

UNIVERSITY OF KWA-ZULU NATAL

Title

Impact of Information Technology on Innovation in Determining Firm Performance

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**College of Law and Management Studies**

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- Each and every participant that took the time to complete the survey

## Abstract

The aim of this study was to investigate if IT Capability played a moderating role on the relationship between Innovation Capability and the Firm Performance. The study used resource-based theory to test if IT was a competitive resource, by examining the role it played between the constructs of innovation capability and firm performance. A cross-sectional study was conducted amongst two hundred and ninety two (292) employees at the Hillside Aluminium Smelter in Richards Bay, South Africa. The results showed a strong, positive and statistically significant relationship between innovation and firm performance (r-value of 0.616, p-value <0.01, and R<sup>2</sup> value of 0.375). The results also support the model in showing a moderate and statistically significant relationship between IT Capability and Innovation Capability (r-value of 0.563, p-value <0.01, and R<sup>2</sup> value of 0.32). The conceptual model tested the moderation role of IT Capability between Innovation Capability and Firm Performance. These results showed a favorable result for the moderator variable (p-value <0.01), however the Innovation Capability as the independent variable showed an unfavorable results (p-value=0.579 > 0.05), albeit with a good R<sup>2</sup> value of 0.45. Consequently, a multiple regression analysis was conducted using IT Capability and Innovation Capability as independent variables. This model proved to be statistically significant with both p-values of <0.01 and a R<sup>2</sup> value of 0.4573. This result fitted well with the research analysis. For practice, the drive for innovation as a key determinant of future firm competitive advantage must factor in the technological capability, specifically information technology. Through the careful selection of IT resources and skills, IT capabilities the are valuable, rare, imperfectly imitable, and non-substitutable can be achieved, resulting in IT as a strategic resource.

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## Abbreviations

ANOVA	Analysis of Variation
CA	Competitive Advantage
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CIO	Chief Information Officer
CO	Customer Orientation
CPOE	Computerised Physician Order Entry
DC	Dynamic Capabilities
EE	Employment Equity
EMT	Expertise and Management Team
FP	Firm Performance
HA	Hillside Aluminium
IC	Innovation Capability
ICT	Information and Communication Technology
IIC	Information Infrastructure Capability
INC	Innovation Capability
INNO	Firm Innovativeness
IO	Internal/Cost Orientation
IPS	Information Processing Systems
IT	Information Technology
ITBV	Information Technology Business Value
ITC	Information Technology Capability
ITOT	IT-enabled Organizational Transformation
KM	Knowledge Management
ODC	Organisational Dynamic Capability
OEM	Original Equipment Manufacturer
PACS	Picture Archiving and Communication Systems
PCC	Pearson Correlation Coefficient
PO	Competitor Orientation
RBV	Resource-based View
SaaS	Software-as-a-Service
SCA	Sustainable Competitive Advantage

SCC	Supply Chain Capability
SME	Small Medium Enterprises
SO	Strategic Orientation
TBL	Triple Bottom Line
TO	Technology Orientation
TT	Technology Turbulence
VRIN	Valuable, Rare, Imperfectly imitable, and Non-substitutable

# 1 CHAPTER ONE Introduction

## 1.1 Introduction

In this chapter the study context, research focus and research approach is presented. The motivation and focus sections set the theoretical and practical context of the research. The problem statement, research questions, and research objectives sections set the research focus. The research methodology is introduced and finally the structure of the rest of research is outlined.

## 1.2 Motivation for the Study

The aim of this study was to investigate if IT Capability played a moderating role on the relationship between Innovation Capability and Firm Performance. The knowledge gained through this understanding would enable a business to make more informed IT investment decisions. CEOs have acknowledged the role technology plays as chief external influencers on their enterprises (Berman et. al, 2016) and so need to ensure they don't fall victim to the productivity paradox. CIOs therefore need to have a thorough understanding of the organisation's internal and external environments to craft and execute IT strategies which maximise IT business value. Information technology OEMs (original equipment manufacturers) are required to develop a comprehensive understanding of their customers' environments to ensure they can support them in achieving their respective strategies. This study focuses on the strategic relevance of information technology with the aluminium industry, of which no study has been found. This quantitative study will therefore add to the body of knowledge on IT business value, including determining the role of IT capability as a strategic resource in the manufacturing industry.

## 1.3 Focus of the Study

According to Drnevich and Croson (2013) IT resources include tangible resources (physical IT infrastructure and human IT resources) and intangible IT resources (e.g. knowledge systems). Information technology capability (ITC) reflects a firm's capability to "source, implement, integrate, and reconfigure IT resources in support and enhancement of business strategies and work processes" (Cai et al., 2016). This study focuses on IT through its collective capabilities drawn from the underlying



resources. IT Capability therefore represents a multifaceted construct, and is studied as such in this investigation.

Determining the strategic relevance of ITC is the aim of this study. The literature will focus mainly on theoretical and empirical work related to ITC and its impact on enabling sustainable competitive advantage. Innovation and Firm Performance, as supporting constructs, will be investigated in understanding the strategic relevance of IT. The growth in global markets and rapid technology improvements forces organisations to continually adapt, improve, and be innovative (Turulja & Bajgoric, 2016).

#### 1.4 Problem Statement

The Productivity Paradox from the 1980s referred to the increase in productivity at the country and firm levels but this did not correspond with the significant growth in information technology (Daulatkar & Sangle, 2015). A key point of contention is that improvements in firm performance promised by IT opportunities were not consistent with the significant investments in such IT (Daulatkar & Sangle, 2015).

The correct strategic positioning of IT in an organization is crucial for its success, including its long-term competitiveness. Many CEOs and CIOs are faced with this challenge. Daulatkar and Sangle (2016) re-conceptualization of IT business value shows that if the business strategy is *prospector*, then the IT insourcing is suggested, whereas if the business strategy is *defender*, then IT outsourcing is preferred. Once this decision sourcing strategy is made, it will be very costly to change. Incorrect IT strategic positioning is therefore a risk to business. Cai et. al. (2016) showed ITC to be valuable but not rare and so a common resource. Ong and Chen (2013) researched the relationship between ITC and firm performance, future firm performance, and firm value. Their results showed a positive and statistically significant relationship between these constructus, albeit with varying levels of significance, and concluded ITC as a strategic resource. These literature studies show divergent results of ITC strategic relevance.

The relationship between innovation and firm performance has been well researched and there exists an abundance of studies confirming the positive and significant relationship between these constructs (Michna, & Meczynska, 2012; Birkner & Mahr, 2016; Kmiecniak, Leitner, Warnke, & Rhomberg, 2016; Reaiche, de

Zubielqui, & Boyle, 2016). The research was built on this model and investigated the influence of ITC on business strategic. Extant literature on the constructs of ITC and innovation capability (INC) showed varying outcomes (Turulja & Bajgoric, 2016). The research aimed to determine the impact of IT capability on innovation capability in determining firm performance.

### 1.5 Research Question

The following points summarize the research questions this study aims to uncover:

1. What is the impact of innovation capability on the firm performance?
2. What is the impact of information technology capability on innovation capability?
3. Does information technology capability play a moderating role in the relationship between innovation capability and the firm performance?

### 1.6 Objectives

The following are the research objectives of this study:

1. To find out if there is a beneficial impact of innovation capability on the firm performance
2. To find out if there is a beneficial impact of information technology capability on innovation capability
3. To find out if information technology capability plays a moderating role in the relationship between innovation capability and the firm performance

### 1.7 Methodology

The research used a quantitative study approach. The research instrument used was a questionnaire presented online for ease of data gathering and preparation. The questionnaire was designed around two broad scales of data. The first was demographic data using nominal and ordinal scales, the second, used a Likert scale (five point scale is used), which is based on interval scale. The questions were based on extant literature on the constructs of ITC, INC, and FP. The conceptual

model presented the hypothesis showing the relationship between these constructs. The data collected was analyzed using regression analysis and Pearson correlation coefficient. The findings were discussed using the Pearson r-values, ANOVA table (p-value interpretation) and model summary (to interpret the  $R^2$  values).

## 1.8 Chapter Outline

There are five chapters covering this research. Below is a summary of these chapters.

1. Chapter One – this chapter introduced the main topic addressed by this research. The motivation for the selected topic is provided. To achieve the aim of the topic, the research questions and objective are listed. A brief overview of the research methodology is presented. The chapter completes by providing an overview of what to expect from each chapter, and then concludes with a summary.
2. Chapter Two – this chapter presented the extant literature focusing on the main issue of IT strategic relevance. The literature review includes discussion on the theory underpinning this study and then proceeds to present theoretical and empirical research findings. The literature review focuses on the constructs of this research viz. IT Capability, Innovation Capability, and Firm Performance.
3. Chapter Three – the methodology followed by this study is presented. It covers the main research design components including the research philosophy and paradigm. The research instrument is presented and motivated. Data collection and analysis methods are also presented and discussed.
4. Chapter Four – the chapter presents the results of the survey analysis using the chosen statistical tool. In particular the results presented are aligned to the research objectives.
5. Chapter Five – the final chapter presented a discussion on the findings, the conclusion from the study and recommendations for theoretical and practical purposes. Limitations experienced in the course of the study are also included in this chapter.

## 1.9 Summary

This chapter introduced the main topic addressed by this research. The motivation for the selected topic is provided. To achieve the aim of the topic, the research questions and objective are listed. A brief overview of the research methodology is presented. The chapter completes by providing an overview of what to expect from each chapter. The next chapter is a literature review of extent research for the topic selected.

## 2 CHAPTER TWO Information Technology: Strategically Relevant or Common Resource?

### 2.1 Introduction

The chapter first introduces principles of strategic management theory and resource-based theory. Information technology capability is discussed based on the review of extant academic research. Next, the concept of innovation is presented, narrowing the focus on the relationship with information technology. Firm performance (FP) is the last concept that is presented. While this may be considered a relatively simple construct, the research includes different facets of FP that may impact or influence innovation capability (INC) or information technology capability (ITC). For example, FP can be considered from different levels within the organization i.e. strategic or operational. In addition, most organizations may only consider FP from a financial perspectives, however this may not be adequate e.g. triple bottom line reporting. Furthermore, business ethics has become a critical facet of business in the past decade, and so an ethical dimension to reporting on FP is also presented.

### 2.2 Theoretical Perspective

Dent and Bozeman (2014) present the factors that contributed to the development of modern management into the prevalent power it is today. Their research covered the salient societal ideas and stimuli that shaped the environment for modern management to be established: social Darwinism and religion, the growth of social science, the capacity of the scientific method, and the viewpoints of the business magnates. Their findings showed the factors having the most significant impact on modern management were social Darwinism and the potential of the scientific way.

One of the most influential factors of modern management was the book, "*The Origin of Species by Means of Natural Selection or the Preservation of Favored Races in the Struggle for Life*" by Charles Darwin (1859). Darwin theory presented a reason for the survival of species. Sociologist Herbert Spencer (1864, pp. 444-445, as cited by Dent et al) combined Darwin's theories into societal theories by stating that, "This survival of the fittest, which I have sought to express in mechanical terms, is that which Mr Darwin has called, natural selection or the favoured races in the struggle

for life". These early works of Darwin and Spencer is what I would consider as the seeds of what we are witnessing to the highly competitive new economy.

Scientific management is a theory of management that analyzes and synthesizes workflows (Taylor, 1911). Its main objective is improving economic efficiency, especially labor productivity. Parker (2016) empirical study on activity-based work (ABW) show cost efficiencies and productivity emerge as key ABW output focus. This reflects scientific management principles of early twentieth-century. Taylor's scientific management was not only about efficiency gains but also about the effective usage of firm's resources, inclusive of the workforce. (Dent & Bozeman, 2014). Taylor (1911) popularized modern management in an unprecedented way. These preceding theories of Darwinism and scientific management are now brought together under a unified theory i.e. resource-based theory. This theory is presented in the following section.

### 2.3 Resource-based View Theory

Strategic management theory serves as the theoretical foundation for this research, in particular resource-based theory. Resource-based theory (RBT) considers the capabilities and skills of an organization as the key factors in explaining the difference between an organization achieving competitive advantage and one that is not (Turulja & Bajgoric, 2016). Information technology and innovation are considered resources of the organization thereby integrating into management theory and leading into the conceptual model in Figure 3.1 as key constructs.

The definition of resource-based theory (RBT) draws on the works Barney (1991), Grant (1991), Enriquez de la o (2015) and Turulja and Bajgoric (2016). The common thread through these articles is the relevance and relationship between a firm's resources and its strategy. Organization or business strategy is directly linked to FP. The concepts of resources and capabilities are explored including the salient characteristics that make these relevant for strategic relevance.

Grant (1991) draws definition from two different strategy perspectives, namely the corporate strategy and business strategy. At the corporate strategy level, theoretical interest in economies of scope and transaction costs have focussed attention on the role of corporate resources in determining the industrial and geographical boundaries of the firm's activities. At the business strategy level, explorations of the

relationships between resources, competition, and profitability include the analysis of competitive imitation, the appropriateness of returns to innovations, the role of imperfect information in creating profitability differences between competing firms, and the means by which the process of resource accumulation can sustain competitive advantage. Together, these contributions amount to what has been termed "the resource-based view of the firm."

Barney (1991) examines the link between firm resources and sustained competitive advantage. A firm is said to have a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented currently by any of its potential competitors. Furthermore, a sustained competitive advantage includes the definition of competitive advantage but extends it to include when these competitors are unable to duplicate the benefits of this strategy. Firm resources include all assets, capabilities, organizational processes, firm attributes, information knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Barney ,1991). Barney classifies these numerous possible firm resources into three categories: physical capital resources, human capital resources, and organizational capital resources. Barney aimed is to specify the conditions under which such resources can create sustained competitive advantage for a firm. For the purposes of this research, this implies identifying the resources that impact FP.

Understanding sources of sustained competitive advantage (SCA) for firms has become a major area of research in the field of strategic management. According to (Barney, 1991) a single organizing framework has been used to structure much of this research as shown in Figure 2.1.

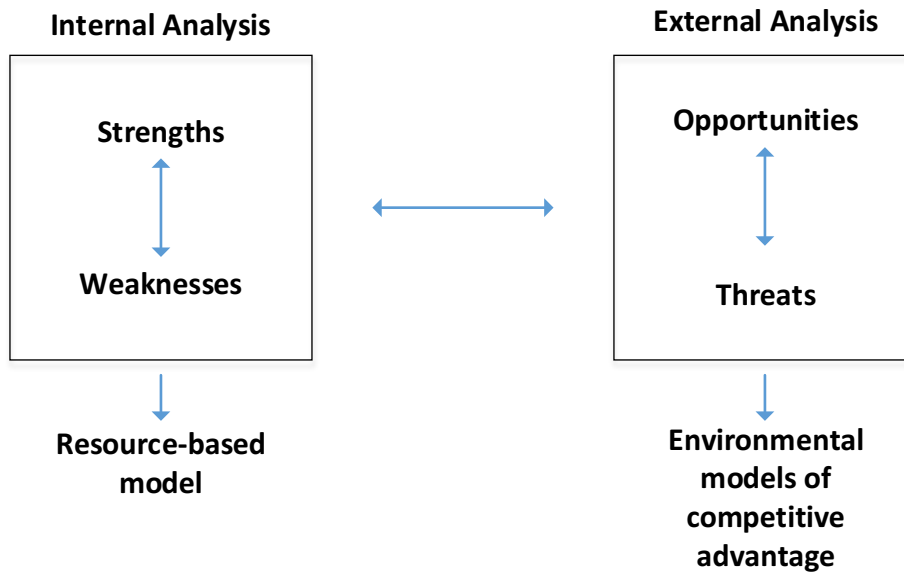


Figure 2.1 Relationship between traditional SWOT analysis, the resource based model, and models of industry attractiveness

Adapted from Barney (1991)

According to (Barney, 1991) the framework suggests that firms obtain sustained competitive advantages by implementing strategies that exploit their internal strengths, through responding to environmental opportunities, while neutralizing external threats and avoiding internal weaknesses. For a firm's resources to hold the potential of SCA, it must have four attributes:

- a. it must be valuable, in the sense that it exploit opportunities and/or neutralizes threats in a firm's environment
- b. it must be rare among a firm's current and potential competition
- c. it must be imperfectly imitable, and
- d. there cannot be strategically equivalent substitutes for this resource that are valuable but neither rare or imperfectly imitable

Due to the initials of each characteristic, these are called VRIN (Valuable, Rare, Imperfectly imitable, and Non-substitutable) (Enriquez de la o, 2015). These firm attributes are briefly defined next.



### 2.3.1 Valuable Resources

Firm resources can only be a source of competitive advantage or SCA when they are valuable (Enriquez de la o, 2015). Resources are valuable when they enable a firm to realize strategies that improve its efficiency and effectiveness. Firm attributes may have the other characteristics that could qualify them as sources of competitive advantage, but these attributes only become resources when they exploit opportunities or neutralize threats in a firm's environment. That firm attributes must be valuable and thus sources of competitive advantage indicate an important complementarity between environmental models of competitive advantage and the resource-based model (Enriquez de la o, 2015). Environment models can identify firm attributes that exploit opportunities and/or neutralize threats, and thereby highlight which firm attributes may be considered as resources. Consequently, the resource-based model suggests what additional characteristics that these resources must possess if they are to generate SCA.

### 2.3.2 Rare Resources

Valuable firm resources also owned by rival companies would not be considered causes of competitive advantage nor SCA. Competitive advantage is established by a company when the value-adding strategy it has is not being developed in parallel by any of its rivals (Enriquez de la o, 2015). The same applies to bundles of valuable firm resources used to identify and implement strategies. Some strategies require a particular mix of physical capital, human capital, and organizational capital resources to implement. It must be noted that since valuable and rare resources result in competitive advantage is not to ignore common resources. Common resources help to guarantee a company's existence when they are utilized to produce competitive parity in an industry (Barney, 1991; Enriquez de la o, 2015). Competitive parity aids the economic survival of an organization, albeit no single entity may achieve competitive parity (Barney, 1991; Grant, 1991). How rare a valuable firm resource must be in order to have the potential for generating a competitive advantage is a difficult question. "In general, as long as the number of firms that possess a particular valuable resource is less than the number of firms needed to generate perfect competition dynamics in an industry" (Grant, 1991; Grant, 2013), that resource has the potential of generating a competitive advantage.

### 2.3.3 Imperfectly Imitable Resources

Valuable and rare organizational resources can only be sources of SCA if firms that do not possess these resources cannot obtain them. Such firm resources are referred to as being imperfectly imitable. Firm resources can be imperfectly imitable for one or a combination of three reasons (Barney, 1991):

- a. the ability of a firm to obtain a resource is dependent upon unique historical conditions,
- b. the link between the resources possessed by a firm and a firm's sustained competitive advantage is causally ambiguous, or
- c. the resource generating a firm's advantage is socially complex.

### 2.3.4 Substitutability

The last requirement for a firm resource to be a source of SCA is that there must be no strategically equivalent valuable resources that are themselves either not rare or imitable (Grant, 1991; Enriquez de la o, 2015). Substitutability can take at least two forms. First, though it may not be possible for a firm to imitate another firm's resources exactly, it may be able to substitute a similar resource that enables it to identify and implement the same strategies. Second, very different firm resources can also be strategic substitutes. Barney (1991) cites the example of a charismatic leader and a company-wide strategic planning process to be firm resources. While these are two different firm resources, they are substitutes for each other in establishing a clear perspective of a company's future.

### 2.3.5 Firm Resources and Sustained Competitive Advantage

Barney (1991) presents a framework for the relationship between the concepts investigated, as presented in Figure 2.2 below.

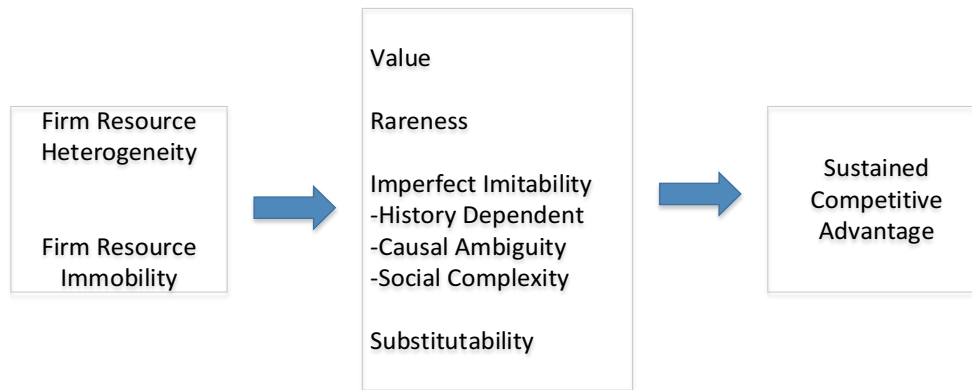


Figure 2.2 The Relationship between Resource Heterogeneity and Immobility, Value, Rareness, Imperfect Imitability, and Substitutability, and Sustained Competitive Advantage

Adapted from Barney (1991)

In a broad sense, resources can be considered as tangible, intangible and human. Furthermore, resources can be classified to be static or dynamic (Enriquez de la O, 2015). Lockett, Thompson, and Morgenstern (2009) indicate three core components in RBV: resource functionality, resource combination, and resource creation and decay. Value is created by the combination of resources. Importantly, should a resource lose any one of its VRIN characteristics it must be replaced, in order to maintain SCA.

