order to promote and build innovation capabilities in South Africa.
2. Some researchers call for a common definition of innovation in order to promote common understanding. However, the recent research still proposes different conflicting definitions. There is no consensus on what should count as innovation and the classification of different types of innovation.
3. Alliance management capability is commonly cited by research as the necessity for a successful inter-organisational collaboration. However, no empirical evidence could be found to confirm the validity of this theory.
4. Prior research on the relationship between a larger alliance portfolio size, alliance portfolio diversity and the performance of inter-organisational collaboration does not provide a conclusive solution. Some theories suggest a positive relationship and some theories suggest a negative. A theory testing research is required to validate these theories.
5. The literature on the measurement of innovation criticises the used of R&D expenditure and counts of patents as indicators of innovation. It is still unclear which indicator is suitable to measure the innovation capability of an organisation. More research is required to clear this issue.

CHAPTER 3: METHODOLOGY

As indicated in the literature review section, it is not clear how alliance portfolio size, alliance portfolio diversity and alliance management capability affect the organisational innovation capability. The current research aims to test the theory about the relationship between the four mentioned concepts. This section describes the methods used to achieve these objectives.
3.1 RESEARCH STRATEGY

The most common methods to test the deterministic relation theory are experimental testing, single case study and comparative case study. Dul and Hak [42] considers experimental testing to be the best method and single case study or comparative case study to be the second best. Since the independent variables in the current study cannot be manipulated and used in an experiment, a comparative case study is considered.

At least two comparable groups of cases are required when conducting a comparative case study [42]. The current study requires one group to represent the innovative organisations and the other group to represent non-innovative organisations. This approach allows the comparison of the independent variables in the two groups of cases. Data related to alliance portfolio size, alliance portfolio diversity and alliance management capability was collected for both groups.

3.2 CANDIDATE CASES AND CASE SELECTION

The procedure indicated in Figure 8 was used to identify innovative and non-innovative organisations.

![Diagram](image)

**Figure 8: Criteria for candidate cases**

Innovative group represents organisations with high innovative capability, candidates for this case are required to be organisations which are known to be innovative. Non-innovative group represents organisations lacking innovation capability and candidates for this case are required to be organisations which are known to be less innovative.
Forbes and Boston Consulting Group (BCG) conducts a study on a yearly basis to identify the most innovative organisation in the world. The methodology used by Forbes and BCG is different, and thus their result is also different. Forbes uses what they call innovation premium to determine the most innovative organisations. Dyer et al [43] describe Innovation premium as the proportion of the organisations' market value which cannot be measured by the cash flow of the business. Innovation premium is based on the investor's perception of the organisation's future growth. BCG uses the combination of public perception data, which is collected by interviewing top executives and the weighted average of three financial indicators which are shareholder return, revenue growth and margin growth [44].

The BCG’s survey methodology was found to be suitable for the current research since it is in accord with the benefits of the innovation as indicated by [4] [3], BCG’s survey methodology takes into account both financial performance and public perception. BCG survey report ranks fifty most innovative companies according to their innovativeness with rank-one representing the most innovative organisation and rank-fifty representing the least innovative organisation in the list. The BCG 2016 survey report of the 50 most innovative companies in the world was used to identify innovative organisations and to create case study groups.

According to Dul and Hak [42], case studies in the comparative case studies need to have some similarities to enable comparison. The comparability of the innovative group and non-innovative group was ensured by considering only organisations within the same industry. The BCG classify organisations into nine industries, the Automobile; Consumer and retail, Energy; Financial Services; Healthcare; industrial products; Media and entertainment; Tech and telecom; and Transportation and travel. The current research is interested in the organisations from the Tech and Telecom. According to the BCG survey, thirty percent of the most innovative organisations comes from the tech and telecom industry as indicated in Figure 9.

The BCG 2016 survey report also contains a list of organisations that did not make it to the top 50. The cases for the non-innovative group were selected from the tech and telecom list of organisations that did not make it to the 2016 top 50 innovative companies. These cases were randomly selected base on data availability.
3.3 **APPLICABILITY OF THE CASES TO THE SOUTH AFRICAN ORGANISATIONS AND CONDITION.**

Since all the selected case studies are foreign organisations, it was important to validate the similarity and applicability of the selected cases to the South African organisations and conditions. The similarity and applicability were ensured by selecting candidates from the Information and technology industry (ICT). According to the Brand South Africa [45], the South African ICT sector is the largest and most advanced in Africa. The case study candidates are made out of the mixture of organisations from the developed and developing countries. Although South Africa is classified as the developing country, its ICT infrastructure is similar to that of the developed countries [1]. The international benchmarking of South Africa’s Science, Engineering and Technology (SET) graduation level is ranked at 30.0, which is very similar to the developed countries, for example the United State has a SET level is ranked at 39 [1].