Barney (1991) proposed that a broad range of firm resources could be analyzed for their potential as SCA. This analysis not only specifies the theoretical conditions under which SCA might exist, but also suggests specific empirical questions that need to be addressed before the relationship between a particular firm resource and SCA can be understood. Using this framework, Barney presents an example using information processing systems (IPS). The type of information system being analyzed determines if it presents sustained competitive advantage. A computer by itself is unlikely to offer sustained competitive advantage. Due to computers being a common resource, any strategy accrued to this resource is very probably going to be imitated and thereby not a source of SCA. However, an IPS that is entrenched in a company's formal and informal decision-making process may offer potential SCA (Barney, 1991). In such an environment, according to Barney, information

processing as a resource can be regarded as valuable, rare, imperfectly imitable, and non-substitutable, thus having the potential to be a source of SCA.

## 2.4 Dynamic Capabilities and Sustained Competitive Advantage

Firms obtain SCA in many ways, for example, developing new products in new markets, establishing improved production processes due to innovation, and by creating new business model. Major themes in the development of strategic management include strategy as positioning, competitive advantage, and strategic conflict (Teece, Pisano & Shuen, 1997). These strategy approaches have in common the fact that benefits come from an advantageous product/market position, with a predominantly external environment focus. An alternative approach is a focus on internal resources, trying to establishing SCA by reaping entrepreneurial benefits arising from firm level efficiencies. These methods are the resourced-based view (RBV) of the organization and the related dynamic capabilities (DC) theme.

Centering on capabilities and internal resources, RBV and DC strategies can provide a sustainable competitive advantage than the common product/market method. However, this means that external environment and recommendations of industrial organization from Porter must be complemented. The responsibilities of managers and leaders in varying industries is a hint for the deployment of resources and capabilities. Their decisions, their integration and the way they adapt faster than industry speed will ensure survival.

Penrose (1959) settled that firms are “flesh and blood” organizations, and not just a point on a cost curve. The theory of growth of a firm states that the organization is composed of two resources, human and non-human. These resources are under authoritative and administrative coordination and communication. Penrose studied the firm’s internal resources as primary sources of competitive advantage. He also claimed that management are integral to the success of the firm. Penrose (1959) found three factors which served as the impetus for internal resources and capabilities to obtain more attention: a) business environments are being more unstable, requiring a more stable foundation on which strategy can be created; b) the belief that competitive advantage and not only industry attraction was the primary source of profitability; and c) the reality of a world in which consumer needs and technological advancements are constantly evolving.

Resource-based view and Dynamic Capabilities relate to the strategy creation of SCA focusing on internal resources and complement the focus on industry structure that Porter has claimed (Brahma & Chakraborty, 2011). RBV strategy concentrates on the most efficient role of resources and capabilities as the prime source for a SCA. Resource-based view is centered on the character of firms grounded on its resources. Another way to define the RBV is as a determined collection of assets or resources that are tied “semi-permanently” to the firm (Wernerfelt, 1984) and (Lockett, Thompson, & Morgenstern, 2009).

Resource-based view has had a major impact on strategy because the typical product/market orientation is no longer suitable due to the constant and rapid change of the external environment and customer preferences (Grant, 2013). It is easy to catch this if we consider that it is more feasible to control internal resources and capabilities to face the real world, than changing the world to adapt to the firms' needs. RBV strategy seems insufficient to support significant and sustained competitive advantage, especially in rapidly changing environments. The problem with RBV is that the view of the firms as a bunch of resources is very static and limited and does not provide explanations on how successful firms endure over time with an increasing competitive environment. This ability to achieve new forms of competitive advantage through the renovation of competition-based resources and competences belongs to dynamic capabilities approach.

According to Barney (1991), dynamic capabilities (DC) follow the theory of RBV of the firm. Dynamic capabilities can be considered a complement to RBV approach. An interesting definition of dynamic capabilities as follows: “the firm ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Ambrosini, Bowman, & Collier, 2009).

#### 2.4.1 Dynamic Capabilities

Dynamic capabilities refer to resources acquired by managers' through path dependence in managing volatile environments. Resource-based view and dynamic capabilities focus on strategy through a performance perspective instead of through Porter's market position stance (Teece, Pisano, & Shuen, 1997). They emphasize path dependence and internal resources of them, rather than the external environment focus that Porter proposes.

Dynamic capabilities are not capabilities by themselves neither are they resources. In dynamic capabilities, the term “capabilities” stresses “the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment” (Teece, Pisano, & Shuen, 1997, p. 515).

The word ‘dynamic’ denotes to the capability to revamp competences and resources to have relevance with the changing environment (Teece, Pisano, & Shuen, 1997). It is also future positioned because it represents processes that modify the base VRIN resources, rather than just consuming and uniting them in a variety of ways. Dynamic implies a change in environment, but not to the ability of being dynamic. In RBV, capabilities refers to the way the resources are utilized. It refers to the skills to change and adapt constantly external and internal resources to address the volatile environment (Ambrosini & Bowman, 2009).

#### 2.4.2 Sustained Competitive Advantage

Generally, literature has identified two major sources of greater profitability: industry attractiveness and competitive advantage (CA) with competitive advantage being considered the more relevant (Grant, 2010). Studies have shown the high correlation between firm resources and competitive advantage. In RBV, competitive advantage is achieved when a firm identifies and applies its VRIN resources. However, these VRIN resource remain constant during a specific window in time, and at some future point these resources can be copied or substituted by competitors and thereby removing the competitive advantage. Considering literature, it appears that DC is a supplement to the static approach of the RBV to get material and sustained CA. According to Ambrosini and Bowman (2009) “dynamic capabilities govern the rate of change of a firm’s resources and notably its VRIN resources”. Ambrosini et al. (2009) state that the abstract and intangible nature of DC, its impact on FP is indirect unlike with VRIN resources which are more direct. Dynamic capabilities are necessary but not sufficient for creating SCA as they are imitable.

Dynamic capabilities are going to be very significant for the future mainly due to the ever-evolving business environment. For this reason static resources are not an option by themselves. The identification of correct routines and processes that

enable firms to renew based resources, thus identifying VRIN resources, will result in giving firms the ability to compete and realize material and sustainable CA (Ambrosini, Bowman, & Collier, 2009). The potential for long term CA exists in the resource configurations management create utilizing DC, and not in the capabilities themselves.

## 2.5 Information Technology Capability

Resources are considered those assets of a firm that are tangible and result in profits, which may be transferred from company to company without any major loss in value (Drnevich & Croson, 2013). IT resources are composed of three components, namely, tangible resources, human IT resources and intangible IT-enabled resources (Drnevich & Croson, 2013). Information technology (IT) capability reflects “a firm’s ability to acquire, deploy, combine, and reconfigure IT resources in support and enhancement of business strategies and work processes” (Cai et al., 2016). This ability is an important catalyst that helps achieve business value by embedding IT-enabled resources to support the processes and strategies of a firm (Cai et al., 2016).

The importance of IT capability in supply chain management is widely recognized in literature. For example Cai et al. (2016) considered supply chain management to be digitally enabled and generates significant research opportunities in the interdisciplinary field of IT and supply chain management.

In Cai et al. (2016), their research covers the relationship between SCC and organizational responsiveness as well as its boundary condition based on the organizational learning perspective. The current study reports that IT capability serves as a significant boundary factor that moderates the relationship between SCC and organizational responsiveness. The study shows that the moderating effects of the three IT capability types vary; both outside-in and spanning IT capability enhance the positive relationship between SCC and organizational responsiveness, whereas inside-out IT capability weakens the relationship between SCC and organizational responsiveness (Cai, Huang, Liu, & Liang, 2016). The results of the study show that the three types of IT capability cannot directly influence organizational responsiveness in the context of supply chains. The results reflect an emerging insight that IT capability is valuable but not rare. IT has been standardized

and homogenized meaning that most firms can afford IT artifacts and acquire such capability. As the IT barrier decreases, the strategic role of IT capability changes from a leading one to a supporting one. This supports that view that IT is a commodity can holds little strategic relevance to an organization.

Ong and Chen (2013) study is to simultaneously determine the impact of information technology capabilities on FP, future FP, and firm value. The study uses secondary data from 480 matched-firms from InformationWeek and Compustat database. The results conclude that IT capability does has a positive influence on these three constructs, although they vary in significance. In particular, the significance level of firm value is higher than that of FP. In addition, FP represents a short-term influence and firm value represents a long-term influence. Of importance for strategic relevance, the long-term significance is important. In other words, managers should pay more attention to the long-term strategic positioning that IT provides for firms, rather than only considering the short-term improvements gained through improvements in operational effectiveness.

### 2.5.1 IT Capability and Knowledge Management Resources

Knowledge management (KM) is an important determinant for the information infrastructure capability (IIC) and organisational competitive advantage (CA) (Sook-Ling, Ismail, & Yee-Yen, 2015). Sook-Ling et al. (2015) propose an inclusive research model to overcome the single perspective issues of the previous research which were looking at either on knowledge management (KM) activity, information technology (IT) applications or information infrastructure capability (IIC) independently. The study was conducted using primarily case studies using eight companies, two international, and six national. They propose and empirically analyse an inclusive KM research framework that examines how IIC influences the sustainable KM and CA of an organisation. This framework is illustrated in Figure 2.3 below.



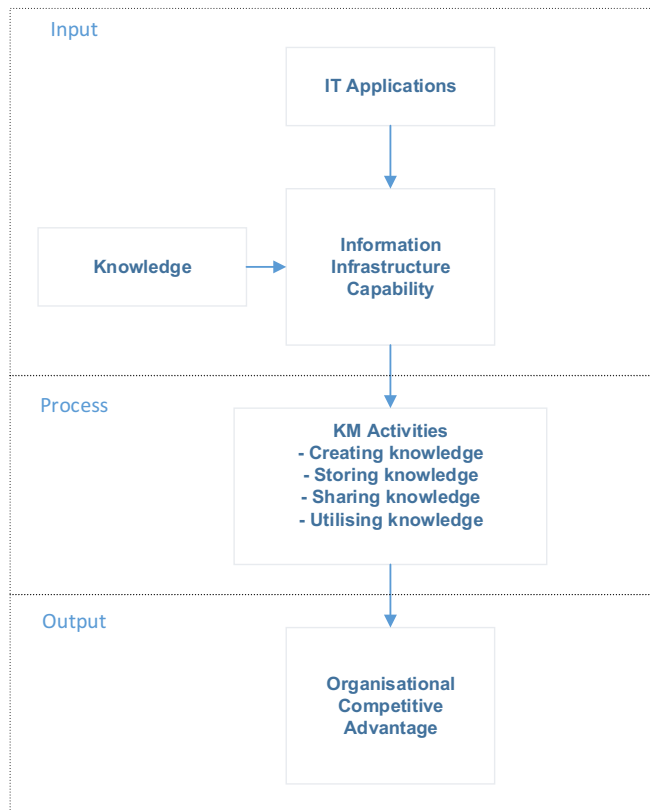


Figure 2.3 Comprehensive framework to investigate how effective IIC and KM Measures can contribute to Organization CA

Adapted from Sook-Ling, Ismail, & Yee-Yen (2015)

According to Sook-Ling et al. (2015) the above framework is in a view of information processing flow, showing the relationships in three phases with connected direction: input, process and output. Having IIC is first perceived as “input”; performing KM processes is perceived as “process” in the middle phase and achieving “organisational CA” is observed as output.

According to Sook-Ling et al. (2015), IIC is regarded as organisational information processing capability that may result in organisational CA. These authors present a research framework that includes key IICs such as the capabilities of integration, data management, security, utility and collaboration. Such a comprehensive framework enhances the KM practices of knowledge and technology based firms so as to achieve long term CA.

Sook-Ling et al. (2015) findings identified that through an understanding of the types of knowledge and services, relevant IT applications can be identified and

implemented in support of KM initiatives. Sook-Ling et al. developed the model shown in Figure 2.4 to aid in the identification of such types.

		Knowledge Type	
		Exploitive	Explorative
Service Type	Unique	Type I	Type II
	Standardised	Type III	Type IV

Figure 2.4 Knowledge Management Model

Adapted from Sook-Ling et al. (2015)

Sook-Ling et al. (2015) identified two types of service, namely unique and standardised. Unique services are those that may be highly context dependent, whereas a standardised service has low context dependency (and more procedure-oriented service). They classified knowledge into two types, namely exploitive and explorative. Exploitive knowledge is considered more explicit and therefore easier to be shared. Explorative knowledge is however more tacit and hence requires more formal and structured mechanism to disseminate such knowledge.

Some of the salient findings from the case study based research by Sook-Ling, et al. (2015) are:

- the proposed framework (Figure 2.4) would be a more appropriate target instead of multi-business organisations.
- among all the IIC components, utility capability appears as priority for strategic human resource practices
- To enable concise achievement of organisational CA, the right IT applications must be selected. KMS has improved the efficiency and effectiveness of its day to day IT troubleshooting and generated data management capability.

- IIC is considered an information processing capability that may result in organisational CA

Knowledge management is a crucial factor in innovation. This relationship between KM and ITC demonstrates the link between innovation and information technology capability. Understanding the level of ITC in an organisation is therefore important for the purposes of this research.

### 2.5.2 Disruptive Technology Impact on Strategy Management

A disruptive technology is one that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new industry (Christensen, 1997). He separates new technology into two categories: sustaining and disruptive. Sustaining technology relies on incremental improvements to an already established technology. Disruptive technology lacks refinement, often has performance problems because it is new, appeals to a limited audience and may not yet have a proven practical application. "Disruption is a theory of competitive response. It tells you: if I innovate in this way, then this is what I can expect incumbent competitors to do. If I introduce a sustaining innovation, incumbents will generally try to mount a defence and try to eliminate me. If it's disruptive innovation, they are likely to ignore me or flee rather than fight." (Denning, 2016). Information technology is a major player in the disruptive technology space e.g. PC, email, cloud computing and social networking.

According to the strategy field, differences in an organization's form may represent a company's capability to obtain benefits through its investments in technology. Pratono (2016) research adds to this sentiment, when investigating the relationship between a firm's strategic orientation (primary determinant) and firm performance (dependent variable) and claiming that technology turbulence as the primary contingency factor. The purpose of his study is to offer guidance in matching strategic orientation (SO) with varying levels of technology turbulence (TT). The study involved randomly surveying 390 small and medium enterprises (SMEs) in Indonesia.

According to Shin & Lee (2016) a firm's major key strategic orientations are customer orientation (CO), competitor orientation (PO), technology orientation (TO) and internal/cost orientation (IO). The study investigates the influence of information

TT on the relationship between SO and FP. By defining IT as a moderating variable “offers a holistic conceptual of technological business value” (Cao et al., 2011). IT contributes to firm’s performance if it can properly combine with other company factors, such as SO. Information technology is defined as a moderating variable which contributes to firm performance via such a company factor, and so being considered as resource complementary. Figure 2.5 shows a graph depicting the results of the study.

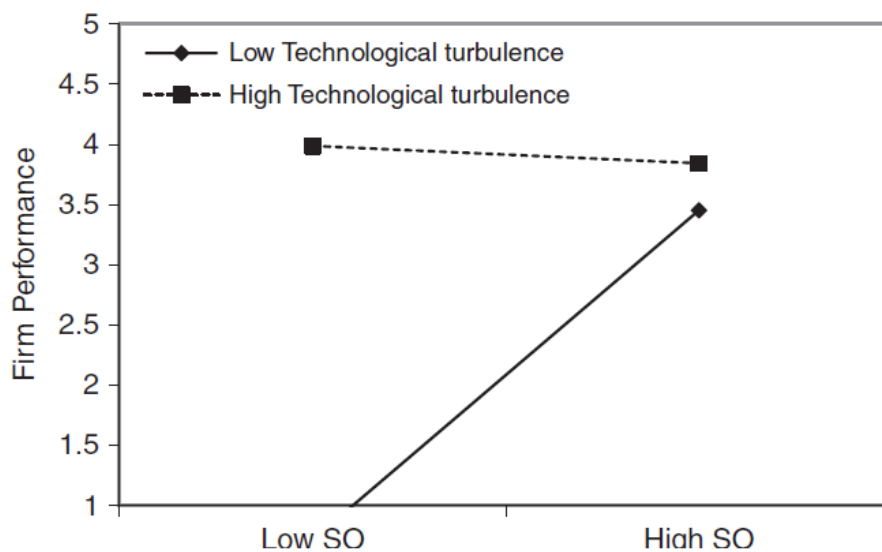


Figure 2.5 Moderating effect of information technology turbulence  
Adapted from Pratono (2016)

Figure 2.5 shows Pratona (2016) findings that TT brings varying impact on FP. If TT is low then SO shows a positive relationship with FP (solid line). However during high TT, the relationship changes to a negative one (dashed line). The findings show that IT provides challenges to the performance of SMEs. Technology turbulence changes the impact of the independent variables on the performance of the firm within the field of contingency theory. Information technology turbulence remains for the foreseeable future. In order for SMEs to ensure their investments strategic orientations contribute favourably to the FP, they have to ensure the right IT capabilities exists. In this way, IT capabilities have a significant role in driving FP, thus aligning to being an important strategic resource in SMEs as per this study.

### 2.5.3 Information Technology Business Value: Strategic Perspective

In today's highly competitive economies, costs, and in particular cost/benefits are under severe scrutiny. Daulatkar and Sangle (2015) have defined IT business value (ITBV) as "The organizational performance impacts of IT at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impact". The huge potential of IT in enhancing organizational performance compared to the significant investment seems to be the middle of argument (Daulatkar & Sangle, 2015). IT business value (ITBV) addresses the relationship between IT investment and organizational performance (Daulatkar & Sangle, 2015).

The Productivity Paradox was in reference to the disparity between the productivity growth in industry (national and firm level) and the boom in information technology (Daulatkar & Sangle, 2015). Widespread research was conducted to address the impact of IT and FP, however these findings remain inconclusive. Many theoretical frameworks or models have sought to explain the impact of IT on organizational performance (Daulatkar & Sangle, 2015). Extant research on ITBV has been limited up to now. According to Daulatkar and Sangle (2015), only three major themes on IT creation value for business strategy have been research. These are listed in Table 2.1 below.

Table 2-1 Summary of the three previous literature reviews on "value"

Year	Central Theme	Findings about "Value" in ITBV
2004	Sustained competitive advantage	Level of inimitability of rare organizational resources that are complementary to IT and lack substitutes impacts the degree to which a firm can obtain a sustained competitive advantage
2005	Sustainability of competitive advantage rooted in information systems use	Four determinants of sustainability of IT-dependent strategic initiatives: 1. IT resources barrier (IT assets and IT capabilities); 2. complementary resources barrier, such as organizational structure, governance, or access to distribution channels; 3. IT project barrier (technology characteristics and implementation process); and 4. preemption

		barrier (switching costs and value system structural characteristics)
2008	Future directions in ITBV research	1. IT does create value; 2. IT creates value under certain conditions; 3. IT-based value manifests itself in many ways; 4. IT-based value is not the same as IT-based competitive advantage; 5. IT-based value could be latent; 6. there are numerous factors mediating IT and value; and 7. Causality for IT value is elusive. Four major themes for future research: IT-based co-creation of value; IT-embeddedness; information mindset; and value expansion. Leveraging IS and complementarities can lead to competition-strengthening “differential value”

As adapted from Daulatkar & Sangle (2015)

In order to address this conundrum, Daulatkar & Sangle (2015) focus on organizational dynamic capability (ODC) and IT-enabled organizational transformation (ITOT) as enabled by IT. These two streams of research asserted they may complement each other in explaining why and how IT can create greater FP. Therefore, literature review from the viewpoint of causality of ITBV creation is required before developing a causality model of ITBV creation. Through the knowledge acquired by the causation of ITBV, corporations can justify their IT investments (at times significant) as well as to bring about organization transformation to facilitate improvements in firm performance. The following are the main findings from the research of Daulatkar & Sangle (2015):

1. ODC and ITOT are two supporting streams of ITBV creation.
2. transformational has been identified as the fourth set of benefits through ITBV research (Table 2.1 shows the three existing benefits)
3. reverse causality facet requires formal research and a dynamic capabilities perspective may offer greater insight in the research between IT capability and organizational performance
4. ITOT is in its infancy strategic IS research and requires more detailed research around the OT process

5. organizational learning and change allows an organization to adjust to environmental alterations modifications of organizational characteristics.
6. future dynamic causal ITBV creation models must include all of the intermediary steps

Daulatkar and Sangle (2015) provide primarily a theoretical perspective on ITBV emphasizing the (future) significance of ITOT and ODC. The findings offer limited empirical findings and business relevance. Daulatkar and Sangle (2016) undertake a study to re-conceptualize ITBV benefits. This re-conceptualization improves understanding of ITBV aligning IS with business strategy and objectives and further enabling identification of key ITBV measurements. The study's sampling population were 150 IT experts from various industry service sectors.

There are four dimensions based on extant literature that offer a framework for the classification of ITBV. Three of the benefits are drawn from the work by Mirani and Lederer, and one from Gregor et al. (2006) (Daulatkar and Sangle, 2015; Daulatkar and Sangle, 2016). These are summarised in Table 2.2 below.

Table 2-2 Organizational benefits of information systems

ITBV benefits' dimension	Description	Sub-dimensions
Strategic benefits	Strategic IT is that which “changes an organization’s product or the way in which the organization competes”	“Competitive Advantage” “Alignment” “Customer Relations”
Informational benefits	Informational IT “provides the information and communication infrastructure of the organization”	“Information Access” “Information Quality” “Information Flexibility”
Transactional benefits	Transactional IT “supports operational management and helps cut costs”	“Communications Efficiency” “Systems Development Efficiency” “Business Efficiency”
Transformational benefits	Refer to “the result of changes in structure and capacity in a firm that may accompanying investment in IT”	-

Adapted from Daulatkar & Sangle (2016)

To re-conceptualise the ITBV benefits, Daulatkar and Sangle (2016) used confirmatory factor analysis (CFA) and grouped the various ITBV benefit factors in four primary factors. These four factors were statistically tested and the analysis is presented Table 2.3 using the Hrischhein and Sabherwal’s (2001) alignment profile. The context of this enlisting is based on Miles and Snow (1978) business strategy typology which is frequently used in IS literature (Daulatkar & Sangle, Proposed re-conceptualization of IT business value benefits, 2016).



Table 2-3 Three strategic alignment profiles

Alignment profile		Infusion: alignment through business leadership	Alliance: alignment through partnering	Utility: alignment through low cost delivery
Business strategy		Prospector	Analyser	Defender
IS Strategy	IS role	Opportunistic	Comprehensiveness	Efficiency
	IS sourcing	Insourcing	Selecting sourcing	Outsourcing
	IS Structure	Decentralized	Shared	Centralized

Adapted from Daulatkar & Sangle (2016)

Factor 1 emphasizes efficiency and aligns the role of IS with that of the utility profile of IS alignment – hence the renaming to “Utility” benefits. Utility IS strategy ensures the provisioning of IT services using the most economical vehicle and is based on an outsourcing strategy supported by a centralized IT structure (Daulatkar and Sangle, 2016). The business strategy adopted is that of “Defender” wherein the organization aggressively defends its markets.

Both Factors 2 and 4 seem to correspond to the “Infusion” IS profile. The business strategy best aligned to this is that of “prospector” which corresponds to pursuing and exploiting new opportunities in new markets. However, Factor 2 places emphasis on new products and services by improvements to business models through innovation and transformation, while Factor 4 emphasises an increase on financial assets through the delivery of these services and products to new market.

Factor 3 aligns with “Alliance” IS strategy. With this strategy IS partnerships are formed to support operations and exploit opportunities for improvements. Alliance strategy aligns best with a business strategy of “Analyser”. In such a business strategy the organization aims to maximize profit-making opportunities while simultaneously mitigating any risk.

Based on studies from 2006 to 2012, the traditional conceptualization of IT business benefits of informational and transactional have thus evolved into the utility and alliance benefits, respectively. Table 2.4 below presents this reconceptualization of ITBV benefits.

Table 2-4 Re-conceptualization of ITBV benefits

Parameters	Classification			
Business strategy	Defender	Analysar	Prospector	
Business objective	Efficiency	Building alliances with business	Allows the organization to both create and change a market	
IS strategy	Efficiency	Comprehensiveness	Flexibility	
IS role	Efficiency	Comprehensiveness	Opportunistic	
Alignment profile	Utility	Alliance	Infusion	
ITBV benefits	Utility	Alliance	Transformational	Strategic vision

Adapted from Daulatkar & Sangle (2016)

IT business value benefits signal IT investments that enable an organization to achieve it aims of (Daulatkar & Sangle, 2016):

- economic efficiency (Utility ITBV)
- structured business partnerships (Alliance ITBV)
- innovation enabled products and services (Transformational ITBV)
- changing market (Strategic ITBV)

Mithas and Rust (2016) complement the works of Daulatkar and Sangle (2015) and Daulatkar and Sangle (2016) presented above. Mithas and Rust (2016) study looks at the firm's emphasis on IT strategy and investment and its effect on firm performance. While firm performance is a multidimensional construct, Mithas and Rust (2016) use 'profitability' and 'market value' that connect to fundamentals and

stock market evaluations respectively. The researchers use data obtained from InformationWeek, an IT publication in the United States, which surveyed more than 300 of the top IT managers Fortune 500 firms around North America. Their findings indicated three strategic pathways from IT to firm performance:

1. cost reduction
2. increase revenues
3. a dual emphasis of adopting (1) and (2) simultaneously

This is depicted in Figure 2.6 below shows the relationship between IT investment and profitability based on different levels of IT strategy emphasis.

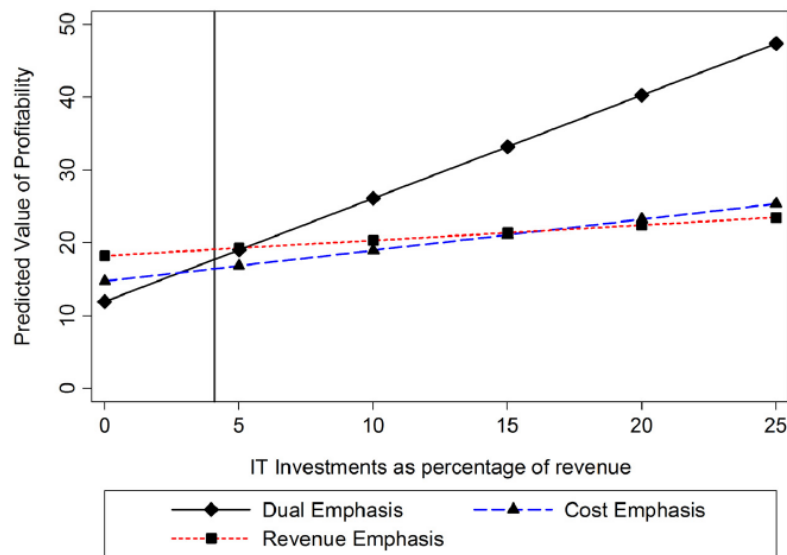


Figure 2.6 Relationship between IT Investment and Profitability

Adapted from Mithas & Rust (2016)

Mithas and Rust (2016) concluded that IT strategic plays a significant moderating role in the relationship between IT investments and FP. Although research provides valuable insight into the impact of IT-related strategic emphasis on FP, the findings also imply that the impacts of strategic emphasis i.e. cost reduction, revenue growth, or a dual emphasis on FP may vary significantly and are contingent on levels of IT investments.

#### 2.5.4 Immersion of Innovation and Information Technology Capability

Turulja and Bajgoric (2016) aim to identify antecedents of firm's success in specific circumstances of the new economy. The purpose of their paper is to analyze the interaction impact of IT capability and firms' innovation on business performance. With reference to RBV, the researches recognize the emerging importance of information technology amongst management and academia as a key resource. Turulja and Bajgoric define IT capability as the existence of three IT components, namely, infrastructure, knowledge and operations within a company. Their research utilizes survey data from managers to determine the relationship amongst IT capability, firm's innovation and business performance. Turulja and Bajgoric (2016) grouped a firm's capital resources into four categories:

1. physical
2. financial
3. human capital
4. organizational

Information technology is considered a physical resource. The combined effects of globalization and technology advancements has placed significant pressure on firms to constantly innovate, improve, and adapt. Their findings provide empirical evidence of the positive relationship between IT capability and innovation.

Pérez-López & Alegre (2012) propose the importance of finding relevant organizational capacities that serve as important mediators between IT and performance. Their findings show that innovation can play a mediating role in the relationship between IT capability (ITC) and firm performance. The results confirm that ITC, is necessary but not sufficient for enabling significant business performance. The researchers also noted that IT capability complemented with organizational culture does promote innovation leading to firm success.

Kmieciak, Michna, and Meczynska (2012) study the relationship amongst ITC and employee empowerment (EE) on innovation as well as the effects of ITC and innovation on firm performance. Their study focuses on small to medium enterprises (SMEs). The study is based in Poland and their sample population is from 109 SMEs. Factor analysis was used in order to identify measureable dimensions for ITC, innovativeness, and empowerment. The researchers investigated the direct

and indirect effects of IT capability on FP. For the indirect scenario, they investigated whether ITC is a moderator of the relationship between innovativeness and FP. Their finding was the ITC does not play a significant moderating role between innovativeness and FP. Information technology development and improvement, the integral role of IT in the economy and the empirical evidence of the impact of IT and FP has resulted in significant interest from academia. As a result a school of thought has emerged that claim that IT cannot be more than a common resource due it not demonstrating the VRIN characteristics of competitive resources. Consequently the RBV theory was adopted in identifying how firms use IT. As a result, causes of competitive advantage comprise various IT-related resources and skills that combine, resulting in an IT capability which demonstrates the VRIN characteristics (Kmieciak, et al., 2012). Applying IT capabilities approach to SMEs, a significant relationship was shown between using IT for internal communications and innovation activity. These results support the view that IT be leveraged off other resources thereby strengthening the positive impact on FP (Kmieciak, Michna, & Meczynska, 2012). In addition it was found that when a suitable climate for innovation is established the result is an improvement in innovativeness. Information technology, was applied in internal communications, results in a positive effect on innovation enhances the climate for empowerment. IT knowledge was found to be an important factor in determining the support by IT for information processes in an organization. This shows that IT skills and knowledge, and investments in these capabilities, will result in greater innovativeness.

## 2.6 Innovation

Innovation is considered one of the most critical capabilities within an organization in this new economy (Birkner & Mahr, 2016). This multi-faceted concept has been extensively researched theoretically and proven empirically to have a direct positive impact on firm performance (Su & Tang, 2016; Srivastava, Sultan, & Chashti, 2017). On the basis of this relationship, information technology is applied to investigate the role of information technology in the new economy.

### 2.6.1 Modern Interpretation of Innovation

Innovation is defined as the skill to do things in another way (Birkner and Mahr, 2016), recognised as something new that can result in value (Reaiche, de Zubieli, & de Zubieli, 2017).

& Boyle, 2016), it is an instrumental in creating a firm's responsiveness toward dynamic business environment (Srivastava, Sultan, & Chashti, 2017). Innovation can be therefore be a critical economic enabler to increase profitability and firm value.

Birkner and Mahr (2016) researched innovation amongst enterprises in Nagykanizsa, Hungary. They argue that in a knowledge-based environment knowledge plays unprecedented importance (Birkner and Mahr, 2016). Consequently knowledge and innovation combine, since innovation is the activity of applying knowledge. Creativity and knowledge are important concepts of innovation. These concepts can be attained and improved through learning (Birkner and Mahr, 2016). Learning is an interactive process and has three subtypes: a) Learning through searching, b) learning through research, and c) learning through production (Péter, 2015). Birkner and Mahr (2016) also proposed two solutions to expanding innovation is an organisation. First, by establishing a new and strong network innovative enterprises within the divisions of industry and services that aspire to international quality levels. And second, to establish strong research capacities with educational institutes around innovation. This would address the gap in innovation skills the researchers observed amongst the SMEs in their sampled population.

## 2.6.2 Modern Forms of Innovation

Leitner, Warnke, and Rhomberg (2016) aims to discuss the critical aspects of new forms of innovation such as increased participation, the use of information technologies and the increased pace of innovation and their challenges for innovation policy. Based on a collection of international practice examples from industry and society, innovation visions have been generated and assessed by different experts across whole Europe. Contemporary innovation models, for instance, open innovation (Chesbrough, 2003), user innovation (von Hippel, 2005), and crowdsourcing (Howe, 2006) have raised much attention in academia, business and policy (Leitner, Warnke, & Rhomberg, 2016). The proponents of these models often highlight the need to adopt these strategies to increase competitiveness in the global innovation race and, albeit to a lesser extent, to address societal challenges. IT software will be integral innovation and it is predicted that we will see further automation of innovation. The INFU project described the visions "open source society" and "automatized innovation", which rest on an extensive use of information

and communication technologies (ICT), and expect that we will see more use of ICT for the search for solutions and the identification of customer demands on the web and for web-based product testing, simulations, etc. With “automatised innovation”, it is assumed that a number of new techniques such as the semantic web analysis allows for automatising parts of the innovation process, ranging from idea generation via design to testing. In this model, sophisticated semantic web filters track changes in consumer preferences and new ideas in real time and automatically extract innovations with an outstanding market potential. Concerning the use of ICT to run the innovation procedure, past principles offer guidance to use of digital data innovation purposes once relevant data has been collected has been collected, this could lead to appropriate law and standards inhibiting automation of innovation.

Although many new innovation models accelerate the innovation process (Leitner, Warnke, & Rhomberg, 2016), there are also some counter trends which in some fields may slow down the innovation process. This development may even lead to a future which might best be described as “Europe as exhausted giant” or “European innovation fatigue”. The negative consequence of this hindsight is that companies may rejected or limit their exposure to innovation. Innovation does come at a cost, and it’s imperative that the benefits derived from the innovation exceed the outlay. Therefore, further research proposed to acquire insight into ICT-based innovations on business and sustainability.

### 2.6.3 Innovativeness and IT Capability

In modern views of economy, innovativeness is considered as one of the significant factors enabling the survival, growth and competitiveness of organisations (Kmieciak, Michna and Meczynska, 2012). In addition, it is asserted, that in the long term, innovativeness is the only effective way to be competitive (Kmieciak et al., 2012). Kmieciak et al. (2012) pursued a study to determine two business objectives. The first was how to improve and retain innovation. The second was how innovation relates to financial and non-financial firm performance. Achieving competitive advantage and improved firm performance are cited as the two primary reasons for firms to innovate. According to these researchers empirical research is divided between the positive relation between innovation and FP. Information technology has shown to positively influence innovation through improvements in

communication, sharing of information and knowledge, inter-organizational exchange and processes of organizational learning, concepts which underlie innovation (Kmieciak et al., 2012). Using IT, customer feedback can be solicited, with such data serving as input into the innovation process and thereby resulting in improved or new product or service (Kmieciak et al., 2012). The conceptual model investigated by Kmieciak et al. is shown in Figure 2.6.

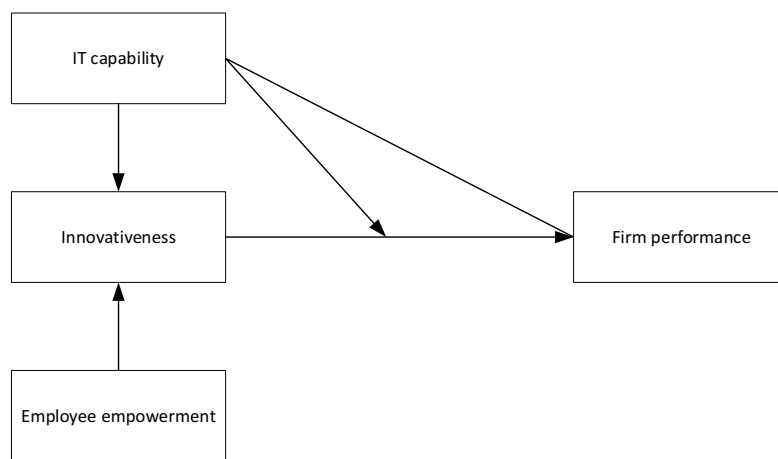


Figure 2.7 Main Relationships among Constructs under Investigation

Adapted from Kmieciak et al. (2012)

The results of this study reveal a positive relation between innovation and FP amongst the Silesian SMEs. In addition, the results reveal that there is no direct relationship between innovation activity and FP (profitability and income growth). This was explained through the fact that innovation comes at a cost hence no relation with profitability growth. Furthermore, innovation does require upfront investment in tangible and intangible assets and returns on these investments may take time to be realised (Kmieciak et al., 2012). It is therefore imperative to create a climate which stimulates innovation in a sustainable way.



## 2.6.4 Innovation and Firm Performance: Strategic Perspective

### 2.6.4.1 Nespresso Case Study: Competitive Advantage through Innovation

Brem, Maier and Wimschneider (2016) explain how Nespresso attained competitive advantage via innovation by red-defining the rules of the game in its market. Nespresso was evaluated using publicly accessed secondary data, combining with academia constructs on innovation and CA.

An innovation is defined as an invention that becomes successfully commercialized. Brem, et al. (2016), classify innovations into four dimensions: trigger, area, change, and novelty, as depicted in Figure 2.8.

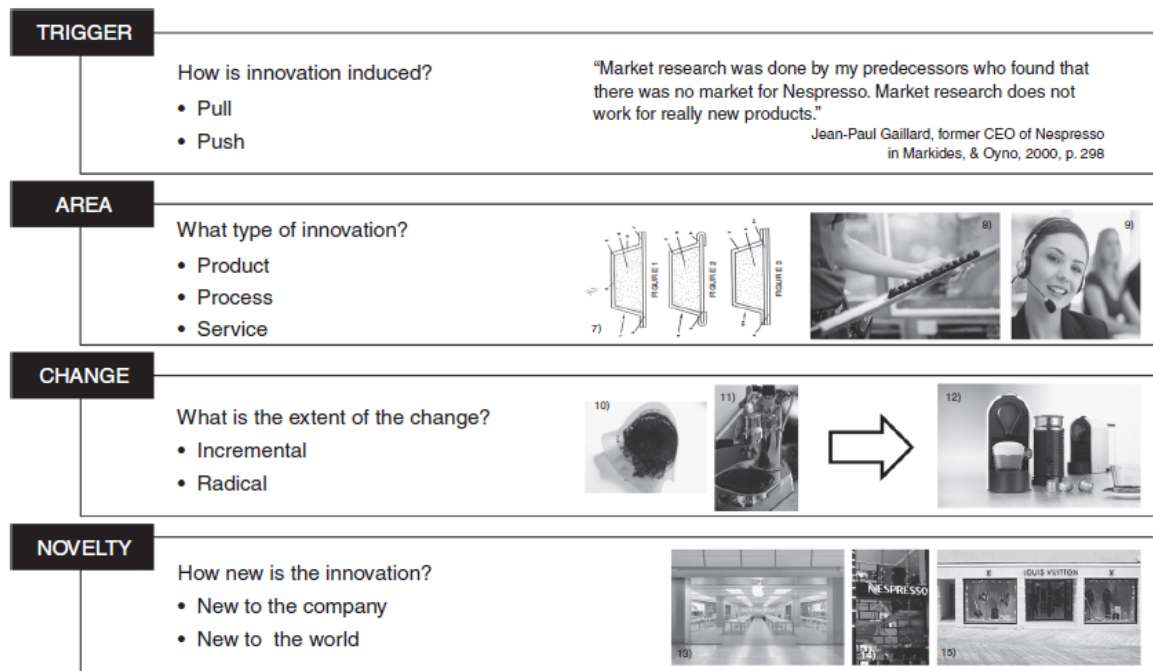


Figure 2.8 Dimensions of Innovation using the Nespresso example

Adapted from Brem et al. (2016)

The main test for firms is to successfully attain CA through interventions of innovation (Porter, 1990). Porter adds that to achieve CA it is imperative to adopt or adapt to new technologies and doing things differently. The RBV of the firm stresses the value of a firm's core competencies (Wernerfelt, 1984). Core competencies have the potential to create a CA. Firms must identify core competencies, determine how

best to utilise them, and identify the value proposition this process can achieve. Regarding the VRIN framework, with respect to Nespresso, the company's core competencies are valuable resources in the form of new product and process technologies that enhance an effective and efficient strategy (Grant, 2013).

Nespresso's business model has demonstrated a successful level of value creation (Matzler et al., 2013). However, with the expiry of business-critical patents, the future is uncertain. The impact of this has seen Nespresso's market share decline from 32% in 2010 to 27% (Revill, 2012). In addition, Nespresso faces ongoing questioning on the environmental damage by its aluminium capsules. Nespresso's business model is currently considered non-duplicable, and only faces real threat if this model is imitated (Matzler et al., 2013).

#### 2.6.4.2 Strategies for Guiding Innovation

Berman, Davidson, Ikeda, Korsten, and Marshall (2016) probes the perspectives of 818 CEOs to find out what they think the future will bring and how they're positioning their organizations to prosper in the "age of disruption." CEOs are seeing technological advances create massive upheaval, with industries converging and new ecosystems emerging as never before. The report also focuses specifically on what a subset of the 818 - CEOs of the most successful enterprises surveyed – do differently.

IBM analysis identified a small group of organizations that have both a strong reputation as leading innovators and an outstanding financial track record. These Torchbearers, as we call them, comprise only 4 percent of all enterprises represented by CEO interviewees. Analysis also identified another group of organizations that lag behind the rest. Market Followers as defined are less innovative in the opinion of the CEOs who head them, and are far less financially successful. They account for 26 percent of the sample.