3.4 **MEASUREMENT**

The measurement of alliance portfolio size, alliance portfolio diversity and alliance management capability for both the innovative group and the non-innovative group were required to enable the testing of the propositions in the current research. The sections that follow examine how the three variables are measured in the existing literature and discuss how the variables are measured in the current research.
3.4.1 Alliance Portfolio Size

Alliance portfolio size is commonly researched as an independent variable to study its effect on the dependent variables such as alliance portfolio performance [46], alliance expansion [16], betweenness centrality [47], firm performance and innovation performance [17]. The measurement of alliance portfolio size is the same across the alliance portfolio literature, it is measured by counting the number of partners in the firm’s alliance portfolio. However, the study period and the analysis methods vary across the literature, e.g. Heimeriks et al [46] used for years as a study period and used correlation as an analysis method; Gilsing et al [47] used one year study period and logistic regression analysis; and Lahiri et al [4] used three years study period and bivariate correlation analysis. Lahiri et al [17] point at the fact that the impact of an alliance is not immediately and suggest that at least three years should be used to measure the impact of an alliance. The use of secondary data is common in the alliance portfolio literature, all the scholars cited above all used various database as the source of data.

In the current research, alliance portfolio size refers to the number of partners which the focal organisations have worked with in the past or ongoing. The secondary data regarding alliance portfolio size of the cases in the innovative group and the non-innovative group was collected from the LexisNexis academic database. The alliance portfolio size for each case was determined by counting the number of the partnership established between the year 2013 and 2015 for all the cases.

3.4.2 Alliance Portfolio Diversity

2.1.1.1 Review of alliance portfolio diversity measurement

Scholars has studied alliance portfolio diversity as an independent variable to investigate its effect on various organisational performance, such as alliance performance [20], innovation performance [41] and operational result [48]. A literature review was conducted to understand how alliance portfolio diversity is measured and analysed. A literature review was conducted to answer the following questions:

1. What are the common variables studied in the alliance portfolio diversity research?
2. How is alliance portfolio diversity categorized?
3. What kind of data do scholars use to study alliance portfolio diversity?
4. How is Alliance portfolio diversity level calculated?
5. Which analysis Method is used to study the relationship between alliance portfolio diversity and other variables?

*What are the common variables studied in the alliance portfolio diversity research?*

Alliance portfolio diversity is commonly used as an independent variable to study or predict the performance outcome of various dependent variables. The dependent variables that are studied in relation to alliance portfolio diversity can be categorized into three groups: the alliance portfolio performance [20], innovation performance [48] and organisational performance [41].

*How is alliance portfolio diversity categorized?*

Since diversity level is about determining the range of different items, categorization is very important in diversity calculation. To uncover the types of alliance portfolio diversity, a review on how scholars categorize alliance portfolio diversity was done. Seven types of alliance portfolio diversity were found from the literature, these are, organisational diversity, functional diversity, industry diversity, governance diversity, technology diversity, geographical diversity and vertical-horizontal diversity.

The elements used to evaluate organisational diversity are similar in the alliance portfolio diversity literature. Researchers evaluate organisational diversity based on the size (e.g. small, medium or large organisation) and type of organisations in the portfolio (e.g. private or public organisation) [41] [20].

Vertical-horizontal diversity is the most studied type of alliance portfolio diversity. Although researchers use different sets of elements to determine Vertical-horizontal diversity, the four elements (customers, suppliers, competitors and universities) are found in all the Vertical-horizontal diversity studies [41]. Additional elements such as commercial laboratories, Consultants and Research institutes are commonly added to the four elements to determine Vertical-horizontal diversity [41].

Scholars evaluate functional diversity based on the presence or absence of three alliance functional elements; these are marketing, manufacturing and research & development (R&D). The use of these three functional elements is common in the alliance portfolio diversity literature. Functional diversity is the second most studied type of alliance portfolio diversity [41] [20].
Technology diversity, Industrial diversity, Governance diversity and Geographical diversity are the least studied types of alliance portfolio diversity. Technology diversity is evaluated based on the differences in Technology-capabilities of the partners in the alliance portfolio [20]. Industrial diversity is evaluated base on the presence or absence of partners from different industries in the alliance portfolio [20]. Governance diversity is evaluated base on the presence or absence of equity and non-equity organisations in the portfolio [20]. Geographical diversity is evaluated based on the differences between local and foreign partners in the portfolio [20].

What kind of data do scholars use to study alliance portfolio diversity?

A literature review to determine the sources and type of the data the scholars use to study alliance portfolio diversity, shows that most of the researchers used secondary data from various database sources. For example, [49] used alliance announcements as a source of data, [50] used registration records of the German Commercial Register and [51] used data from alliance capability assessment survey published in 2006. The Securities Data Corporation database is the most common source of secondary data used to study the alliance portfolio diversity [19].

How is Alliance portfolio diversity level calculated?

A review of how alliance portfolio diversity is calculated reveals four methods that are used by the scholars, these are the Blau index [20] [48] [19], the Herfindahl index [50] [51], the count-Method [49] and the new-proposed-methods [41]. In the count-method, the researcher determines diversity level by counting number of different items in the diversity categories. In the new-proposed-method the researcher introduces a new method of calculation. The Blau Index is the most commonly used method to calculate the alliance portfolio diversity.

A comparison of the Blau index and Herfindahl index in Table 1 shows that the two methods have the same calculation technique. However, the scholars refer to them using different names to refer to the same technique.

<table>
<thead>
<tr>
<th>Table 1: Blau and Herfindahl index comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blau index</strong></td>
</tr>
<tr>
<td>Formula</td>
</tr>
<tr>
<td>$APD = 1 - \sum p_i^2$</td>
</tr>
</tbody>
</table>
Variables

\( pk = \) The proportion of alliance partners in the \( k \)th category which was computed based on a total number of a firm’s active alliances

\( P_j = \) representing the number of partners of category \( j \),

\( PT = \) the total number of partners,

\( N = \) the number of different partner categories

<table>
<thead>
<tr>
<th>Result</th>
<th>Minimum value = 0, no diversity</th>
<th>Maximum value = 1, Complete diversity</th>
</tr>
</thead>
</table>

Which analysis Method is used to study the relationship between alliance portfolio diversity and other variables?

A review of how alliance portfolio diversity is analyzed reveals various types of statistical methods. Table 2 list the statistical analysis methods found in the literature.

**Table 2: Analyses Methods**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Analysis Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>[19]</td>
<td>Multiple linear Regression</td>
</tr>
<tr>
<td>[50]</td>
<td>Event history analysis</td>
</tr>
<tr>
<td>[20]</td>
<td>Meta-Analysis</td>
</tr>
<tr>
<td>[49], [51]</td>
<td>Generalized-method-of-moments (GMM) Regression</td>
</tr>
<tr>
<td>[48]</td>
<td>The partial least squares (PLS)</td>
</tr>
</tbody>
</table>

2.1.1.2 Measurement of alliance portfolio diversity in the current research

As indicated in the review section, the Blau diversity formula is the most commonly used method to calculate the diversity level in the alliance portfolio diversity literature. For that reason, the Blau diversity was used to calculate the alliance portfolio diversity level of case studies in the innovative and non-innovative group.

In the current study, the two types of diversity are used to calculate the overall alliance portfolio diversity for innovative and non-innovative group. These two types are functional diversity and industrial diversity. The overall alliance portfolio diversity is calculated by averaging the scores for functional diversity and industrial diversity. The Mergers & Acquisitions and Partnership report contain information related to the type of function for which the partnership was created. The current research identified nine categories of functional diversity from the Mergers & Acquisitions and Partnership report, these are, Co-development, Co-Marketing, Affinity
Marketing, Majority Acquisition, Minority Acquisition, Joint Venture, Licensing Agreement, 100% Acquisition and Other. Functional diversity in the current research was calculated based on these nine categories. A sample report for the Mergers & Acquisitions and Partnership is shown in Figure 11. The functional diversity data for the Innovative Group and the Non-innovative group is shown in Appendix B Table 16 and Table 17. Example on Table 3 shows how functional diversity is calculated in the current research.