One of the most notable trends of the past decade has been the increase in the significance CEOs attribute to technology. Ten years ago, they put it sixth on the list of most important external factors they expected to exert an influence on their enterprises. Now, it consistently tops the factors that light up their radar screens (see Figure 2.6).

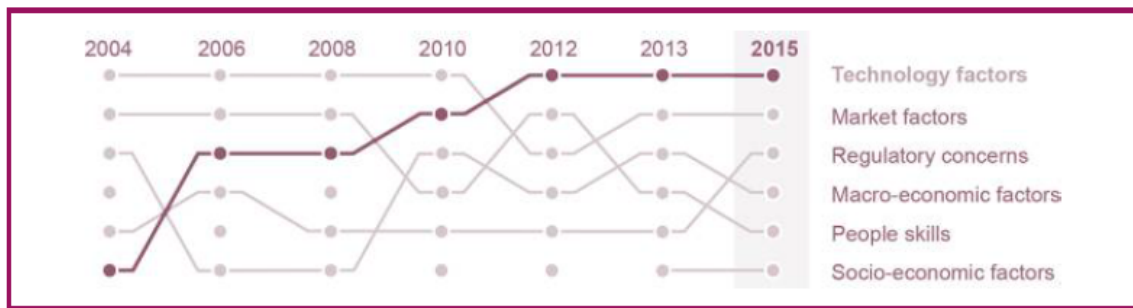


Figure 2.9 Top factor: CEOs say technology is the chief external influence on their enterprises

Adapted from Berman et al (2016)

CEOs think four particular technologies will be the main drivers of change in the near term, with mobile solutions at the forefront. Thereafter, opinion is divided. Torchbearer CEOs place more weight on contextual mobile and cognitive computing, whereas Market Follower CEOs stress the importance of cloud and the Internet of Things (see Figure 2.10).

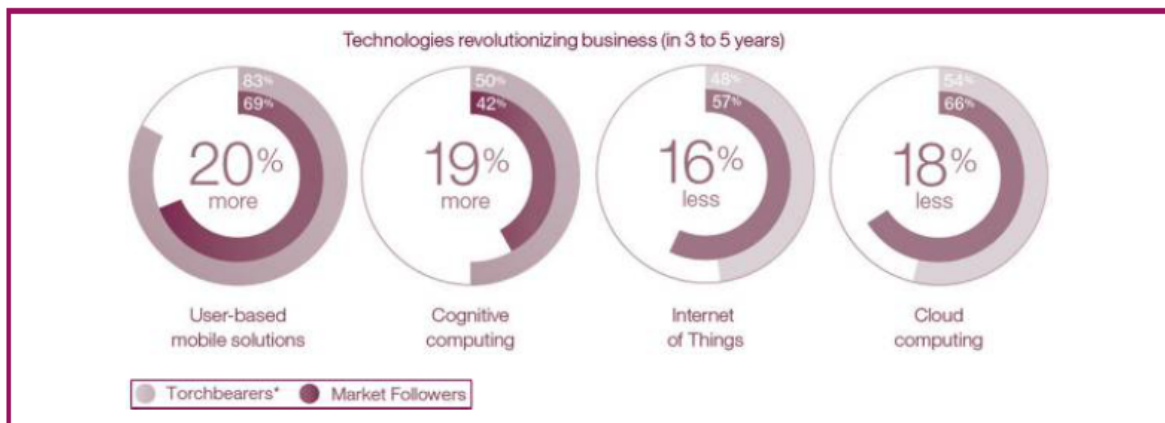


Figure 2.10 Cutting edge: Torchbearers focus on contextual mobile and cognitive

Adapted from Berman et al. (2016)

So how are CEOs preparing their organizations to meet these challenges? They're starting with the big picture because they understand that focusing on operations can only solve the problems of today, whereas focusing on strategy can change the

entire future of their businesses (Berman, Davidson, Ikeda, Korsten, & Marshall, 2016). Torchbearer CEOs are in the vanguard; 58 percent are focusing on disruptive innovation, for example. The pioneers aren't simply tweaking existing products and services; they're shedding old industry paradigms and reinventing their firms. Torchbearer CEOs are also exploring opportunities to leverage emerging technologies and ecosystems to pursue entirely new revenue streams and models. For example, Uber, Airbnb and Etsy are using digital technologies to eliminate traditional market inefficiencies, by matching supply and demand directly and enabling customers to get what they want when they want it, without going through intermediaries.

CEOs of the most successful enterprises also have different organizational philosophies. They place a higher premium on agility and experimentation, because they know these are prerequisites for disruptive innovation (Berman, Davidson, Ikeda, Korsten, & Marshall, 2016). Moreover, Torchbearer CEOs understand that investments with the power to transform an enterprise often take more time to pay off than those that deliver incremental advances. Success stories like Yu'e Bao, Alibaba's new money market fund, have opened up additional options. Founded in June 2013, Yu'e Bao raised US\$90 billion from more than 81 million investors in just 10 months, and now accounts for a third of China's money market fund business.

Pertinent findings from this research are summarized below (Berman, Davidson, Ikeda, Korsten, & Marshall, 2016):

- What to do: Sharpen your strategy. Pursue disruptive innovation, not purely incremental improvement.
- How to do it: Energize your engagement. Use predictive and cognitive analytics to investigate new trends, identify new customer segments and make smarter business decisions.
- What you need to do it: Turbocharge your transformation. Build a culture of rapid experimentation and prototyping to accelerate the release of new business models, products and services.

### 2.6.4.3 Strategic Orientations, Innovativeness and Firm Performance

Shin and Lee (2016) paper aims to provide an examination of firms' strategic orientations, innovativeness and performance with large Korean companies. The authors investigated the impacts of firms' major key strategic orientations (customer orientation, competitor orientation, technology orientation and internal/cost orientation) on firm innovativeness and performance outcomes with large Korean companies.

Firm innovativeness (hereafter, INNO) has been regarded as a critical component for the success of firms in many academic fields, such as marketing, strategic and organizational management, international business. It has been conceptualized in various ways, such as INNO inputs (i.e. efforts made toward innovation, e.g. R&D expenditure and patents), INNO outputs (i.e. consequences of innovation activities, e.g. incremental and radical innovation products) and INNO culture (i.e. the firm's ability to constantly introduce new products) (Shin and Lee, 2016). We are interested in the INNO as culture (i.e. the process view of innovation) for multiple reasons. First, it was found that firm INNO culture is positively related to the organization's ultimate performance outcomes such as financial position (e.g. profits) and firm value more than the other INNO constructs (Rubera and Kirca, 2012). Second, it has been less examined in terms of its important drivers and consequences. Last, we are interested in the firm's strategic issues of the higher-order level. Likewise, the stream of INNO research found the importance of and called for further examination of corporate culture in driving INNO and its performance outcomes (Shin and Lee, 2016).

The major question addressed in our study is whether each of key strategic orientations, such as customer orientation (hereafter, CO), competitor orientation (hereafter, PO), TO and internal/cost orientation (hereafter, IO), is related to INNO culture and FP in an Eastern country such as Korea.

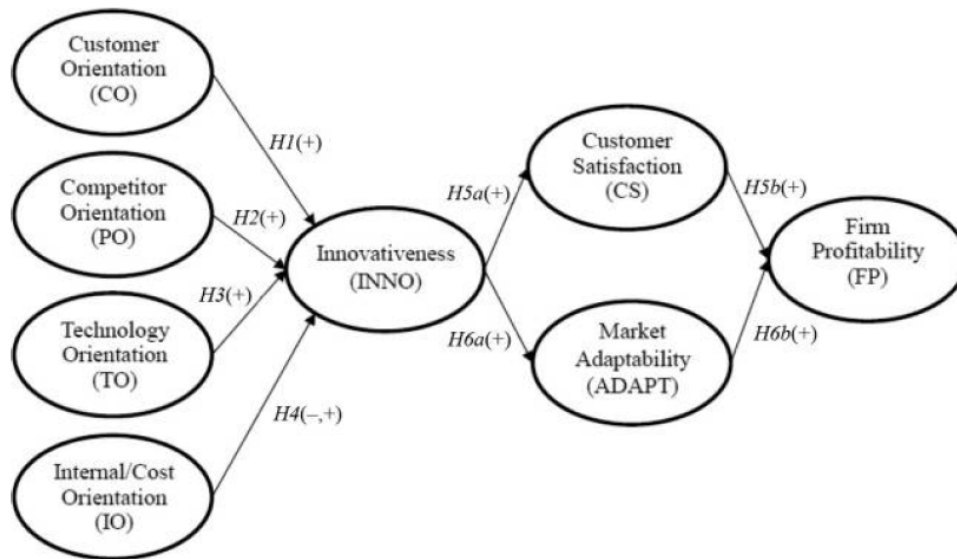


Figure 2.11 Research model  
Adapted from Shin and Lee (2016)

Shin and Lee (2016) propose the relationships among four different strategic orientations and INNO with three definite directional associations. More specifically, we derive and test the layered relationships among strategic antecedents, INNO and firms' performance outcomes, such as CS, market adaptability (ADAPT) and firm profitability.

In the extant literature on innovation, innovation is construed to be sought, in various ways, with a new product/service, a new process, a new organizational structure or an administrative system (Rubera and Kirca, 2012). With this background in mind, the firm's INNO culture refers to a firm's receptivity and inclination to adopt new ideas that lead to the development and launch of new products (Shin and Lee, 2016). In other words, the INNO culture represents the *process* view of innovation such that performance gains are brought about by specific competitive capabilities which go beyond developing and introducing new products; these capabilities are embedded in the cultural traits of innovative firms (Rubera and Kirca, 2012). The INNO culture directly results in the firm's capacity to innovate, i.e. the capacity to introduce new products/services or idea in the organization (Shin and Lee, 2016).

Firms with low INNO may invest time and resources in studying markets but can hardly translate this market study into practice. On the other hand, the high level of

capacity to innovate is one of very important factors which positively impact firm performances (Porter, 1990; Rubera and Kirca, 2012). The resource-based view explains how firms derive competitive advantages by channelling resources into the development of new products, processes and so forth (Shin and Lee, 2016). INNO is a means for changing an organization to achieve desired outcomes, whether it is pursued as a response to changes that occur in its external or internal environment or as a proactive move taken to influence an environment.

However, previous studies have shown mixed results on the relationship between INNO and the firm's performance outcomes (Shin and Lee, 2016). The conflicting findings imply that there may be potential influences of unexplored mediating or moderating constructs on the relationship between INNO and the firm's performances, which is neatly confirmed by a comprehensive and meticulous meta-analysis of firm INNO constructs and performance outcomes (Rubera and Kirca, 2012). Following the theoretical logic of Rubera and Kirca (2012) we want to test that CS and market ADAPT operate as key mediating variables in the route from INNO to financial performances (FPs).

First, we show the finding that INNO affects FP through CS and ADAPT, confirming the theoretical logic of the routes, i.e. from INNO through market position (CS, ADAPT) to financial position (Rubera and Kirca, 2012). Next, our finding suggests that strategic orientations CO, PO and TO influence INNO, leading to better business performance, whereas IO shows no effect on INNO. Our study findings imply the possibility that the differentiation strategy route fits well with INNO culture, as opposed to the low-cost strategy route (Porter, 1985). For INNO to relate to firm profitability, firms had to better note the necessary condition that INNO brings about CS and the sufficient condition that INNO fits with ever-changing market needs.

### 2.6.5 Culture and Innovation

Reaiche, de Zubielqui, and Boyle (2016) emphasis the relevance of innovation for business value creation in an evolving and expanding globalized market. Innovation is widely view as a key enabler for a nation's economic prosperity. Their research hypothesis that a country's culture impacts on defining culture. Consequently, they aim to determine more accurate methods to understand innovation. The study also aims to study the different perceptions of innovation based on differences in culture,

and hypothesis that a singular definition may not be effective in interpreting this innovation. The sampling population is based on three countries within the Asia Pacific area with unique entrepreneurial cultures. Their finding is that perception and interpretation of innovation across the participants is determined by their regional location. For countries wishing to maintain a sustainable economy it is becoming important to design appropriate policies around innovation activities. Innovation comes in many different forms and can include, but is not limited to, that which is associated with products, services, operations, organizational issues, financial engineering, and/or marketing strategies. The research makes contributions at the theoretical and applied levels. The scholarly contribution aids in understanding the influence of culture factors on innovation. At the applied level, the results aid managers and policy makers in evaluating the effectiveness of existing innovation practices. Such applied insight could assist managers in identifying appropriate training interventions to enhance employees understanding of innovation.

The three countries view of innovation at first seems to be equal across the various cultures. However, there are significant differences when they interpret the concept and process of innovation. Overall, culture would appear to have a very significant moderating effect in defining Innovation and the consequent adoption of policies. Countries hoping to enhance their innovative capabilities across global markets should pay attention to culture, since culture could both enhance and inhibit innovation processes via the various perceptions in depicting innovation per se. We have explored only three countries, all in the Asia Pacific region and therefore a broader comparative study including countries within a variety of geographical distributed regions is needed.

The purpose of this paper is to better understand how and why adoption and implementation of healthcare IT innovations occur. The authors examine two IT applications, computerised physician order entry (CPOE) and picture archiving and communication systems (PACS) at the meso and micro levels, within the context of the National Programme for IT in the English National Health Service (NHS). Qualitative data collected between 2004 and 2006 uses semi-structured, in-depth interviews with 72 stakeholders across four English NHS hospital trusts.

Given that the adoption and implementation of IT innovations remains a goal of most healthcare systems (Reaiche, de Zubielqui, & Boyle, 2016), the question remains,



“How can we best understand how and why the adoption and implementation of IT innovations occurs?” Specifically, in what ways do certain innovative applications appear problematic to implement? And how can a blending of investigative concepts help to elucidate this problem?

As with the study of other types of innovations, with IT innovations in healthcare the complexity of context is hard to ignore, context here being interpreted in terms of the landscape at different levels of various scale – ranging from the small (micro) to medium size (meso) to large (macro). In a publicly funded health system, such as the English NHS, the interplay between policymaking (macro level), healthcare organisations (meso level) and the clinical encounter and technical procedures (micro level) assumes particular significance. Each of these levels is shaped by a set of specific interests, rules and norms of a given field of action and thought and the ways in which interests mesh or collide within and across levels help to determine the course of an innovation’s adoption.

In response to the original research questions about understanding the how and the why of adoption and implementation of healthcare IT innovations, and the contribution of theory in explaining the problems arising, the authors argue that the way forward may lie in blending useful tenets of DoIT with alternative, system-level approaches.

## 2.7 Firm Performance

### 2.7.1 Defining Firm Performance as the Satisfaction of Stakeholders

Firm performance is an important construct in strategic management studies and often modelled as a dependent variable. However in spite of its importance, there is still no singular definition, its dimensionality, nor its measurement, aspects that prohibit advances in research and understand of this construct. Santos and Brito (2012) define performance as the satisfaction of stakeholders. In defining performance its time frame and reference points must be factored in.

Santos and Brito (2012) present a model for FP based on subjective indicators. The study’s sampling population included 116 Brazilian senior managers. The researchers criticize strategic management for not prioritizing the provisioning of a rigorous construct measure. This shortcoming negatively impacts the accuracy of

quantitative research quality impeding identification of true relationships. This is the case for determination of firm performance.

Firm performance is considered a multidimensional construct, yet many studies offer a single measure for FP thus representing it as unidimensional (Santos and Brito, 2012). Resource based view (RBV) theory uses aggregated measures of performance and this may pose a challenge. When measuring the FP construct, they be either unidimensional or multidimensional. This is illustrated in Figure 2.12 using two models.

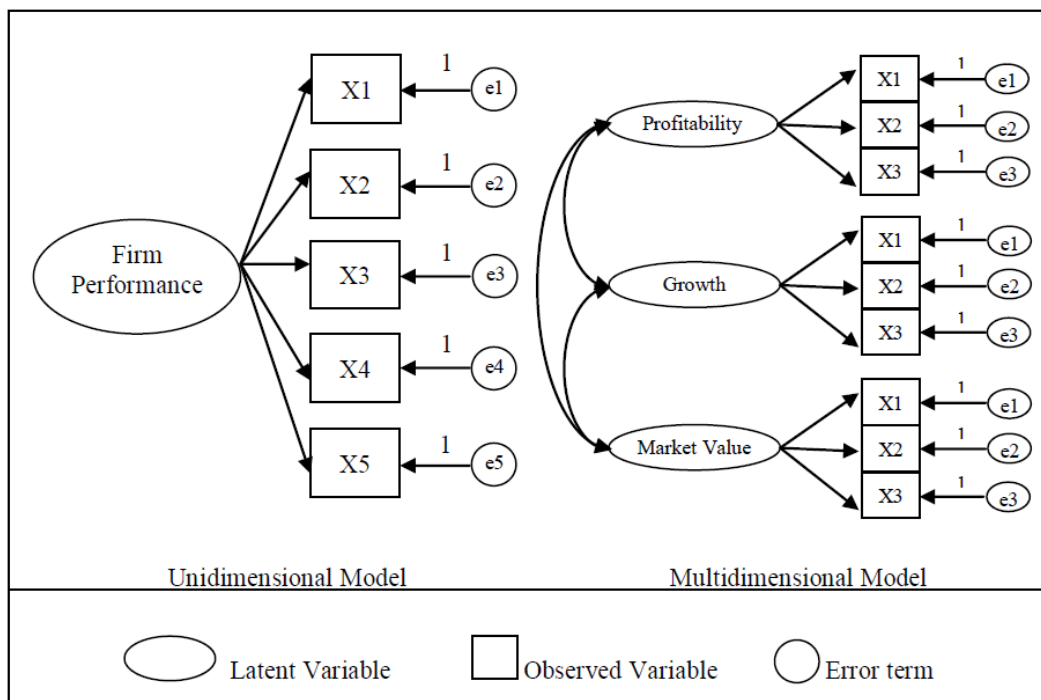


Figure 2.12 Unidimensional and Multidimensional Representation

Adapted from Santos and Brito (2012)

Unidimensionality is reflected in the left-side model in Figure 2.12, implying that all the indicators exemplify the performance of the firm in a swappable way. This implies that there is a high correlation amongst these indicators. Multidimensionality proposes that each dimension denotes one angle of the total result of the firm, and is embodied by a certain group of indicators. Indicators of the same domain should be grouped together under the same dimension, resulting in a higher correlation amongst themselves than with indicators belonging to a different dimension.

Theoretical and empirical studies recommend the multidimensionality approach since this offers a more complete notion of firm performance (Santos & Brito, 2012).

Santos and Brito (2012) also site the challenges FP faces within the field of strategic management i.e. limited conceptualization, subjective identification of indicators, and a lack of thought around its dimensionality. The aim of this paper is therefore to address these shortcomings. The result of the research offered two plausible approaches, one instrumental (relating to scale) and the other conceptual (relating to dimensionality). Their conceptual model identified five dimensions:

1. financial performance,
2. customer satisfaction,
3. employee satisfaction,
4. social performance and
5. environmental performance.

Multidimensionality implies indicators from different dimensions cannot be interchanged, as they reflect different aspects of FP. In addition, strategies may have varying impacts on the different dimensions (Santos & Brito, 2012).

Santos and Brito (2012) find that using only profitability to reflect financial performance is a serious flaw in empirical studies. Extant research defined competitive advantage as “the ability to create more economic value than the marginal (break-even) competitor in its product market” (Santos and Brito, 2012). Economic value is defined as the gap between the inclination to pay and the economic cost. Pricing has a different impact on CA depending if it is above or below competitor prices. If set above, then profitability determines CA but not growth, with the opposite taking place if price is set below. Therefore measuring growth and profitability together justifies the conceptual model.

The model also indicates the absence of a second-order construct affecting the non-financial dimensions. This may imply that there is no common factor affecting the satisfaction of customers, employees, governments and communities. This result indirectly validates that each stakeholder has its own intent in relation to the firm, in view of their satisfaction being linked to different firm actions. As such prioritizing becomes a challenge. From resource-dependence view, a higher dependence on the stakeholders results in the relationship between stakeholder needs and the

company's results being much stronger. It is therefore imperative that a company focus on the relative importance of each stakeholder group and create and develop strategies to satisfy each stakeholder. Santos and Brito, 2012 assert that by satisfying the needs of the various stakeholder groups is a significant means to for the long term goal of a company of achieving market value maximization. This proposal implies that managers should use this as their ultimate objective to prioritize different stakeholders' needs and identify relevant strategies to implement. In addition, by placing market value as the dependent variable in the long term, this adds a time perspective, an aspect for future study.

### 2.7.2 Corporate Governance as Antecedent for Firm Performance

Today, globalization has made the world a smaller place enabling business to be conducted from anywhere. Consequently, investors worldwide evaluate the performance of the firm first. Furthermore, with the widest spread of generation in technology, job-seeking people can identify those firms with the highest performance readily and pursue employment therein. Due to these considerations, it is imperative that management seek continuous methods and structures to improvement firm performance. Al-Matari et al. (2014) undertook a study on measurements related to corporate governance and the effect of such measurements on firm performance from 2000 to 2012. They attempted to identify if such measurements are consistent with accounting-based and market-based measurements. This study contributes to further research on FP measurements.