**Table 3: Calculating Functional Diversity**

<table>
<thead>
<tr>
<th>Example of Calculating Functional Diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CompanyX has formed 15 partnership over the last three years, and the purpose of these partnerships was as follows: Three were formed for Co-development, one for co-marketing, seven for Affinity Marketing, one was for Licensing Agreement, and three were for other categories out of the nine. Alliance functional diversity for CompanyX is calculated as follows:</td>
</tr>
<tr>
<td>[D = 1 - \left( \frac{3}{15} \right)^2 + \left( \frac{1}{15} \right)^2 + \left( \frac{7}{15} \right)^2 + \left( \frac{1}{15} \right)^2 + \left( \frac{3}{15} \right)^2 ] = 0.693</td>
</tr>
</tbody>
</table>

The Standard Industry Classification (SIC) is commonly used by researchers to study the industry diversity of organisations, e.g. [40] and [35]. The SIC code is also used in the current study to calculate the industry diversity of each of the cases in the innovative group and non-innovative group. Since some organisations operate in more than one industry, data regarding the primary and secondary SIC codes were collected from the LexisNexis academic database. The SIC codes classify industries into 12 categories. These are agriculture, forestry and fishing; mining; construction; manufacturing; transportation, storage and communications; electric, gas and water; wholesale, hotels & restaurant and retail trade; finance, real estate and business services; general government services [4]. The industry diversity data for the Innovative Group and the Non-innovative group is shown in Appendix B - Table 13 and Table 12.

### 3.4.3 Alliance Management Capability

Researchers commonly associate alliance management capability with alliance experience in partnering with other external organisations [39] [37]. The use of alliance experience to measure alliance management capability is adopted in the current research as it is currently used in the existing literature. The Alliance experience in the current study is calculated as the difference between the year 2015 and the year the organisation entered into an inter-
organizational collaboration for the very first time. For example, if an organisation started engaging in partnership in 2010, its alliance experience is 5 years.

3.5 TESTING PROPOSITIONS

The statistical hypothesis testing was used to test the propositions in the current research. Statistical hypothesis testing is a statistical procedure used to test assumption about the parameters of the population. There are various statistical methods used to test the hypothesis. Since the current study is interested in testing the hypothesis by comparing two groups, independent sample t-test is the perfect statistical method for this research [42].

Independent samples t-test is commonly used in the group comparison studies when the research desire to compare the means score of two independent groups. Two types of variables are needed to conduct independent samples t-test, these are: (1) one categorical, independent variable with two level of groups and (2) one continues dependent variable. The null hypothesis of independent t-test assumes that there is no difference between the means of the two groups (μ1=μ2) and the alternative hypothesis argues that there is a statistically significant difference in the mean score of the two groups [52] [42].

The independent samples t-test result in a p-value which indicates the probability of result occurring due to random chance. There are various significant levels that can be used in deciding whether to reject or fail to reject the null hypothesis, such as 1%, 5% and 10%. A p-value of less than 5% is commonly accepted to be statistically significant. In statistic, statistical significance is the probability that the observed result is due to random error. E.g. if the p-value is 0.01, the statistical significant indicates that there is 1% chance that the observed score is a result of a random chance. Thus, the higher the p-value, the higher the probability that the result is due to random chance [52].

Independent samples t-test takes the following assumptions into consideration:

- Sample data from each group is normally distributed
- There is the homogeneity of variance. The homogeneity of variance is commonly tested using Levene’s test for the quality of significant. A significant level larger than 0.05 indicates that equal variance can be assumed and the assumption is tenable.
- The mean score from the two groups are independent of each other
The Statistical Package for Social Sciences (SPSS) tool was used to conduct the statistical hypothesis testing and the following hypotheses were declared to enable the testing of the propositions with the independent sample t-test technique.

Proposition 1: The larger alliance portfolio size has a positive effect on the innovation capability

\[ H_{10} \text{: There is no significant statistical difference between alliance portfolio size of innovative and non-innovative organisations.} \]

\[ H_{1a} \text{: There is a significant statistical difference between the alliance portfolio size of innovative and non-innovative organisations.} \]

Proposition 2: A high level of alliance portfolio diversity has a positive effect on the innovation capability

\[ H_{20} \text{: There is no significant statistical difference between the alliance portfolio diversity of innovative and non-innovative organisations} \]

\[ H_{2a} \text{: There is a significant statistical difference between the alliance portfolio diversity of innovative and non-innovative organisations.} \]

Proposition 3: A high level of management capability has a positive effect on the innovation capability

\[ H_{30} \text{: There is no significant statistical difference between the alliance management capability of innovative and non-innovative organisations} \]

\[ H_{3a} \text{: There is a significant statistical difference between the alliance management capability of innovative and non-innovative organisations.} \]

CHAPTER 4: RESULT

4.1 INTRODUCTION

The purpose of the study was to compare the collaboration characteristics of the innovative and non-innovative organisation with the effort to find a solution on how South African organisations can build innovation capability in their organisations. The independent sample t-test analysis technique is used to compare the alliance portfolio size, alliance portfolio diversity and alliance management capability of innovative and non-innovative organisations. The
motivation for selecting the independent sample t-test as analysis technique is presented in the methodology section. This chapter will present the analysis result of the collected data.

4.2 CASE STUDIES ANALYSIS

Two sets of data were collected to enable us to conduct a comparative case study. One set of data represented cases for the innovative organisation and the other represented cases for non-innovative organisations. Table 4 shows the Firmographics data of the selected cases. One of the requirements for conducting a comparative case study is that the cases should be equivalent [42]. This requirement was met by selecting all the cases from the same industry, in this study all the cases came from the telecommunication and technology industry. In addition to ensuring comparability, an independent t-test was done to compare the mean ages of the two groups, and the result in

Table 5 shows that the ages of the innovative group and non-innovative groups are statistically significantly the same (p=0.345).

Table 4: Firmographics Data

<table>
<thead>
<tr>
<th>Innovative Organisations</th>
<th>Non-Innovative Organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case</strong></td>
<td><strong>Established Year</strong></td>
</tr>
<tr>
<td>Case1</td>
<td>1976</td>
</tr>
<tr>
<td>Case2</td>
<td>1998</td>
</tr>
<tr>
<td>Case3</td>
<td>1975</td>
</tr>
<tr>
<td>Case4</td>
<td>1938</td>
</tr>
<tr>
<td>Case5</td>
<td>1968</td>
</tr>
<tr>
<td>Case6</td>
<td>1984</td>
</tr>
<tr>
<td>Case7</td>
<td>2006</td>
</tr>
<tr>
<td>Case8</td>
<td>1981</td>
</tr>
</tbody>
</table>

Table 5: Independent Sample t-test for Age

<table>
<thead>
<tr>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F</strong></td>
<td><strong>Sig.</strong></td>
<td><strong>t</strong></td>
</tr>
<tr>
<td>Age</td>
<td>Equal variances assumed</td>
<td>5.066</td>
</tr>
</tbody>
</table>
4.3 TESTING THE PROPOSITION

4.3.1 Proposition 1

The alliance portfolio size of innovative and non-innovative organisations were compared to test the proposition that larger alliance portfolio size has a positive effect on innovation capability. To enable the testing of this proposition, the following was hypothesized:

$H_{10}$: There is no significant statistical difference between alliance portfolio size of innovative and non-innovative organisations

$H_{1a}$: There is a significant statistical difference between the alliance portfolio size of innovative and non-innovative organisations.

Table 6 reports the descriptive statistics for the comparison of innovative and non-innovative organisation based on the alliance portfolio size. The report indicates a high alliance portfolio size mean of 8.375 for innovative organisations.

<table>
<thead>
<tr>
<th>Innovative and Non-Innovative</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alliance Portfolio Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative Group</td>
<td>8</td>
<td>8.375</td>
<td>5.706</td>
<td>2.017</td>
</tr>
<tr>
<td>Non-Innovative Group</td>
<td>8</td>
<td>3.000</td>
<td>3.742</td>
<td>1.323</td>
</tr>
</tbody>
</table>

An independent sample t-test was conducted to determine whether the means of innovative and non-innovative organisations are different in terms of statistical significance. An independent sample t-test resulted in a p-value of .038 as shown in Table 7. Since the p-value is less than .05, the null hypothesis can be rejected. Therefore, this result suggests that there is enough evidence to conclude that there is a significant statistical difference between the alliance portfolio size of innovative and non-innovative organisations. Furthermore, we can conclude that a larger alliance portfolio size has a positive effect on innovation capability.
4.3.2 Proposition 2

The alliance portfolio diversity of the innovative and non-innovative organisation were compared to test the proposition that a high level of alliance portfolio diversity has a positive effect on the innovation capability. To enable the testing of this proposition, the following was hypothesized:

\( H_{20}: \) There is no significant statistical difference between the alliance portfolio diversity of innovative and non-innovative organisations

\( H_{2a}: \) There is a significant statistical difference between the alliance portfolio diversity of innovative and non-innovative organisations.