Performance measurement refers to the process of measuring the action's efficiency and effectiveness (Al-Matari et al., 2014). Performance measurement is the transference of the complex reality of performance in organized symbols that can be related and relayed under the same circumstances (Al-Matari et al., 2014).

Performance measurement is crucial for effective management of any firm (Al-Matari, et al., 2014). The process improvement is not possible without measuring the outcomes. Hence, organizational performance improvement requires measurements to identify the level to which the use of organizational resources impact business performance (Al-Matari, et al., 2014). Identifying a measurement for the performance of the firm allows longitudinal studies to be conducted on performance. Performance of a firm is significantly impacted by corporate

governance and if the functions are appropriately established for the corporate governance system, it attracts investment and helps in maximizing the company's funds, reinforcing the company's pillars and this will result in the expected increase in FP.

Measurement of performance can offer significant invaluable information, however this is hampered due to the lack of a consistent interpretation of organizational performance. The importance of business performance in strategic management can be categorized into three dimensions; theoretical dimension, empirical dimension and managerial dimension. The findings of the review by Al-Matari et al (2014) showing the most dominant measures for account-based and market-based measures. These are depicted in Table 2.4 and Table 2.5 below.

Table 2-5 The Account-Based Measurement

Return on Assets (ROA)	88
Return on Equity (ROE)	52
Return on Sales (ROS)	9
Return on Investment (ROI)	1
Profit Margin (PM)	15
Operating Cash Flow (OCF)	1
Earnings per Share (EPS)	9
Operation Profit (OP)	1
Growth in Sales (GRO)	3
Return on Capital Employed (ROCE)	1
Expense to Assets (ETA)	1
Cash to Assets (CTA)	1
Sales to Assets (STS)	1
Expenses to Sale (ETS)	1
Labor Productivity (LP)	3
Cost of Capital (COC)	1
Return on Revenue (ROR)	1
Profit per employee (PPE)	1
Return on Fixed Assets (ROFA)	1

Adapted from Al-Matari et al. (2014)

Table 2-6 The Market-Based Measurement

Tobin-Q	74
Market Value Added (MVA)	2
Market-to-Book Value (MTBV)	6
Abnormal Returns: Annual stock return, (RET)	4
Dividend Yield (DY)	3
Price-Earnings Ratio (PE)	3
Log of Market Capitalization	1
Stock Repurchases	1
Superior to Cumulative Abnormal Returns (CARs)	1

Adapted from Al-Matari et al. (2014)

### 2.7.3 Ethical Perspective on Firm Performance Measures

The cost of ethical failures is enormous. This has been evidenced from recent ethical scandals that have led to the global financial crises and the collapse of major corporations such as Enron, WorldCom, Tyco International and Arthur Anderson, costing owners, investors and employees trillions of dollars. Such scandals could have been avoided if management and employees of these firms had not overlooked the unethical behaviour of their colleagues (Narayan, 2016).

Narayan (2016) provide an ethical perspective that goes beyond best practice in performance measurement systems in the public sector to help minimise unintended and unethical effects. The paper draws on the ethical concepts of bounded ethicality, ethical blind spots and ethical fading to help illuminate the dark side of performance measurement in public sector organisations.

Triple bottom line (TBL) is a sustainability-related construct that was coined by Elkington (1997). Driven by sustainability, TBL provides a framework for measuring the performance of the business and the success of the organization using three lines: economic, social, and environmental. Al-Matari et al. (2014) primarily focused on financial measures as illustrated in Table 2.4 and Table 2.5. However sustainability requires enforces an ethical dimension to performance management.

Alhaddi (2015) concluded that public sector organizations are complex because of multiple goals and often conflicting interests of different stakeholders. This finding is consistent with that of Santos and Brito (2012) alluding to the multidimensionality of

performance measurements. By going beyond best practice notions of performance measurement, the toolkit of performance measurement techniques in the public sector can be extended to help understand the psychological tendencies that create unethical behaviors. Ethical leadership is also necessary to promote an ethical organization culture and implement strategies to ensure compliance with ethics and morality.

## 2.8 Summary

This section has covered a literature review (theoretical and empirical) of the key constructs of this research: IT Capability, Innovation Capability, and Firm Performance. Resource-based theory forms the underlying theoretical foundation on which the study is based.

The research topics covered showed extensive academic research amongst the technology, innovation, and the competitive position of organizations. The next chapter presents the research methodology used for this study.

### 3 CHAPTER THREE Research Methodology

#### 3.1 Introduction

The previous chapter set the context for the investigation into the relationship between the three constructs of IT Capability, Innovation Capability, and Firm Performance. In this section, the methodology employed to undertake this investigation is presented.

The research objectives set the foundation for the research design and method, setting the research philosophy as presented below. This also informed the nature of the study i.e. quantitative or qualitative. The study setting is presented and justified setting up the environment on which the research instrument is developed and applied. The sampling population is described by elaborating on the strategy for the selection of participants. The pre-test and pilot testing exercises will also be discussed and the learnings mentioned. Data collection method is presented and reasons for selecting this are discussed. Based on the quantitative approach, the data collected was subject to statistical analysis. The choice of analysis is discussed and the motivation for the choice of measurements is presented. The discussion of the data is concluded by considering the reliability and validity of the study.

The section concludes by discussing the ethical dimensions of the study, including the nature of the study itself and the process of data collection. A summary of this section is then covered.

#### 3.2 Aim of the Study

The aim of this study was to investigate if IT Capability played a moderating role on the relationship between Innovation Capability and Firm Performance. A review of the relevant extant literature presented mixed views. To investigate this, innovation capability and FP are employed. The following research questions were used in the investigation:

1. What is the impact of innovation capability on firm performance?
2. What is the impact of information technology capability on innovation capability?



3. Does information technology capability play a moderating role in the relationship between innovation capability and firm performance?

Building on the findings from the literature review, the conceptual model presented in Figure 3.1 addresses independent, moderating, and dependent variables for investigation.

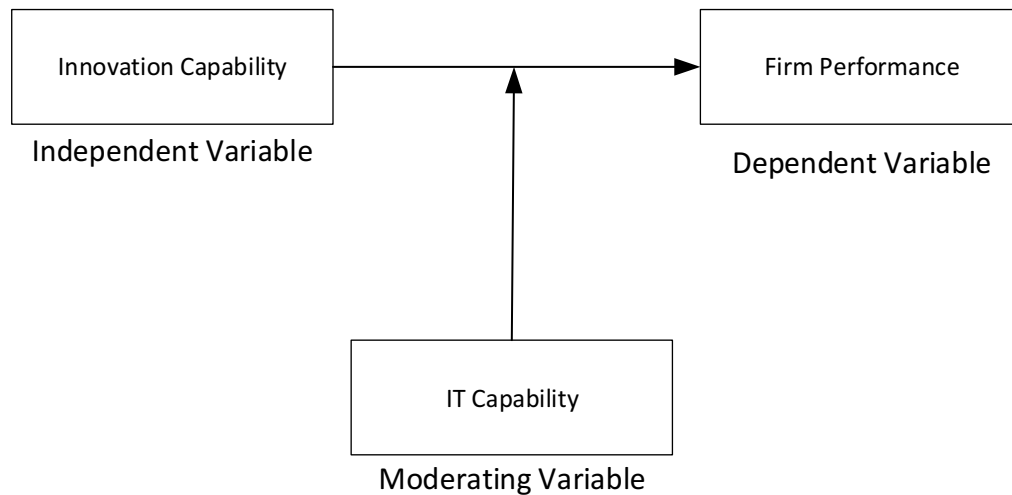


Figure 3.1 Research Conceptual Framework (Researcher)

This research aimed to investigate the relationship between innovation capability (independent variable) and firm performance (dependent variable), and used IT capability as the moderating variable. This area of research has not been addressed and therefore this study aims to make a contribution to this body of knowledge.

### 3.3 Research Design and Methods

A research design is a blueprint for the collection, measurement, and analysis of data, based on the research questions of the study (Sekaran & Bougie, 2013). Common forms of research design include causal-comparative research, correlational research, explanatory research, descriptive research, and exploratory research (Sekaran & Bougie, 2013, p. 97). Based on the aim of this study, correlational research design will be selected. Correlational research refers to studies in which the purpose is to discover relationship between variables through the use of correlational statistics e.g. correlational coefficient (Creswell, 2014). However, correlational study must guard against arguing for a cause and effect

relationship between the variables merely because of a strong correlation between them (Creswell, 2014). Experimental research design could be used to conclude any causation relationship. A major advantage of correlational research is that the researcher can explore a wide variety of different relationships in the same study (Sekaran & Bougie, 2013). Therefore the use of this approach enabled the test of the effect of IT capability as a moderator variable.

The extent of interference by the researcher has a direct bearing on whether the study undertaken is correlational or causal (Creswell, 2014). A correlational study is conducted in a natural environment with minimal interference by the researcher. In causal study, the researcher tries to manipulate certain variables so as to study the effects of such manipulation on the dependent variable of interest (Sekaran & Bougie, 2013, p. 99). As this study required voluntary participants to be contacted via email and utilize online survey, the study had very limited interference by the researcher. According to Sekaran and Bougie (2013), business research can be in the natural environment where events proceeds normally i.e. noncontrived setting or in an artificial, contrived setting. This was a correlational study and therefore was conducted in a nontrived environment. Correlational studies done in a noncontrived settings are called field studies (Sekaran & Bougie, 2013, p. 100).

The unit of analysis refers to the level of aggregation of the data collected during the subsequent data analysis stage (Sekaran & Bougie, 2013, p. 104). The research question determines the unit of analysis. Units of analysis include individuals, dyads, groups, divisions, and industry. For this research, the unit of analysis will be individual.

A cross-sectional study is one in which the data to be gathered is just once, possibly over a period of days, or weeks or months, in order to answer a research question (Sekaran & Bougie, 2013; Creswell, 2014). This is also referred to as a one-shot study. Longitudinal studies are such where, for example, the dependent variable is gathered at two or more points in time to answer the research question. This research was conducted once-off and was therefore a cross-sectional study.

### 3.4 Research Paradigm

Research paradigms convey the fundamental philosophical concepts and values about the nature of reality and scientific pursuit of knowledge (Sekaran & Bougie, 2013). Two primary schools of thought are positivism and phenomenology.

Positivist research is generally quantitative and involves the use of numerical measurement and statistical analyses of measurements to examine social phenomena (Creswell, 2014). Advantages of this approach is its objectivity and reliability of results. In its application to social phenomena, it may not always be appropriate, as all social phenomena cannot be accurately and reliably measured, thus reducing validity of the findings. Phenomenology research argues that the world is socially constructed and that science is driven by human interests, with the researcher being the subjective entity of the observed world (Sekaran & Bougie, 2013). Advantages of this approach are that the findings have greater validity and less artificiality as the process of observing phenomena in natural, real-life settings often allows researchers to develop a more accurate understanding of those phenomena. This research adopted a positivist approach.

Research strategies differ for positivist and phenomenology paradigms (Sekaran & Bougie, 2013; Creswell, 2014). Positivism strategies include experiments and survey research, while phenomenological paradigm employ observation, case studies, grounded theory, action research, and ethnography. For the purposes of this research, surveying was used. A survey is a system for collecting information to describe, compare, or explain their knowledge, attitudes, and behavior (Sekaran and Bougie, 2013). Surveys are very popular in business research because it enables the collection of quantitative and qualitative data. In addition, surveys are used in exploratory, descriptive and in causal research.

### 3.5 Study Setting

South32 ([www.south32.net](http://www.south32.net)) is an international mining and resources company. Commodities included in its portfolio include coal, manganese, and aluminium. Hillside Aluminium is a wholly owned subsidiary of South32 and is based in the town of Richards Bay, South Africa. Hillside Aluminium produces approximately 700 Mt of primary aluminium annually. The price of aluminium is set by the London Metal Exchange (LME). Of the many input costs one of the largest, and most critical, is

electricity. As the price of aluminium is determined by the LME, the only factor the company can control to influence profitability is cost ( $\text{Profit}=\text{Revenue}-\text{Cost}$ ).

### 3.6 Population and Sample of the Study

The population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate (Sekaran & Bougie, 2013). An element is a single member of the population. A sample is a subset of the population i.e. it contains some but not all elements of the population. The sampling unit is the element or set of elements that is available for selection in some stage of the sampling process (Sekaran & Bougie, 2013). A subject is a single member of the sample.

Hillside Aluminium (HA) has two categories of employees, expertise and management team (EMT) and expertise and action team (EAT). The EMT category of employees are seen as the management layer of the organization and therefore are more involved in strategic and tactical level decision-making. Shanteau et al. (2002) have listed eight primary tactics to expert selection. These researchers base their selection on a single criteria, the level of management in the IT domain for the industry personnel. This approach is followed in selecting the EMT category of employees as the population for this research. Based on the payroll as of May 2017, two hundred and ninety two (292) elements (or samples) made up the population. This also served as the sampling frame.

### 3.7 Sampling Method

There are two broad approaches to studying a population, namely, taking a census or selecting a sample (Sigdel, 2011; Creswell, 2014). Both approaches provide information that can be used to make conclusions about the whole population.

There are two major types of sampling design: probability and nonprobability sampling. In probability sampling, the elements in the population have some known, nonzero chance or probability of being selected as a sample subjects (Sekaran & Bougie, 2013). In nonprobability sampling, the elements do not have a known or predetermined chance of being selected as subjects. Probability sampling designs are used when the representativeness of the sample is of importance in the interests of wider generalizability (Sekaran & Bougie, 2013).

A census is comprehensive and complete study of every element in a population i.e. a complete enumeration. Advantages of using a census include (Sigdel, 2011):

- offers a true measure of the entire population (no sampling error)
- benchmark data is presented for future studies
- more likely to have comprehensive information about small sub-groups within the population

Disadvantages of using census include (Sigdel, 2011):

- time constraints may prevent a full enumeration of the population
- could prove to be cost inhibiting in comparison to a sample
- collection, analyzing, and publishing of data more be more time consuming

In this research the whole population of EMTs was targeted. As such, the sampling frame is the same as the population. The use of online survey and email to engage with participants' poses no cost or time limitations. As the data was centrally stored and extracted from the online database, there were no time delays in obtaining the data. Therefore census sampling was the preferred method to study the population.

### 3.8 Construction of the Instrument

As indicated by the choice of research paradigm, surveying was used. The three main data collection methods are interviewing, observing, and administering questionnaires (Sekaran & Bougie, 2013; Creswell, 2014). Questionnaires are generally less expensive and less time consuming than interviews and observations, but they also introduce a much larger chance of nonresponse and nonresponse error (Sekaran & Bougie, 2013, p. 147). Drawing on the findings from the literature review, questions relevant to each of the constructs researched were adapted in compiling the questionnaire. Questions were drawn from the Tippins and Sohi (2003), Turulja and Bajgoric (2016), Karadal and Saygin (2011), and Tseng (2014).

Reduction of abstract concepts to render them measurable in a tangible way is called operationalizing the concepts. The concepts of IT Capability, Innovation Capability, and Firm Performance are such concepts. These concepts were operationalized through carefully selection of questions which best characterized them. Concepts may be unidimensional or multidimensional. This is very important when determining the measurement scale for the concepts (Sekaran & Bougie,

2013). A multidimensional concept must include all dimensions that best describe it for the measurement scale to be valid (Sekaran & Bougie, 2013, p. 201). The three constructs of innovation capability, information technology capability, and firm performance used in this study are all multidimensional. Therefore, the literature review was used to identify the dimensions for each construct and determine relevant elements (questions).

### 3.8.1 Measurement Scales

Measurement means gathering data in the form of numbers (Sekaran & Bougie, 2013). To be able to assign numbers to attributes of objects we need a scale. A scale is a tool or mechanism by which individuals are distinguished as to how they differ from one another on the variables of interest. There are four basic types of scales: nominal, ordinal, interval, and ratio.

#### *Nominal scale*

A nominal scale allows the assignment of values to certain categories or groups. Nominal scales categorize individuals or objects into mutually exclusive and collectively exhaustive groups (Sekaran & Bougie, 2013, p. 212).

#### *Ordinal scale*

In addition to having the characteristic of a nominal scale, an ordinal scale allows variables to be rank-ordered. This scale allows the researcher to determine how respondents distinguish variables of the study. Ordinal scale does not give any indication of the magnitude of the differences among the ranks.

#### *Interval scale*

An interval scale allows arithmetical operations on the data collected from the respondents. The scale allows distance between any two points on the scale to be determined.

#### *Ratio scale*

The ratio scale overcomes the disadvantage of the arbitrary origin point of the interval scale, in that it has an absolute zero point, which is a meaningful measurement point (Sekaran & Bougie, 2013, p. 215). Ratio scale is the most powerful of the four scales and subsumes the properties of the other three.

### 3.8.2 Research Questions Nomenclature

The questionnaire was constructed along the following:

- demographic – four (4) questions
- seventeen (17) questions relating to IT Capability
- seven (7) questions relating to Firm Performance
- thirty three (33) questions relating to Innovation Capability

The demographic questions employed the use of nominal and ordinal scales. This allowed the categorisation of respondents into the various characteristics. Bar and pie charts were used to graphically represent this data. The questions relating to the three constructs all used a five point Likert scale. The scale item should be at least five and preferably seven categories (Brown, 2011).

Most of the research based on Likert items and scales treat them as interval scales and analyses them as such with descriptive statistics like means and standard deviations, and in addition, inferential statistics like correlation coefficients, factor analysis, analysis of variance, etc. (Brown, 2011). The data analysis below provides a more comprehensive description.

### 3.9 Data Collection

Questionnaires can be administered personally, via emailed to respondents, or electronically distributed. For the purposes of this survey a cloud-based software-as-a-service (SaaS) was used ([www.surveymonkey.com](http://www.surveymonkey.com)). As part of this service, the utility provides a hyperlink to the online survey. Using the relevant Hillside Aluminium email distribution lists this hyperlink was sent to the targeted sampling frame. The survey remained open for period 5<sup>th</sup>-May-2017 to 6<sup>th</sup>-June-2017. In total 136 responses were received.

### 3.10 Pre-test and Pilot Test Learnings

#### 3.10.1 Pre-Testing

The questionnaire was sent to two industry experts in IT and project management to check. The following feedback was received and changes affected:

1. Use of the FP and business performance was originally used and this could lead to confusion. Firm performance was chosen as the way to describe the construct and changes to the questionnaire were made.
2. Original list of questions included a total of eighty two (82). It was felt to be too long and introduced risk of respondents not completing the survey. After re-examining the questions, this was reduced to fifty seven (57).

### 3.10.2 Pilot Study

The original plan was to manually administer the question. A sample of twenty (20) users from the population were selected and presented with the questionnaire. In total only twelve responses were received. Follow-ups were made during the period. The following learnings were made and changes affected:

1. Due to time constraints and size of sampling population, the manual approach was changed to using the online service. This was done in consideration for the data analysis phase which would have required manually capturing the data for analysis. The online service approach automated this step.
2. To ensure consistency, the email option allowed a single explanatory note to be used in communicating the intent and request for voluntary participation in the process.
3. Weekly follow-ups were made by re-sending the original email to the target population.
4. The original questionnaire was grouped by construct-dimension-element. It was decided to remove the dimension component as this simplified the user experience. The value of the dimension was realised in the design of the instrument and not in the data collection step.

## 3.11 Data Analysis

### 3.11.1 Data Cleansing

All the raw data was exported from surveymonkey into a Microsoft Excel format file. The data was searched for missing entries and these were removed. The cleansed file was then used as to determine the composite values for the primary constructs



of the study. This data was then used as input in the statistical software called Minitab®, a widely used software tool for statistical analysis popularised for use in Six Sigma programmes.

### 3.11.2 Data Analysis

The data collected were primarily of nominal and interval scales. The nominal scaled data was from the demographic section. This data was formatted and presented using graphs. Two types of statistical information was used in the testing, namely descriptive (demographic data) and inferential (Likert scale data).

#### 3.11.2.1 Descriptive Analysis

Demographic data was extracted to elicit data about the participant. This data would offer options to analyse the data in different ways and offer potentially richer set of findings. The data was presented using graphs.

#### 3.11.2.2 Inferential Analysis

The Likert scale data was used in the statistical analysis process. To interpret the data to address the research objectives two statistical measures were used:

- Pearson Correlation Coefficient
- Regression Analysis

##### 3.11.2.2.1 Pearson Correlation Coefficient

For the purposes of this study, Pearson Correlation Coefficient (PCC) tests were run. It is a measure of the linear correlation between two variables  $X$  and  $Y$  (Hall, 2015). Two results were relevant for this analysis, namely the  $r$ -value and the  $p$ -value. In statistics,  $r$ -value measures the strength and direction of a linear relationship between two variables. The value of  $r$  is always between  $+1$  and  $-1$ , where  $1$  is total positive linear correlation,  $0$  is no linear correlation, and  $-1$  is total negative linear correlation. It is widely used in the sciences. Evans (1996) ratings for different values are presented in Table 3.1. The  $p$ -value is used in the context of null hypothesis testing in order to quantify the idea of statistical significance of evidence. In the majority of analyses, an alpha of  $<0.05$  is used as the cut-off for

significance. If the p-value is less than 0.05, null hypothesis is rejected i.e. there's no difference between the means and conclude that a significant difference does exist. The coefficient was tested for between Innovation Capability and Firm Performance as well as between IT Capability and Innovation Capability. Evans (1996) suggests a rating for different values of r, presented in Table 3.1 below.