Table 8 reports the descriptive statistics for the comparison of innovative and non-innovative organisation based on the alliance portfolio diversity. The report indicates a high level of alliance portfolio diversity means of .482 for innovative organisations.

<table>
<thead>
<tr>
<th>Innovative and Non-Innovative</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alliance Portfolio Diversity</td>
<td>8</td>
<td>0.482</td>
<td>0.223</td>
<td>0.079</td>
</tr>
<tr>
<td>Innovative Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Innovative Group</td>
<td>8</td>
<td>0.233</td>
<td>0.196</td>
<td>0.069</td>
</tr>
</tbody>
</table>

An independent sample t-test was conducted to determine whether the alliance portfolio diversity means of innovative and non-innovative organisations are different in terms of statistically significance. An independent sample t-test resulted in a p-value of .019 as shown
in Table 9. Since the p-value is less than .05, the null hypothesis can be rejected. Therefore, this result suggests that there is enough evidence to conclude that there is a significant statistical difference between the alliance portfolio diversity level of innovative and non-innovative organisations. Furthermore, it can be concluded that a high level of alliance portfolio diversity has a positive effect on innovation capability.

**Table 9: Alliance Portfolio Diversity Independent t-test for Innovative and Non-Innovative Organisation**

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>Alliance Portfolio Diversity</td>
<td>0.077</td>
<td>0.785</td>
<td>2.367</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>2.367</td>
<td>13.787</td>
<td>0.033</td>
</tr>
</tbody>
</table>

4.3.3 Proposition 3

The alliance management capability of innovative and non-innovative organisation was compared to test the proposition that a high level of management capability has a positive effect on the innovation capability. To enable the testing of this proposition, the following was hypothesized:

**H30:** There is no significant statistical difference between the alliance management capability of innovative and non-innovative organisations.

**H3a:** There is a significant statistical difference between the alliance management capability of innovative and non-innovative organisations.

Table 10 reports the descriptive statistics for the comparison of innovative and non-innovative organisation based on the alliance management capability. The report indicates a high level of alliance management capability means of 7.5 years for innovative organisations.
Table 10: Descriptive Statistics for Alliance Management Capability

<table>
<thead>
<tr>
<th>Innovative and Non-Innovative</th>
<th>Innovative Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alliance Management Capability</td>
<td>Innovative Group</td>
<td>8</td>
<td>7.500</td>
<td>2.070</td>
<td>0.732</td>
</tr>
<tr>
<td>Non-Innovative Group</td>
<td></td>
<td>8</td>
<td>5.375</td>
<td>2.669</td>
<td>0.944</td>
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</table>

An independent sample t-test was conducted to determine whether the means of innovative and non-innovative organisations are different in terms of statistical significance. An independent sample t-test resulted in a p-value of .097 as shown in Table 11. Since the p-value is greater than .05, the null hypothesis cannot be rejected. Therefore, this result suggests that there is insufficient evidence to conclude that innovative organisations have a higher level of alliance management capability when compared to non-innovative organisations. This means that alliance management capability is not a differentiator between innovative and non-innovative organisations.

Table 11: Alliance Management Capability Independent t-test for Innovative and Non-Innovative Organisation

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>Alliance Management Capability</td>
<td>0.359</td>
<td>0.559</td>
<td>1.779</td>
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<td></td>
<td>Equal variances assumed</td>
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<tr>
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<td>Equal variances not assumed</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1.779</td>
<td>13.184</td>
<td>0.098</td>
</tr>
</tbody>
</table>

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

Because innovation is needed to improve the economy and quality of life, South African organisations need to build innovation capabilities. There are several factors that can influence the organisation’s ability to develop innovation capability. One way for organisations to build innovation capability is to form an alliance and collaborate with other external organisations. Different researchers have taken different angles to study the factors influencing innovation
capability, particularly about the characteristics of inter-organisational collaboration. Some scholars focused on Alliance portfolio size; some focused on alliance portfolio diversity, and some focused on alliance management capability as the independent variables of innovation capability.

The existing literature thus far does not provide a decisive conclusion on whether the relationship between the different characteristics of inter-organisational collaboration is positive or negative towards building innovation capability.

The objective of the current research was to compare the collaboration characteristics of the innovative and non-innovative organisation with the effort to examine whether the collaboration characteristics have any effect on innovation capability of organisations.

The current research has addressed the question of how South African organisations can build their innovation capability by examining the relationship between innovation capability and the three characteristics of inter-organisational collaboration (the alliance portfolio size, alliance portfolio diversity and alliance management capability). The BCG survey report of the “Most innovative companies 2016” was used to identify innovative organisations and to create the two case study groups, one group representing the innovative organisation and the other group representing the non-innovative organisations. Secondary archived data was collected for each group from the Lexis academy database.

An independent-sample t-test was used to test the propositions that there is a significant statistical difference between the three variables of inter-organisational collaboration (the alliance portfolio size, alliance portfolio diversity and alliance management capability) of innovative and non-innovative organisations.

In this chapter, the result of the previous chapter is considered in detail.

5.2 **INTERPRETATION OF THE RESULT**

5.2.1 **Alliance portfolio size**

The comparison of the innovative and non-innovative organisation indicated that innovative organisations have a larger alliance portfolio size. This result suggests that there is a positive relationship between innovation capability and alliance portfolio size. This result supports proposition1b and line with the findings of scholars that advocate positive relationship between alliance portfolio size and innovation capability.
5.2.2 Alliance portfolio diversity

The comparison of the innovative and non-innovative organisation indicated that innovative organisations have a larger alliance portfolio diversity. This result supports proposition 2b and line with the findings of scholars that advocate positive relationship between alliance portfolio diversity and innovation capability.

5.2.3 Alliance Management Capability

The current research did not found sufficient evidence to conclude that there is a relationship between innovation capability and alliance management capability. The result did not indicate any difference in the alliance management capability of innovative and non-innovative organisations. This result is surprising as several scholars have associated the success of alliance performance and innovation performance to the management capability of the focal organisation [53] [39] [54].

Two inferences can be made about this result. First, when alliance management capability is the same for competitors, the alliance portfolio size and alliance portfolio diversity will be the differentiator. This result goes against the prior research findings that alliance management capability is the main differentiator. Secondly, this result might be due to the measurement technique proposed in the existing literature, which was also adopted in the current research. The existing literature uses collaborating experience, measured in years as an indicator of alliance management capability. This might not be robust enough to capture and measure the alliance management capability since other scholars define management capability as a product of dynamic routines that govern organisations ability to learn, adapt and change and renew over time [19]. Furthermore, some scholars have proposed some framework to measure alliance management capability. However, these models are more complex and require organisational data that is not easy to gather. For example, Sluys et al [54] use the number of alliance learning mechanisms such as alliance manuals, tools, procedures, training programs and codification of best practices to measure alliance management capability. As capability is commonly cited as an important element of organisation performance [37] [39] [40], more research work is required to study how to find a more effective way to measure alliance management capability.

5.3 Limitation of the Study

There are various types of innovation capability; the current research only focused on product innovation. It will be interesting to see if the same result applies to service innovation.
The degree of innovation is classified into radical and incremental innovation; the current study did not discriminate between the two types. Future research can be done to determine whether the characteristics of collaboration differs in radical and incremental innovation.

The current research has found an association between innovation capability and alliance portfolio size. Some of the prior researchers have found a similar result, but however, they have suggested that extending alliance portfolio is beneficial up to a certain level. The current research did not gauge this assumption. Future research is required to investigate if this assumption is valid and if valid, the turning point needs to be identified.

The alliance portfolio diversity in the current study was calculated based only on functional and industry diversity. It would be interesting to see if different types of alliance diversity have a different effect on the innovation capability.

The studies on the measurement of alliance management capabilities are still underdeveloped. As a result, the measurement technique used in the current research might not be robust enough to capture the alliance management capabilities of the selected cases. More research work is required to examine how best the alliance management capability can be measured.

### 5.4 Recommendation

South African organisations need to be competitive in the global market to improve the current state of economy and quality of life in South Africa. Prior researchers have identified innovation to be the solution to this challenge. With the effort to uncover how South African organisation can build innovation capability, it was found that collaborating with other external organisations is one of the ways organisations can build innovation capability. A literature review was conducted to understand the relationship between innovation capability and intra-organisational collaboration. However, the literature did not provide a conclusive solution. The current study dived deeper to investigate the relationship between innovation capability and the three characteristics of collaboration by comparing innovative and non-innovative organisation. Although the study found evidence to support the existence of a relationship between innovation capability and the two characteristics of collaboration, many questions remained unanswered.

Future research is required to answer the following questions:

1. How can the organisational capabilities in managing alliance be captured and measured?
2. How do the characteristics of collaboration affect the different types of innovation capability, e.g. radical and incremental innovation?