Table 3-1 Pearson Ratings

Range	Rating Description
.00-.19	very weak
.20-.39	Weak
.40-.59	Moderate
.60-.79	strong
.80-1.0	Very strong

Adapted from Evans (1996)

### 3.11.2.2.2 Regression Analysis

Simple regression analysis is used where one independent variable is hypothesized to affect one dependent variable (Sekaran & Bougie, 2013, p. 315). Therefore, the initial test is performed to confirm with the literature study that Innovation Capability is strong positively correlated with Firm Performance. A moderating variable is a variable that modifies the original relationship between an independent variable and the dependent variable (Sekaran & Bougie, 2013). The hypothesis to be tested here is if IT Capability plays a moderating role i.e. by checking if the effect of Innovation Capability on Firm Performance is in anyway regulated or influenced by IT Capability. Such interactions are included as the product of two variables in a regression model.

A moderating variable is a variable that modifies the original relationship between an independent variable and the dependent variable (Sekaran & Bougie, 2013, p. 320). Such interactions are included as the product of two variables in the regression model. The relationship between Innovation Capability ( $X_1$ ) and Firm Performance ( $Y_1$ ) can be modelled as follows:

$$Y_1 = \beta_0 + \beta_1 X_{1i} + \varepsilon_1 \quad \underline{\hspace{10em}} \quad 3.1$$

The research has hypothesized that the effect on  $X_1$  on  $Y$  depends on  $X_2$ . This can be modelled as follows:

$$\beta_0 = \gamma_0 + \gamma_1 X_{2i} \quad \underline{\hspace{10em}} \quad 3.2$$

Adding the second equation (2) into (1), gives the following model:

$$Y_1 = \beta_0 + \gamma_0 X_{1i} + \gamma_1 (X_{1i} X_{2i}) + \varepsilon_1 \quad \underline{\hspace{10em}} \quad 3.3$$

The equation 3.3 above states that the slope of the model is a function of variable  $X_{2i}$ .

Therefore the regression analysis two regression tests will be run:

1. simple regression test to confirm relationship between independent variable and dependent variable
2. moderator regression test to test the impact of the moderator variable on the independent variable

### 3.12 Reliability and Validity of the Study

#### 3.12.1 Reliability

Reliability is the degree to which an assessment tool produces stable and consistent results (Sekaran & Bougie, 2013, p. 229). The idea behind reliability is that any significant results must be more than a one-off finding and be inherently repeatable. Without this replication of statistically significant results, the experiment and research have not fulfilled all the requirements of testability (Creswell, 2014, p. 201).

There are three types of reliability tests (Sekaran & Bougie, 2013):

1. Stability This is when a researcher obtains the same result in repeated administrations or when the same test tools are used on the same sample size more than once, and when there is a reliability co-efficient that provides an indication of how reliable the tool is. Over the long term this study does not lend itself well to this test. The dynamic nature of IT for example would create a total different IT capability within a short space of time and therefore change the perception and experience of the respondents.
  
2. Homogeneity This is a measure of the internal consistency of the scales. Cronbach's alpha is used to measure the reliability of a tool. A Cronbach alpha value that's >0.7 is widely recognized as indicating reliable internal consistency (Sekaran & Bougie, 2013, p. 293). Cronbach alpha was calculated for each of the constructs in the conceptual model and for the overall question set. The results were:
  - IT Capability - 0.8802
  - Innovation Capability - 0.9000
  - Firm Performance - 0.8094
  - Overall - 0.9363
  
3. Equivalence This is level of agreement among researchers using the same data collection tool. The ratings of two or more researchers are compared by calculating a correlation co-efficient. This test was not concluded and remains for the future to be determined.

### 3.12.2 Validity

Validity encompasses the entire experimental concept and establishes whether the results obtained meet all the requirements of the scientific research method (Sekaran & Bougie, 2013; Creswell, 2014). Internal validity dictates how an

experimental design is structured and encompasses all of the steps of the scientific research method. External validity is the process of examining the results and questioning whether there are any other possible causal relationships. There are three types of validity tests namely, construct validity, content validity, and criterion-related validity (Sekaran & Bougie , 2013)

#### *Construct Validity*

Illustrates how closely the results obtained from the study measure the theoretical hypotheses around which the research instrument is designed. This is assessed through convergent and discriminant validity. Convergent validity is proven when the scores obtained from two different research instruments measuring the same concept are highly correlated. Discriminant validity is proven when based on theory, two variables are predicted to be uncorrelated and the scores obtained then illustrate whether this is true. In this study, convergent validity was used by comparing the research results obtained from the field study to the research results of prior studies with different instruments uncovered during the literature review. The goal of the study was to examine the impact of a moderating variable on the relationship between an independent and dependent variable.

#### *Content Validity*

Ensures that the measure includes an adequate and representative set of items that explore the concept. The more that the scale items represent the domain of the concept, the greater will be the content validity of the research instrument. This study will draw on well-established scale items that represent significantly the domain of the concepts being tested. The literature review has discovered peer-reviewed prior studies that state what scale items usually represent such concepts under study. It was not practical to incorporate all possible scale items into the research questionnaire as the questionnaire would become too lengthy and this would hinder the response rate to the questionnaire. It was deemed sufficient to include the ten main items into each of the three constructs being tested. These ten items gave a representative indication of the construct in question.

#### *Criterion-related Validity*

This validity is established when the measure differentiates an individual on a criterion that it is expected to predict. Criterion-related validity can be established by concurrent validity or predictive validity. Concurrent validity is established when the scale discriminates individuals known to be different.

### 3.13 Bias

Bias is defined as any tendency which prevents unprejudiced consideration of a question (Sekaran & Bougie, 2013). Bias can occur at any phase of research, including study design or data collection, as well as in the process of data analysis. A quantitative approach was taken thus limiting the bias within the study. Participation bias was avoided by using the company's distribution lists on its' emailing server to send out the invitation to participate in the study. Information bias was prevented by uploading all the valid responses into the statistical tool (Minitab ®) for analysis. Results presented are as reported by the statistical tool.

### 3.14 Ethical Considerations

Due to the highly competitive nature of the aluminum industry as well as the requirements of the University of KwaZulu-Natal ethics committee, a gatekeeper's letter was obtained from the Vice President Operation of Hillside Aluminium prior to questionnaires being sent out. Participation in this survey was completely voluntary and this was communicated in the email note. In addition, the letter of informed consent was incorporated into the online survey with the choice for the participants to participate in the survey.

All respondents are anonymous and the online questionnaire results has been secured in a safe and confidential location for a period of at least five years in line with the University of Kwa-Zulu Natal's research policy. The field study only proceeded once such ethical clearance (Protocol reference number: HSS/0277/017M) was granted.

### 3.15 Summary

In this section the research methodology was presented. The research design was presenting including the research paradigm, data collection and processing, as well the analysis technique. The research reliability and validity tests are also presented.

Finally, the ethical and bias perspectives were considered. In the next section the results of the survey is presented.

## 4 CHAPTER FOUR Presentation of Results

### 4.1 Introduction

The previous chapter set out the research methodology that guided the empirical study. This chapter presents the results of the survey. Prior to analysing the data, the results had to be cleansed to remove incomplete responses. The data gathered is tabulated, expressed graphically, and statistically analysed in this chapter. The intent of this study is to investigate if IT Capability plays a moderating role on the relationship between Innovation and Firm Performance.

The data was analysed using descriptive and inferential statistics. Descriptive analysis favoured the data collected in the demographic section whereas inferential analysis was conducted on the remaining questions centred on use of the Likert scale.

### 4.2 Results of Demographic Data

Hillside Aluminium manning list (term used internally to refer to the permanent employees who are on the company's payroll) was used to determine the population sample. In Table 4.1, details of the responses are shown.

Table 4-1 Population, Participation, and Response Data

Population Size	292
Total Respondents	136
Response Rate	47%
Error Count (Blank entries)	16
Total Valid Responses	120
Valid Response Rate	41%



### 4.2.1 Levels of Management

Majority of the respondents were lower level management, making up 68% of the total valid responses. This was followed by the middle management (25%) and senior management (7%). However, when considering the different management levels and their respective population size, the response rate provides an alternate perspective on the participation rates. This perspective shows that senior management were the majority participants at a rate of 89%, followed by middle management (68%), and lower management (34%). The interpretation of the significance of this is presented in chapter five.

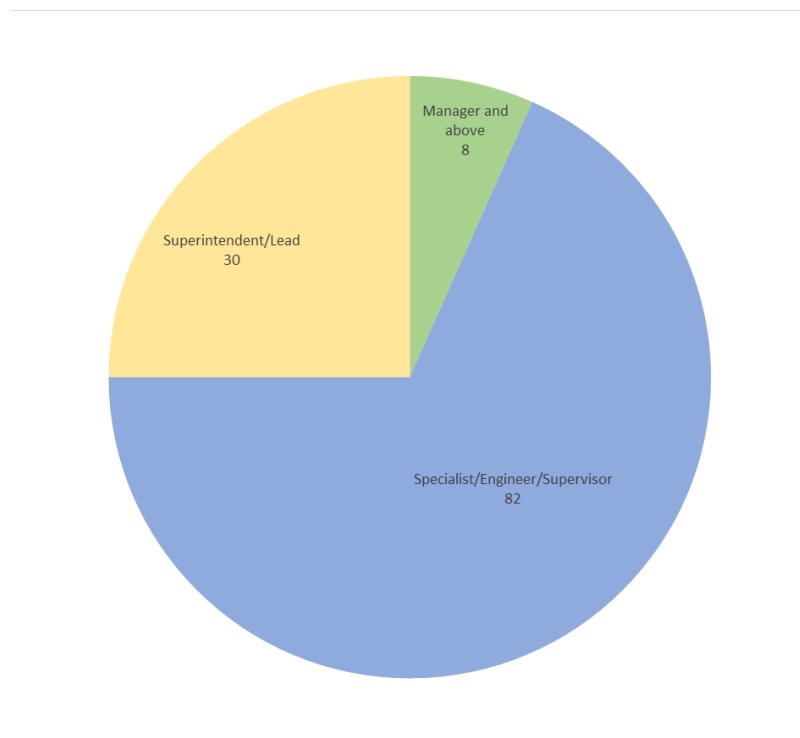


Figure 4.1 Job Grades of the Participants

### 4.2.2 Working Experience of Sampled Population

Work experience revealed that majority of the participants (88%) had in excess of 10 years of work experience. The lowest participant rate was from less than five years' experience (4%). This data is shown in Figure 4.2.

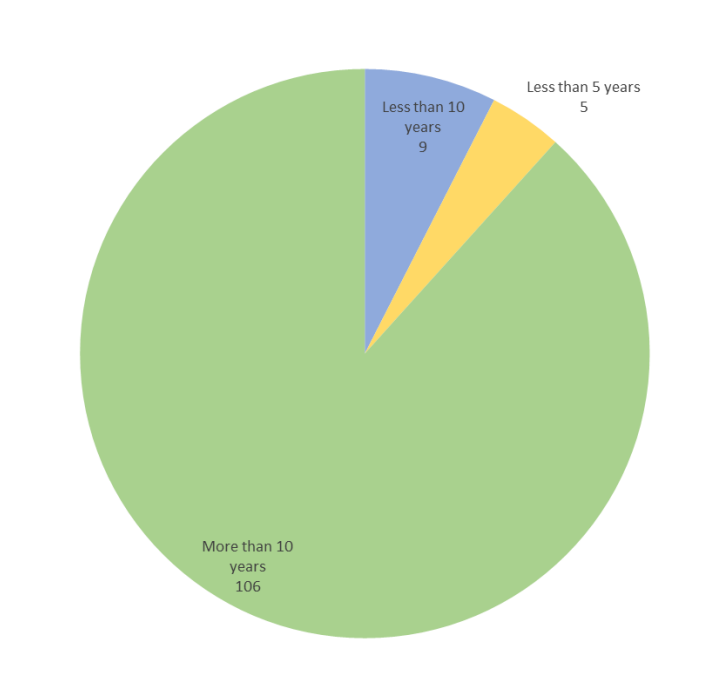


Figure 4.2 Years of Experience of the Participants

#### 4.2.3 Respondents by Gender

The gender distribution of the respondents who participated in the study is reflected in Figure 4.3. Males made up a majority of 79% of the sampling population. A recent survey conducted at the Hillside organization focusing on females only had a response rate of eighteen percent (18%). The combined payroll of females for the organisation is two hundred and forty eight (248). While more female participation is favoured, the results of this survey shows consistency with previous survey in the company. Hence this ratio is accepted for this study.

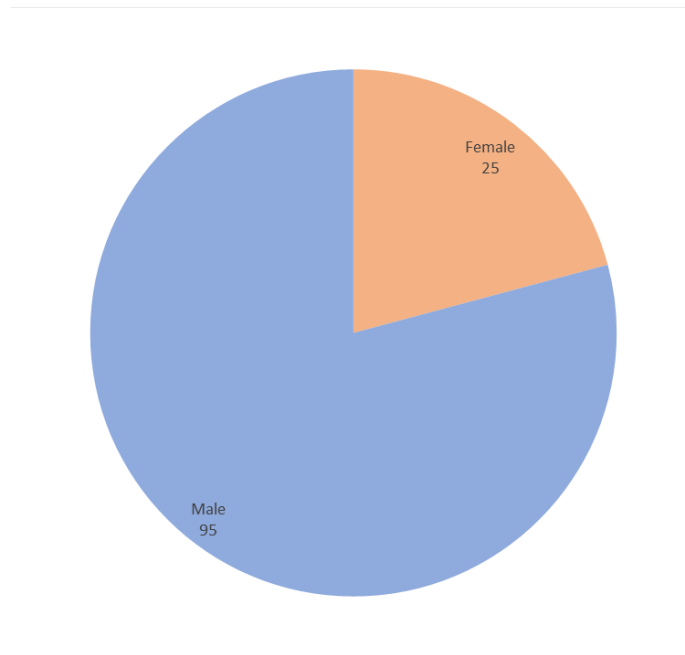


Figure 4.3 Gender of the Participants

#### 4.2.4 Age Perspective of Participants

A majority 68% of the participants are over the age of 40 years (16% older than 50 years of age, and the delta 53%). The years of experience is an important scale in that given the rapid change in technology, the impact on individuals knowledge of such technology has a direct bearing on their interpretation of the value that technology could have on innovation and FP. This data is presented in Figure 4.4.

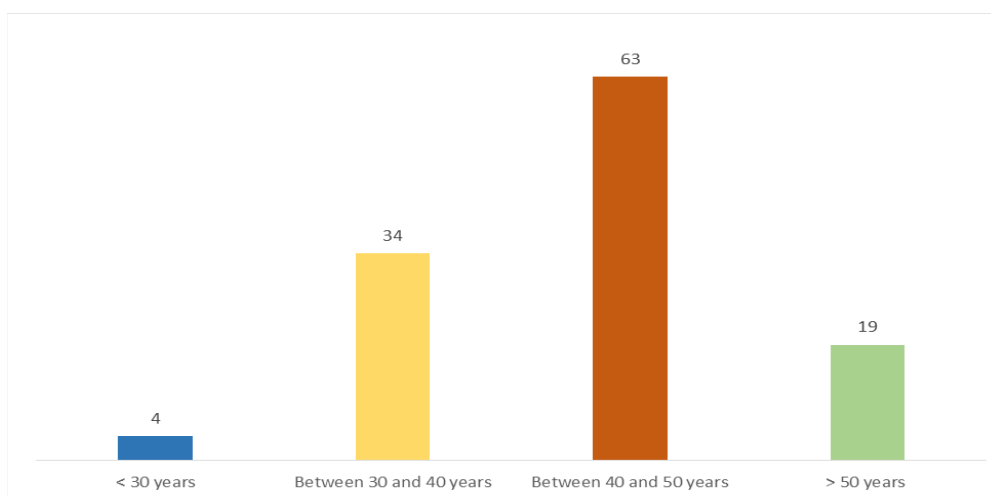


Figure 4.4 Age Group of the Participants

### 4.3 Frequency Distribution of Constructs

In this section a frequency distribution analysis is presented for each of the constructs researched. The frequency tables presented below show the frequency distribution for each question asked in the survey. As each question employed the five point Likert scale measure. For ease of analysis and discussion it was decided to aggregate the results for Strongly Disagree and Disagree responses, and similarly for Agree and Strongly Agree responses. For each table column n represents the total participants.

#### 4.3.1 IT Capability Distribution

The frequency distribution (by percentage) for each of the questions for the IT Capability construct is presented in Table 4.2. Majority of the results point towards a high level of IT Capability. However three values require comment. Question 7 queries the use of decision-support systems for managing customer information, which shows a results of 50.83%. The use of such systems will create insights into customer preferences, for example, and thus provide valuable input into the innovation processes (Leitner, Warnke, & Rhomberg, 2016). Question 14 “There is a climate that encourages risk taking and experimentation with IT” shows a 22.5% positive result. This points towards a relatively weak culture of innovation. Lastly, Question 17 “IT outsourcing improves firm performance” shows a low 43.33% positive result.

Table 4-2 IT Frequency Distribution

Question	IT Capability Questions	% Frequency (n=120)				
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	Overall, our technical support staff is knowledgeable when it comes to computer-based systems	1,67	8,33	4,17	60,00	25,83
2	Our firm possesses a high degree of computer-based technical expertise	1,67	5,83	8,33	63,33	20,83
3	We are very knowledgeable about new computer-based innovations	0,83	11,67	28,33	50,83	8,33
4	We have the knowledge to develop and maintain computer-based communication links with our external and internal suppliers and customers	0,00	5,00	13,33	68,33	13,33
5	We routinely utilize computer-based systems to access market information from outside databases	0,00	8,33	36,67	46,67	8,33
6	We have set procedures for collecting customer information from online sources	1,67	10,00	29,17	53,33	5,83
7	We utilize decision-support systems frequently when it comes to managing customer information	0,00	10,83	38,33	48,33	2,50
8	We rely on computer-based systems to acquire, store, and process information about our customers	0,00	7,50	17,50	54,17	20,83
9	Our company has a formal IT department	0,83	0,00	0,83	50,00	48,33
10	Our firm employs a manager whose main duties include the management of our information technology	0,00	4,17	5,00	55,83	35,00
11	Our firm creates customized software applications when the need arises	3,33	11,67	12,50	50,83	21,67
12	Our firm's members are linked by a computer network	0,00	0,00	2,50	49,17	48,33
13	Implemented IT solutions fulfill our business objectives	0,83	7,50	3,33	56,67	31,67
14	There is a climate that encourages risk taking and experimentation with IT	5,83	34,17	37,50	20,00	2,50
15	There is clarity of vision regarding how IT contributes to firm value or strategy	0,00	21,67	21,67	47,50	9,17
16	There is integration of business strategic planning and IT planning	0,83	11,67	21,67	55,83	10,00
17	IT outsourcing improves firm performance	5,83	26,67	24,17	38,33	5,00

### 4.3.2 Innovation Distribution

Table 4.3 shows the percent frequency distribution for each of the Innovation Capability questions asked to the participants based on the Likert scale. Questions 1 and 2 show relatively low value (47.50%) toward customers' preferences changes

in product quality. Questions 29 (45.83%), 31 (35%), 32 (32.50%), and 34 (22.50%) can be grouped into a dimension that indicates a culture of innovation. This dimension also indicates a low disposition toward innovation culture. Question 33, with an aggregate result of 31.67%, indicates the company to be a follower of innovation, albeit a quick follower. Questions 37 and 38, with an aggregate values of 21.67% and 35% respectively, supports this view that the company would prefer to be. Questions 48 and 49, with aggregate values of 42.50% and 40.83% respectively, is consistent with the fact that the organization currently only intends on producing a single market product.