3. Do the different types of alliance portfolio diversity affect innovation capability differently?

CHAPTER 6: CONCLUSIONS

South African organisations need to be competitive in the global market to improve the current state of economy and quality of life in South Africa. Scholars on the topic of innovation commonly cite innovation as a solution to this problem. However, innovation is not easily achievable. The literature on the subject of innovation is extensive; researchers have found different factors that affect the organisational ability to develop innovation capabilities, some of these factors include organisational culture, leadership style, employee’s motivation, inter-organizational collaboration, knowledge management and much more.

The current research contributed to finding the solution to the problem of building innovation capabilities in South African organisations by studying the relationship between innovation capability and inter-organisational collaboration. Through literature review, it was found that inter-organisational collaboration is composed of three variables, alliance portfolio size, alliance portfolio diversity and alliance management capability. The literature indicated that innovation capability depends on the configuration of these three variables. However, the literature did not provide a decisive solution on the right configuration. The debate revolves around whether a larger alliance portfolio size, a high level of portfolio diversity and a high level of alliance management capability has a positive or negative effect on the organisational innovation capability.

To test the relationship between innovation capability and the three variables of inter-organisational collaboration, three propositions were proposed and an independent-sample t-test was used to test the propositions. The tests was aimed to compare the alliance portfolio size, alliance portfolio diversity and alliance management capabilities of the innovative and non-innovative organisation.

The results suggest that alliance portfolio size and alliance diversity level of innovative organisations is higher than those of non-innovative organisations. Furthermore, the result
indicates that the difference is statistically significant. However, the results ions did not indicate any association between innovation capability and alliance management capability.

The current research has found that there is a positive relationship between the two variables (alliance portfolio size and alliance portfolio diversity) of inter-organisational collaboration and innovation capability. South African organisations can build their innovation capability by partnering with more organisations. South African organisations should ensure diversity when selecting external partners. The current research studied the industry and functional diversity. Future research is required to study the impact of other types of diversity on innovation capability.

3 REFERENCES


APPENDIX A

3.1 Mergers & Acquisitions and Partnership Sample Report

Figure 10: Mergers & Acquisitions and Partners Sample Report
**APPENDIX B**

**Table 12: Non-Innovative Group Data Summary**

<table>
<thead>
<tr>
<th>Case</th>
<th>Industry Diversity</th>
<th>Function Diversity</th>
<th>Diversity</th>
<th>Alliance Portfolio Size</th>
<th>Alliance Management Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case1</td>
<td>0.65</td>
<td>0.14</td>
<td>0.39</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
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<td>0.44</td>
<td>0.44</td>
<td>3</td>
<td>6</td>
</tr>
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<td>0.00</td>
<td>0.67</td>
<td>0.33</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
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<td>0.00</td>
<td>0.00</td>
<td>1</td>
<td>2</td>
</tr>
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<td>Case5</td>
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<td>0.00</td>
<td>0.00</td>
<td>1</td>
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<td>0.36</td>
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<td>6</td>
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</tbody>
</table>

**Table 13: Innovative Group Data Summary**

<table>
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<th>Case</th>
<th>Industry Diversity</th>
<th>Function Diversity</th>
<th>Alliance Portfolio Diversity</th>
<th>Alliance Portfolio Size</th>
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<td>3</td>
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<tr>
<td>INDUSTRY DIVERSITY - NON-INNOVATIVE GROUP</td>
<td>Case1</td>
<td>Case2</td>
<td>Case3</td>
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<td>Case5</td>
<td>Case6</td>
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<td>-------</td>
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<td>Count</td>
<td>P2</td>
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<td>0</td>
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<td>0.001</td>
<td>0</td>
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<td>0.000</td>
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<tr>
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<td>Finance, Insurance and Real Estate</td>
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<td>0.000</td>
</tr>
</tbody>
</table>

Table 14: Non-Innovative Group - Industry Diversity Data
## Table 15: Innovative Group - Industry Diversity Data

<table>
<thead>
<tr>
<th>INDUSTRY DIVERSITY - INNOVATIVE GROUP</th>
<th>Case1</th>
<th>Case2</th>
<th>Case3</th>
<th>Case4</th>
<th>Case5</th>
<th>Case6</th>
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<tbody>
<tr>
<td>Count</td>
<td>P2</td>
<td>Count</td>
<td>P2</td>
<td>Count</td>
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<td>Count</td>
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<td>Count</td>
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<td>0.000</td>
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<td>0.000</td>
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Table 17: Innovative Group - Functional Diversity Data

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