Table 4-3 Innovation Frequency Distribution

Question	Innovation Capability Questions	% Frequency				
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
18	In our kind of business customers' product and quality preferences change quite a bit over time	2,50	37,50	12,50	40,00	7,50
19	Our customers tend to look for new product quality all the time	5,00	33,33	14,17	40,00	7,50
20	Technological changes provide big opportunities in our industry	0,00	7,50	8,33	65,00	19,17
21	A large number of new product ideas have been made possible through technological breakthroughs in our industry	1,67	18,33	21,67	47,50	10,83
22	The technology in our industry is changing rapidly	0,83	20,83	10,00	52,50	15,83
23	Competition in our industry is cutthroat	1,67	16,67	14,17	51,67	15,83
24	Price/Cost competition is a hallmark of our industry	0,83	4,17	11,67	51,67	31,67
25	Anything that one competitor can offer, others can match readily	0,00	10,00	21,67	51,67	16,67
26	We encourage people to think and behave in original and novel ways	0,83	15,00	8,33	70,00	0,83
27	We are willing to try new ways of doing things and seek unusual, novel solutions	0,83	21,67	15,00	56,67	5,83
28	Our company can be described as flexible and continually adapting to change	0,83	15,00	8,33	65,00	10,83
29	In our company, we tolerate individuals who do things in a different way	1,67	30,83	21,67	40,83	5,00
30	Employees get a lot of support from managers if they want to try new ways of doing things	1,67	26,67	14,17	50,00	7,50
31	The reward system encourages innovation in our company	4,17	40,00	20,83	31,67	3,33
32	Our company gives employees free time to pursue creative ideas during the workday	5,83	43,33	18,33	31,67	0,83
33	When we see new ways of doing things, we are last at adopting them	1,67	41,67	25,00	29,17	2,50
34	In our firm we are willing to take risks and explore "chancy" growth opportunities	2,50	48,33	26,67	21,67	0,83
35	Our investments in new machinery and equipment are significant compared with our annual turnover	3,33	34,17	20,83	35,83	5,83
36	Our investments in new methods of production are significant compared with our annual turnover	4,17	37,50	25,83	30,00	2,50
37	In new process and service introductions, our company is often first-to-market	6,67	40,00	31,67	20,00	1,67
38	In comparison with our competitors, our company has introduced more innovative processes and services during the past three years	1,67	25,00	38,33	31,67	3,33
39	Our new processes and services are often perceived as very novel by customers	1,67	19,17	38,33	38,33	2,50
40	In comparison with our competitors, our company has introduced more innovative production or delivery methods during the past three years	2,50	30,00	33,33	30,00	4,17
41	New processes and services in our company often take us up against new competitors	1,67	24,17	30,83	40,00	3,33
42	Our firm will introduce new processes or services within a year	3,33	20,00	25,83	47,50	3,33
43	In new process and service introductions, our company is often at the cutting edge of technology	2,50	31,67	22,50	40,00	3,33
44	During the past three years, our company has developed many new management approaches	0,00	6,67	8,33	72,50	12,50
45	We are constantly improving our business processes	0,00	8,33	8,33	66,67	16,67
46	IT has an effect on the new production ideas	1,67	13,33	8,33	62,50	14,17
47	IT has an effect on the innovation of production works	0,83	11,67	9,17	65,00	13,33
48	IT has an effect on the decrease of development process of the new products	1,67	22,50	33,33	39,17	3,33
49	IT has an effect on the decrease of the changes in product designs	1,67	28,33	29,17	38,33	2,50
50	IT has an effect on the convenience of the new product for the customers	0,83	18,33	21,67	52,50	6,67

### 4.3.3 Firm Performance Distribution

Majority of the results are consistent with the overall performance of the company over the past three years. Question 53 (82.50%) and question 54 (81.67%) complement each other and show consistency. Question 55 indicates there is 40% potential for improvement for this important company performance indicator. Question 65 result was 65% indicates a good result for the impact of innovation on growth and profitability, however this too indicates opportunity for further firm gains. Similarly, question 57 with a result of 54.17% indicate that just below 50% of departments achieved all their KPIs, thus indicating further opportunities for improvements to the overall firm performance.



Table 4-4 Firm Performance Frequency Distribution

Question	Firm Performance Questions	% Frequency				
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly/Agree
51	The quality of our processes and services in your department has improved over the past three years	3,33	22,50	8,33	53,33	12,50
52	Your consumer satisfaction is greater than it was last year	4,17	23,33	20,00	45,00	23,33
53	The firm's profitability is higher than it was last year	0,00	2,50	15,00	63,33	19,17
54	The firm's cost-base has improved since last year	0,00	7,50	10,83	63,33	18,33
55	Labor productivity has improved since last year	1,67	20,83	17,50	53,33	6,67
56	Innovations introduced in the last three years have contributed to income growth or profitability in our firm	0,83	14,17	20,00	52,50	12,50
57	Your department achieved all set key performance indicators in the past three years	2,50	34,17	9,17	49,17	5,00

## 4.4 Inferential Results

The conceptual model presented a hypothesis on relationship between Innovation Capability (independent variable), Firm Performance (dependent variable), and IT capability (moderating variable).

Two statistical models were used to analyse the data:

1. Pearson Correlation Coefficient
2. Regression Analysis

The results of these tests are presented below.

### 4.4.1 Pearson Correlation Coefficient

A p-value  $<0.01$  was found for the relationship between Innovation Capability and Firm Performance. This implies a statistically significant relationship exists between these two constructs. The r-value was 0.616 thus confirming a strong (Evans, 1996) and positive relation.

A p-value  $<0.01$  was found for the relationship between IT Capability and Firm Performance. This implies a statistically significant relationship exists between these two constructs. The r-value was 0.577 thus confirming a moderate (Evans, 1996) and positive relation. Based on the PCC the data has supported the hypothesis presented in the conceptual model.

A third test was also run to test the relationship between IT Capability and Firm Performance. The r-value was 0.577, this indicating a positive and significant relationship exists. In addition, the p-value  $<0.01$  implies that there is a statistically significant relationship between these variables.

The coefficients are shown in Table 4.2 below. Note in all instances the left-sided variable is considered the independent variable, and the right-sided variable the outcome variable.

Table 4-5 Pearson Correlation Analyses

Constructs Relationship	Pearson Correlation	
	r-value	p-value
Innovation Capability → Firm Performance	0.616	<0.01
IT Capability → Firm Performance	0.577	<0.01
IT Capability → Innovation Capability	0.563	<0.01

#### 4.4.2 Regression Analysis

##### 4.4.2.1 Innovation and Firm Performance

Simple regression analysis is used in a situation where one independent variable is hypothesized to affect one dependent variable (Sekaran & Bougie, 2013). The first regression test was conducted for the Firm Performance (independent variable) and Innovation Capability (dependent variable). The results show an  $R^2$  value of 37.94%. This means that approximately 38% of the variation of the Firm Performance can be explained by Innovation Capability. The simple regression analysis applied between these two variables showed a very favourable result. The p-value was <0.01 showing a statistically significant relationship. Also from the research analysis, the model fitted very well (p-value < 0.01).

Table 4-6 Regression Analysis for Firm Performance and Innovation Capability

i. Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	898.3	898.32	72.15	<0.01	
Innovation Capability	1	898.3	898.32	72.15	<0.01	
Error	118	1469.1	12.45			
Lack-of-Fit	50	502.1	10.04	0.71	0.901	
Pure Error	68	967.1	14.22			
Total	119	2367.5				

ii. Model Summary				
S	R-sq	R-sq(adj)	R-sq(pred)	
3.5285	0.38	0.37	0.36	

iii. Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	4.58	2.42	1.90	0.060		
Innovation Capability	0.1849	0.0218	8.49	<0.01	1	

iv. Regression Equation	
Firm Performance	= 4.58 + 0.1849 Innovation Capability

#### 4.4.2.2 IT Capability and Innovation Capability

A simple regression analysis was done between IT Capability and Innovation Capability results. This analysis is necessary as IT Capability is being tested for its moderating effect on the relationship between Innovation Capability and Firm Performance. Hence it is necessary to perform a statistical test between IT Capability (moderator) and Innovation Capability (independent variable). The p-value was found to be <0.01 thus indicating a statistically significant relationship exists between the constructs. Furthermore, a favourable R<sup>2</sup> value of 0.32 was found. The results indicated that 32% of variation in Innovation Capability is determined by IT Capability.

Table 4-7 Regression Analysis for Innovation Capability and IT Capability

i. Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	8319	8319.1	54.67	<0.01
IT Capability	1	8319	8319.1	54.67	<0.01
Error	118	17957	152.2		
Lack-of-Fit	33	6117	185.4	1.33	0.148
Pure Error	85	11839	139.3		
Total	119	26276			

ii. Model Summary			
S	R-sq	R-sq(adj)	R-sq(pred)
12.3359	0.32	0.31	0.29

iii. Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	45.39	8.82	5.15	<0.01	
IT Capability	1.015	0.137	7.39	<0.01	1

iv. Regression Equation
Innovation Capability = 45.39 + 1.015 IT Capability

#### 4.4.2.3 Testing Moderation of IT Capability

The conceptual model presented in this research was employed to determine the strategic relevance of IT in today's business world. Based on resource-based theory, IT Capability was tested for its moderating effect on the relationship between innovation and firm performance, a relationship proven to be positive and significant in the research analysis. A regression analysis was conducted using the three constructs of the conceptual model. The analysis of the results showed that a p-value of <0.01 for moderator variable (a composite based on equation 3.3.), thus indicating a statistically significant relationship exists. However a p-value of 0.579 was found for Innovation Capability. As a p-value >0.05 indicates a statistically insignificant relationship, the conceptual model does not fit well. The R<sup>2</sup>-value was found to be 0.45, a favourable value. The results indicate that 45% variation in the dependent variable can be determined by the independent variable. This is an interesting finding as it shows that the relationship between Innovation Capability and Firm Performance is improved through the inclusion of the IT Capability construct. This indicates that IT Capability does have a positive impact on the relation between the underlying constructs. It was therefore decided to re-run the

tests but using multiple regression analysis. The results of this test are presented in the next section. The results of this model was presented in Table 16 below.

Table 4-8 Regression Analysis with IT Capability as the Moderating Variable

i. Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1075.38	537.692	48.69	<0.01
Moderator	1	177.06	177.062	16.03	<0.01
Innovation Capability	1	3.42	3.422	0.31	0.579
Error	117	1292.08	11.043		
Lack-of-Fit	113	1282.08	11.346	4.54	0.073
Pure Error	4	10	2.5		
Total	119	2367.47			

ii. Model Summary			
S	R-sq	R-sq(adj)	R-sq(pred)
3.3232	0.45	0.44	0.42

iii. Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	10.65	2.73	3.890	<0.01	
Moderator	0.001629	0.000407	4	<0.01	4.79
Innovation Capability	0.025	0.0449	0.56	0.579	4.79

iv. Regression Equation
Firm Performance = 10.65 + 0.001629 Moderator + 0.0250 Innovation Capability

#### 4.4.2.4 Multiple Regression Analysis

Multiple regression analysis was run in view of the unfavourable outcome based on using the IT Capability as a moderating variable. This prompted a retesting of the model using the model applied by Turulja & Bajgoric (2016), in which they showed the IT Capability and Innovation Capability as antecedents of Firm Performance.

The p-values IT Capability and Innovation Capability were <0.01. This indicated a statistically significant relationship between these independent variables and Firm Performance. Furthermore, the R<sup>2</sup>-value of 0.4573 was produced, an improvement on the model showing IT Capability as a moderator. Hence, 45.73% variation in Firm Performance could be explained by IT Capability and Innovation Capability. From the research analysis, this model fitted very well (p-value < 0.01). The statistical results are summarized in Table 17 below.

Table 4-9 Regression Analysis for Firm Performance with Innovation Capability and IT Capability as the Independent Variables

i. Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1082.65	541.324	49.29	<0.01
IT Capability	1	184.33	184.326	16.79	<0.01
Innovation Capability	1	293.7	293.704	26.75	<0.01
Error	117	1284.82	10.981		
Lack-of-Fit	113	1274.82	11.282	4.51	0.074
Pure Error	4	10	2.5		
Total	119	2367.47			

ii. Model Summary			
S	R-sq	R-sq(adj)	R-sq(pred)
3.31381	45.73%	44.80%	42.79%

iii. Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.78	2.62	-0.300	0.765	
IT Capability	0.1827	0.0446	4.1	<0.01	1.46
Innovation Capability	0.1279	0.0247	5.17	<0.01	1.46

iv. Regression Equation
Firm Performance = -0.78 + 0.1827 IT Capability + 0.1279 Innovation Capability

## 4.5 Summary

In section the results of the data collection was presented. This included primarily the presentation of the descriptive and inferential results. Descriptive results were presented in use graphs. The inferential results were presented based on statistical constructs of Pearson Correlation and regression analysis. The findings indicated the function of IT Capability as a moderating variable did not fit well with the results. A multiple regression analysis was run, using IT Capability and Innovation Capability as independent variables. This model produced favourable results showing a statistically significant relationship exists. In the next section a discussion is offered to describe the findings of these results.

## 5 CHAPTER FIVE Discussion, Conclusion and Recommendations

### 5.1 Introduction

The aim of this study was to investigate if IT Capability played a moderating role on the relationship between Innovation Capability and Firm Performance. In this chapter the research study is concluded under three sub-sections viz. discussion, conclusion, and recommendations. In the discussion section the results presented in the previous chapter are discussed incorporating the literature review analysis. The conclusion section draws the outcomes of the research questions in view of the findings. Lastly, the recommendation section presents the implications for future theoretical research and practical considerations for business. The reader's attention is first drawn to the aim of this study and the research questions the study attempted to answer.

### 5.2 Research Objectives

The aim of this study was to investigate if IT Capability played a moderating role on the relationship between Innovation Capability and Firm Performance. In order to gain a perspective on this the following three research objectives were addressed:

1. To find out if there is a beneficial impact of innovation capability on the firm performance
2. To find out if there is a beneficial impact of information technology capability on the firm performance
3. To find out if information technology capability plays a moderating role in the relationship between innovation capability and the firm performance

### 5.3 Analysis of Demographic Findings

The demographic data is best applied in conjunction with the results presented in the inference section below. The following points on each of the demographic variables is observed.

#### 5.3.1 Analysis of Job Grade Results

The organogram of the Hillside organisation is based on a flat structure. According to Ferreira and Sah (2012), there are two levels to a flat structure, where the upper level is made up of the decision-makers and the lower level is determined



endogenously. Consequently the upper layer is smaller than the lower levels. This supports the results of only 7% of the participants are from the manager and above category. The majority participation was from the lower-level of 68%. However, in viewing the participation rate per level, reveals 89% senior management, 68% middle management, and 34% lower management. A plausible explanation for this could be that members of the senior management team were engaged verbally as part of the engagement with the respective departments. Hence they understood the intent of the survey and were more willing to participate. Due to the large number of lower management, use of email services was the only means to reach them. This may have resulted in the lower participation rate.

### 5.3.2 Analysis of Years of Experience Results

The results indicated that a majority of 88% of participants had in excess of ten years of experience. In view of the highly specialized aluminium smelters, employees tend to remain in this industry, with movements or transfer within the boundary of smelting operations. Hence, once an individual reaches ten years of experience in this industry the individual tends to remain for a long period. The low participation rate of 4% is consistent with the company's graduate programme, in which newly graduated individuals are placed in development programmes for a period of two years, being exposed to all areas of the operation, before being permanently placed once they successfully pass the programme.

### 5.3.3 Analysis of Age Group Results

The Hillside Smelter was built in 1994 and commissioned in 1995. The recruitment strategy at that time was deliberate in employing young employees, in which a new culture can be established and sustained. As indicated above, the uniqueness of the aluminium industry results in employees becoming highly specialised and thus limiting movement into other industries. Thus, employees tend to remain working in this industry. In addition, due to the nature of the operations, smelters are usually built in remote towns. Consequently, recruitment takes place from the local surrounding communities. With employees being from the area, they tend to remain in the area. This could attribute the majority 68% age group being over 40 years of age. Four percent of the respondents are less than thirty (30) years. These

represent the latest three generations in society viz. Generation Y, Generation Z, and Gen Alpha (Robinson, 2017).

#### 5.3.4 Analysis of Gender Results

Males made up 79% of the sampling population. There is no clear explanation that can ascribe the low participation by the female workforce. However, the female population is two hundred and ninety eight (298) out of a workforce of approximately one thousand and three hundred (1300). This indicates a 20% female representation across the workforce. In addition, a recent survey conducted on site targeting females only had a response rate of 18%. In view of this, the participation rate of 21% would be acceptable.

#### 5.4 Frequency Distribution Discussion

The following sub-sections present the frequency distribution discussion for the results presented in the previous section. For ease of discussion, the Likert scales values of Strongly Disagree and Disagree were aggregated into Aggregated Disagree measure, and similarly the Strongly Agree and Agree scales were aggregated into the Aggregated Agree measure.

##### 5.4.1 IT Capability Frequency Distribution

As indicated in the previous section, two factors presented for this construct requires a more detailed discussion. These are listed below with their respective Aggregate Agree scores in parentheses:

- Question 14 – There is a climate that encourages risk taking and experimentation with IT (22.50%)
- Question 17 - IT outsourcing improves firm performance (43.33%)

Table 5-1 Aggregated IT Capability Frequency Distribution

Question	IT Capability Questions	% Frequency (n=120)		
		Aggregate Disagree	Uncertain	Aggregate Agree
1	Overall, our technical support staff is knowledgeable when it comes to computer-based systems	10,00	4,17	85,83
2	Our firm possesses a high degree of computer-based technical expertise	7,50	8,33	84,16
3	We are very knowledgeable about new computer-based innovations	12,50	28,33	59,16
4	We have the knowledge to develop and maintain computer-based communication links with our external and internal suppliers and customers	5,00	13,33	81,66
5	We routinely utilize computer-based systems to access market information from outside databases	8,33	36,67	55,00
6	We have set procedures for collecting customer information from online sources	11,67	29,17	59,16
7	We utilize decision-support systems frequently when it comes to managing customer information	10,83	38,33	50,83
8	We rely on computer-based systems to acquire, store, and process information about our customers	7,50	17,50	75,00
9	Our company has a formal IT department	0,83	0,83	98,33
10	Our firm employs a manager whose main duties include the management of our information technology	4,17	5,00	90,83
11	Our firm creates customized software applications when the need arises	15,00	12,50	72,50
12	Our firm's members are linked by a computer network	0,00	2,50	97,50
13	Implemented IT solutions fulfil our business objectives	8,33	3,33	88,34
14	There is a climate that encourages risk taking and experimentation with IT	40,00	37,50	22,50
15	There is clarity of vision regarding how IT contributes to firm value or strategy	21,67	21,67	56,67
16	There is integration of business strategic planning and IT planning	12,50	21,67	65,83
17	IT outsourcing improves firm performance	32,50	24,17	43,33

#### 5.4.1.1 Question 14 – There is a climate that encourages risk taking and experimentation with IT

Kmiecniak et. al. (2012) found that IT enables innovation through empowerment. Leitner et. al. (2016) found that innovation is a critical enabler for firm performance going forward. The result for this factor shows an IT environment that does not support innovativeness. In view of the broader results, the consensus is there is a favorable level of IT Capability in the organization. Within the context of IT being regarded a common resource, this result seems consistent. However, the requirement is for IT to be more innovative and thus create and contribute to the greater innovativeness of the organisation thereby leading to firm performance gains. On this basis, there appears to be a gap in the organisation in addressing the innovative capability required to drive firm performance.

#### 5.4.1.2 Question 17 - IT outsourcing improves firm performance

According to Johansson and Bergkvist (2012), information system (interchangeably used with information technology) that require deep business knowledge must be kept inhouse or onshore. Innovation in the context of an organisation requires a deep level of understanding to be effective. Consequently, value-adding activities can be identified and implemented resulting in improvements to firm performance. This result therefore is consistent with literature in recognizing that IT for the use of improving firm performance, must leverage off innovation and hence insourced IT is best suited.

#### 5.4.2 Innovation Capability Frequency Distribution

Shin and Lee (2016) investigate the relationship between Innovation and Firm Performance by narrowing on the innovation from a culture perspective. Their results proved that innovation culture has a significant statistical relationship with firm performance. The frequency distribution results for innovation is summarised in Table 5.2 below. By sum aggregating and averaging the results for questions 29, 31, 32, and 34 for innovation shows a 67% unfavourable result for a culture of innovation. The results of this research was not consistent with the finding of Shin and Lee. A plausible explanation for this is that their study focused only on the culture dimension of innovation, whereas this study focused on innovation as input, output, and culture of innovation.

Reaiche, de Zubielqui, and Boyle (2016) study the role of country culture in defining innovation proving that culture does impact on the interpretation and application of innovation. The low culture of innovation presented by the results above brings into question the perception towards IT in driving innovation in and by the organisation. This is further discussion in section 5.4.3 below.

Table 5-2 Aggregated Innovation Frequency Distribution

Question	Innovation Capability Questions	% Frequency (n=120)		
		Aggregate Disagree	Uncertain	Aggregate Agree
18	In our kind of business customers' product and quality preferences change quite a bit over time	40,00	12,50	47,50
19	Our customers tend to look for new product quality all the time	38,33	14,17	47,50
20	Technological changes provide big opportunities in our industry	7,50	8,33	84,17
21	A large number of new product ideas have been made possible through technological breakthroughs in our industry	20,00	21,67	58,33
22	The technology in our industry is changing rapidly	21,66	10,00	68,33
23	Competition in our industry is cutthroat	18,34	14,17	67,50
24	Price/Cost competition is a hallmark of our industry	5,00	11,67	83,34
25	Anything that one competitor can offer, others can match readily	10,00	21,67	68,34
26	We encourage people to think and behave in original and novel ways	15,83	8,33	70,83
27	We are willing to try new ways of doing things and seek unusual, novel solutions	22,50	15,00	62,50
28	Our company can be described as flexible and continually adapting to change	15,83	8,33	75,83
29	In our company, we tolerate individuals who do things in a different way	32,50	21,67	45,83
30	Employees get a lot of support from managers if they want to try new ways of doing things	28,34	14,17	57,50
31	The reward system encourages innovation in our company	44,17	20,83	35,00
32	Our company gives employees free time to pursue creative ideas during the workday	49,16	18,33	32,50
33	When we see new ways of doing things, we are last at adopting them	43,34	25,00	31,67
34	In our firm we are willing to take risks and explore "chancy" growth opportunities	50,83	26,67	22,50
35	Our investments in new machinery and equipment are significant compared with our annual turnover	37,50	20,83	41,66
36	Our investments in new methods of production are significant compared with our annual turnover	41,67	25,83	32,50
37	In new process and service introductions, our company is often first-to-market	46,67	31,67	21,67
38	In comparison with our competitors, our company has introduced more innovative processes and services during the past three years	26,67	38,33	35,00
39	Our new processes and services are often perceived as very novel by customers	20,84	38,33	40,83
40	In comparison with our competitors, our company has introduced more innovative production or delivery methods during the past three years	32,50	33,33	34,17
41	New processes and services in our company often take us up against new competitors	25,84	30,83	43,33
42	Our firm will introduce new processes or services within a year	23,33	25,83	50,83
43	In new process and service introductions, our company is often at the cutting edge of technology	34,17	22,50	43,33
44	During the past three years, our company has developed many new management approaches	6,67	8,33	85,00
45	We are constantly improving our business processes	8,33	8,33	83,34
46	IT has an effect on the new production ideas	15,00	8,33	76,67
47	IT has an effect on the innovation of production works	12,50	9,17	78,33
48	IT has an effect on the decrease of development process of the new products	24,17	33,33	42,50
49	IT has an effect on the decrease of the changes in product designs	30,00	29,17	40,83
50	IT has an effect on the convenience of the new product for the customers	19,16	21,67	59,17

### 5.4.3 Firm Performance Frequency Distribution

The factors used by the organisation support the multidimensionality perspective of firm performance as defined by Santos and Brito (2012). The results show a strong awareness amongst the respondents for the profitability factors (questions 53 and 54). This indicates a bias towards the financial perspective of firm performance. Question 52 shows the stakeholder perspective for firm performance through the inclusion of the customer satisfaction. The result of 68.33% shows a strong awareness of the measure by the respondents, implying that there is a good interpretation of the measure from a stakeholder perspective.

Table 5-3 Aggregated Firm Performance Frequency Distribution

Question	Firm Performance Questions	% Frequency (n=120)		
		Aggregate Disagree	Uncertain	Aggregate Agree
51	The quality of our processes and services in your department has improved over the past three years	25,83	8,33	65,83
52	Your consumer satisfaction is greater than it was last year	27,50	20,00	68,33
53	The firm's profitability is higher than it was last year	2,50	15,00	82,50
54	The firm's cost-base has improved since last year	7,50	10,83	81,67
55	Labor productivity has improved since last year	22,50	17,50	60,00
56	Innovations introduced in the last three years have contributed to income growth or profitability in our firm	15,00	20,00	65,00
57	Your department achieved all set key performance indicators in the past three years	36,67	9,17	54,17



## 5.5 Inferential Results

Statistical analysis using Pearson Correlation and Regression Analysis was conducted to test the hypothesis presented in the conceptual model. The results presented in the previous chapter will be discussed below in the context of the research questions. There are four sub-sections discussing the findings. The first three are based on the conceptual mode. Due to the role of IT Capability as a moderating variable not being proven, the fourth section discusses the findings of the multiple regression results.

### 5.5.1 Innovation Capability and Firm Performance

The results found there to be a statistically significant relationship between Innovation Capability (IC) and Firm Performance (FP) with p-values  $<0.01$  confirmed with the Pearson Coefficient and Regression analysis tests. The r-value of 0.616 indicated further that a strong relationship exists. These results are consistent with the findings of Kmiecik et al. (2012) and Brem et al. (2016).

### 5.5.2 IT Capability and Innovation Capability

A positive and significant relationship was shown to exist between IT Capability (ITC) and Innovation Capability (IC). These results are consistent with the findings of Turulja and Bajgoric (2016), Kmiecik et al. (2012), Leitner et al. (2016) and Berman et al. (2016). As ITC was hypothesised as a moderator between IC and FP, it was necessary to test this relationship. On the basis of the favorable results, it was permissible to proceed to test ITC for its moderating role (Section 5.4.3).

### 5.5.3 Testing Moderation Using Regression Analysis

The results of the Pearson Coefficient showed a positive and significant statistical relationship existed for this conceptual model. However, for the regression analysis IC showed an unfavourable p-value  $>0.05$ . Hence it was inconclusive in showing ITC as a moderating variable. A similar result was found by Kmiecik, Michna, and Meczynska (2012). Kmiecik et al. suggested that IT capabilities demonstrating the characteristics of VRIN resources was necessary for consideration of IT as a competitive resource. In view of the low innovation culture finding in section 5.4.1, it is plausible that IT is not being viewed within the context of innovation potential. Rather, IT is being viewed from the perspective of a common resource i.e. a resource

that helps the organisation achieve competitive parity at best. This is consistent with the r-value of 0.563 and p-value <0.01 showing positive and strong relationship between ITC and FP. Pérez-López and Alegre (2012) showed that innovation can have a mediating affect between IT and FP. Ong and Chen (2013) however showed a direct relationship between IT and FP, one that is not contingent on IC. In particular they showed the IT plays a more significant role in firm value than FP. This divergent views lead to the decision to perform a multiple regression analysis using ITC and IC as independent variables and FP the dependent variables. These results are discussed in the next section.

#### 5.5.4 Multiple Regression Analysis

The results showed there exists a positive and significant relationship between ITC and IC as independent variables and FP as the dependent variables (p-values <0.01). In addition, the  $R^2$  value (0.4573) indicated a strong correlation. This test was modelled on the work by Turulja and Bajgoric (2016) and the results were consistent with their findings.

The regression analysis between IC and FP showed a  $R^2$  value of 0.38 and the  $R^2$  value between ITC and IC was 0.32. Consequently the combined effect of ITC on IC resulted in significant improved  $R^2$  value of 0.45, thus indicating that IT does positively influence IC in determining FP. This finding is a critical outcome in the scope of this research. This is elaborated in the conclusion section next.

#### 5.6 Conclusions

The multiple regression analysis showed that IT capability does have a positive impact on innovation capability in determining firm performance. In this way, the research has shown that applied correctly, IT can have a strategic role in an organisation and is not limited being a common resource. Cai, Huang, Liu, and Liang (2016) warned though that IT itself cannot be a strategic resource, as it can be easily imitated. Therefore IT resources, such as skills, infrastructure, and management must be combined into capabilities displaying VRIN characteristics to be considered a strategic resource. It is equally important and critical that the organisation complement this with dynamic capabilities to ensure that sustainable competitive advantage can be achieved, a goal all modern organisations aspire too!

## 5.7 Recommendations

- For future practical considerations:
  1. Firm performance should be broadened to include sustainability dimension. Considering the impact of IT on these sustainability factors could strengthen the case of IT as a strategic resource.
  2. IT capabilities include different IT-related resources and skills. IT management must interpret these resources in the context of competitive advantage. In so doing the correct investment decisions are made in developing those IT attributes that contribute to FP and ultimately business strategy.
  3. To achieve sustainable competitive advantage, the dynamic capabilities of an organisation, specifically in relation to IT capability, must be understood and managed. The pace of change in the business and technological environments will shorten the life-span of IT resources offering strategic benefits requiring the identification of an updated portfolio of strategic resources. This will have to be a continuous process.
- For future literature study
  1. Ong and Chen (2013) state that managers should consider the long term strategic positioning of IT. Their study shows the higher significance level for firm value than the short term FP measure. Hence more empirical longitudinal studies need to be done to understand strategic relevance of IT.
  2. This study focused on a holistic perspective for each of the constructs. The culture dimension extracted from the innovation construct showed a low culture toward innovation (see section 5.4.2). A study looking at this dimension together with IT capability and firm performance would be suggested. The works of Leitner et. al. (2016) and Shin and Lee (2016) could offer a baseline model to work from.
  3. The concept of multidimensionality should be explored for each of the constructs in determining support of the conceptual model. Factor analysis would be an ideal tool to determine the relevant dimensions within each construct that show statistically significant relationships.

4. Reaiche et. al. (2016) found differences in the meso and micro levels are shaped by a set of specific interests, rules and norms of a given field of action and thought and the ways in which interests mesh or collide within and across levels help to determine the course of an innovation's adoption. As such future studies should focus on an homogenous level of management as opposed to the heterogenous approach taken in this study.
5. Robinson (2017) shows the latest age generations to be Gen Z (1996 - 2010 birth years) and Generation Alpha (2011 – 2025 birth years). The generations represent a population of employees that will have the broadest and deepest exposure to technology before entering into employment. Based on this, a study to investigate the expectations from these generations on IT in the workplace would be useful, in particular in relation to innovativeness in the organization.

## 5.8 Limitations of the Research

The following limitations were experienced in the course of this study:

- study was limited to only the EMT population of the Hillside Aluminium Smelter and therefore cannot be generalized to all smelter operations, nor to the industry.
- the response rate was 41%, which fell below the target of 58% as recommended for the size of sampling population. It is therefore recommended that generalisation of the results be done with caution.

## 5.9 Challenges Encountered and Overcome

- The organisation has recently conducted several surveys in close proximity to this survey. There was a risk of reluctance for employees to participate. To mitigate this the email was cascaded through each department's line manager, which offered context and encouragement for the participants to complete the survey.
- The design of the online survey did not make responses to the questions mandatory. Consequently, several questions had blank answers. This

required the raw data to be cleansed and 16 responses had to be rejected due to quality issues.

- The response rate per day showed a decline in the first week and flattened in the second week. A reminder email was subsequently sent out, bringing about a highly participation rate for the remaining days the survey was opened.
- The pilot study was done manually, distributing 20 questionnaires to the pilot sample. However, this exercise found two challenges. Firstly, it was time consuming to engage with each participant. Secondly, the collation of data also proved to be a time consuming exercising. It was therefore decided to use the online survey tool (surveymonkey.com) to complete each response. In addition, the online tool provided built-in functionality to store and export the data.

## 5.10 Summary

This section discussed the primary findings of the results presented in chapter four. Demographic and inferential findings were discussed. While the Pearson Correlation Coefficients showed a favorable response to the conceptual model, the regression analysis showed an unfavorable response. The results were retested using multiple regression, and this showed a positive result to the hypothesis of Turulja & Bajgoric (2016). The main outcome is that IT can have strategic relevance when applied together with innovation in terms of favorable FP outcomes. In the next section the conclusions and recommendations are discussed. IT can be considered a strategic used when used in conjunction with Innovation in driving FP. Concept of IT being a commodity is unlikely. The strategy of a firm showed whether IT should be insourced or outsourced. However in today's environment, a company can't retain a particular strategy indefinitely. It must adapt or change with the industry and broader economy driving factors.

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# Appendix 1 Ethical Clearance Letter



03 May 2017

Mr Indiran Poobalan Naidoo (921313602)  
Graduate School of Business & Leadership  
Westville Campus

Dear Mr Naidoo,

**Protocol reference number: HSS/0277/017M**

**Project title:** The Impact of Information Technology on Innovation in determining Firm Performance

**Full Approval – Expedited Application**

In response to your application received on 29 March 2017, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and FULL APPROVAL for the protocol has been granted.


Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

**PLEASE NOTE:** Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

  
.....  
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Muhammad Hoque  
Cc Academic Leader Research: Dr Emmanuel Mutambara  
Cc School Administrator: Ms Zarina Bullyraj

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Humanities & Social Sciences Research Ethics Committee

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Website: [www.ukzn.ac.za](http://www.ukzn.ac.za)

  
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## Appendix 2 Letter of Informed Consent



### Memorandum

**Date** 01-Mar-2017  
**To** Noel Pillay; Anneke Kleinhans  
**CC**  
**From** Indiran P Naidoo

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**Request for Permission to research the Impact of Information Technology on Innovation in determining Firm Performance at Hillside Aluminium**

I am at the final stage of my studies towards a Master's in Business Administration (MBA) at the University of KwaZulu-Natal (UKZN) Graduate School of Business (GSB). For my dissertation I have elected to conduct a research survey to assess the Impact of Information Technology on Innovation in determining Firm Performance at Hillside Aluminium. This study will focus on the EMTs only.

The research questionnaire will be issued to senior, middle, and lower level management teams members across the plant. The aim will be to determine if information technology is or can impact on innovation to drive firm performance. Innovation is globally considered a critical competency in enabling businesses, especially in the manufacturing industry, to achieve strategic imperatives. Confidentiality of responses and anonymity of respondents will be maintained at all times.

All correspondence will be sent to the HRD Lead for approval before submission to UKZN GSB. I have the assurance of Dr ME Hoque, research supervisor at UKZN GSB, which the results of this survey will be purely for the academic purpose of obtaining my MBA. No information will be made available for public scrutiny. All data will be stored in his office for two years and destroyed thereafter.

Thank you

Approval Signatures

Title	Name	Signature	Date
Lead Learning and Development	Anneke Kleinhans		02/03/2017
VP Operations ASA	Noel Pillay		02.03.17

## Appendix 3 Research Questionnaire



UNIVERSITY OF  
**KWAZULU-NATAL**  
INYUVESI  
**YAKWAZULU-NATALI**

**The Impact of Information Technology on Innovation in determining Firm Performance**

**1. Welcome to My Survey**

UNIVERSITY OF KWAZULU-NATAL  
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

Dear Respondent,

MBA Research Project

Researcher: Indiran P Naidoo (083 272 4185)

Supervisor: Muhammad Ehsanul Hoque (031 2608690)

Research Office: Ms P Ximba (031-2603587)

I, Indiran Poobalan Naidoo an MBA student, at the Graduate School of Business and Leadership, of the University of KwaZulu-Natal. You are invited to participate in a research project entitled **The Impact of Information Technology on Innovation in determining Firm Performance**. The aim of this study is to identify how information technology can be support innovation which is considered a key enabler to business in achieving its business objectives and goals.

Through your participation I hope to understand the role information technology plays in aiding you in your current role. In addition I would need to understand the relevance and importance of innovation in delivering initiatives that support the achievement of your key performance indicators..

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey/focus group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The survey should take you about 30 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Indiran P Naidoo

\* 1. I hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

Yes  No

2





The Impact of Information Technology on Innovation in determining Firm Performance

2. Bio Information

2. Please indicate your job grade:

- Specialist/Engineer/Supervisor
- Superintendent/Lead
- Manager and above

3. Please indicate your aggregate years of work experience:

- Less than 5 years
- Less than 10 years
- More than 10 years

4. Please indicate your gender:

- Male
- Female

5. Please indicate your age group:

- < 30 years
- Between 30 and 40 years
- Between 40 and 50 years
- > 50 years



The Impact of Information Technology on Innovation in determining Firm Performance

3. Information Technology Capability

\* 6. Overall, our technical support staff is knowledgeable when it comes to computer-based systems

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 7. Our firm possesses a high degree of computer-based technical expertise

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 8. We are very knowledgeable about new computer-based innovations

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 9. We have the knowledge to develop and maintain computer-based communication links with our external and internal suppliers and customers

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 10. We routinely utilize computer-based systems to access market information from outside databases

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 11. We have set procedures for collecting customer information from online sources

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 12. We utilize decision-support systems frequently when it comes to managing customer information

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 13. We rely on computer-based systems to acquire, store, and process information about our customers

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 14. Our company has a formal IT department

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 15. Our firm employs a manager whose main duties include the management of our information technology

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 16. Our firm creates customized software applications when the need arises

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 17. Our firm's members are linked by a computer network

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 18. Implemented IT solutions fulfil our business objectives

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 19. There is a climate that encourages risk taking and experimentation with IT

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 20. There is clarity of vision regarding how IT contributes to firm value or strategy

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 21. There is integration of business strategic planning and IT planning

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 22. IT outsourcing improves firm performance

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree



The Impact of Information Technology on Innovation in determining Firm Performance

4. Innovation Capability

\* 23. In our kind of business customers' product and quality preferences change quite a bit over time

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 24. Our customers tend to look for new product quality all the time

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 25. Technological changes provide big opportunities in our industry

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 26. A large number of new product ideas have been made possible through technological breakthroughs in our industry

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 27. The technology in our industry is changing rapidly

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 28. Competition in our industry is cutthroat

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 29. Price/Cost competition is a hallmark of our industry

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 30. Anything that one competitor can offer, others can match readily

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 31. We encourage people to think and behave in original and novel ways

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

- \* 32. We are willing to try new ways of doing things and seek unusual, novel solutions  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 33. Our company can be described as flexible and continually adapting to change  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 34. In our company, we tolerate individuals who do things in a different way  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 35. Employees get a lot of support from managers if they want to try new ways of doing things  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 36. The reward system encourages innovation in our company  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 37. Our company gives employees free time to pursue creative ideas during the workday  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 38. When we see new ways of doing things, we are last at adopting them  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 39. In our firm we are willing to take risks and explore "chancy" growth opportunities  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 40. Our investments in new machinery and equipment are significant compared with our annual turnover  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 41. Our investments in new methods of production are significant compared with our annual turnover  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 42. In new process and service introductions, our company is often first-to-market  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 43. In comparison with our competitors, our company has introduced more innovative processes and services during the past three years  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

- \* 44. Our new processes and services are often perceived as very novel by customers  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 45. In comparison with our competitors, our company has introduced more innovative production or delivery methods during the past three years  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 46. New processes and services in our company often take us up against new competitors  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 47. Our firm will introduce new processes or services within a year  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 48. In new process and service introductions, our company is often at the cutting edge of technology  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 49. During the past three years, our company has developed many new management approaches  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 50. We are constantly improving our business processes  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 51. IT has an effect on the new production ideas  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 52. IT has an effect on the innovation of production works  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 53. IT has an effect on the decrease of development process of the new products  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 54. IT has an effect on the decrease of the changes in product designs  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree
- \* 55. IT has an effect on the convenience of the new product for the customers  
 Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree



The Impact of Information Technology on Innovation in determining Firm Performance

5. Firm Performance

\* 56. The quality of our processes and services in your department has improved over the past three years

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 57. Your consumer satisfaction is greater than it was last year

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 58. The firm's profitability is higher than it was last year

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 59. The firm's cost-base has improved since last year

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 60. Labor productivity has improved since last year

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 61. Innovations introduced in the last three years have contributed to income growth or profitability in our firm

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

\* 62. Your department achieved all set key performance indicators in the past three years

Strongly Disagree  Disagree  Uncertain  Agree  Strongly Agree

# Appendix 4 Turnitin Report

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**Final draft submission**  
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1 CHAPTER ONE Introduction Information technology (IT) has no value beyond that offered as a common resource (Cai, Huang, Liu, & Liang, 2016). Does the world as we observe it support this claim? Consider industry disruptors like Uber, Airbnb, and Alibaba that embraced IT into their business strategies resulting in significant competitive advantages within their respective markets. At the other end of the spectrum, IT outsourcing has seen significant growth over the past decade, driven by the need for organizations' to focus only core business. Extant literature on the role of IT in business is divided. Achieving sustained competitive advantage (SCA) is the aim of any well-crafted business strategy. Resource-based theory (RBT) emerged to explain SCA. Under the definition of resource-based theory, information technology is defined as a physical resource. The growth in globalized markets is firmly establishing innovation as a key tool for the creation of business value. (Reaiche, de Zubielqui, & Boyle, 2016). Innovativeness is considered a significant factor for the success of firms, a view supported by many academic fields, such as marketing, strategic and organizational management, international business (Shin & Lee, 2016). Specifically innovation is a key enabler for a firm to achieve competitive advantage (Kmieciak, Michna and Meczynska, 2012). The strategic role of information technology is studied through the relationship between innovation and firm performance. 1.2 Motivation for the Study The aim of this study is to understand the strategic role IT plays in supporting a business achieve long-term profitability. The knowledge gained through this understanding would enable a business to make more informed IT investment decisions. CEOs have acknowledged the role technology plays as chief external influencers on their enterprises (Berman et al. 2016) and so need to ensure they don't fall victim to the productivity paradox. CIOs therefore need to have a thorough understanding of the organisation's internal and external environments to craft and execute IT strategies which maximise IT business value. Information technology OEMs (original equipment manufacturers) will be required to develop a 1 comprehensive understanding of their customers' environments to ensure they can support them in achieving their respective strategies. This study focuses on the strategic relevance of information technology with the aluminium industry, of which no study has been found. This quantitative study will therefore add to the body of knowledge on IT business value, including determining the role of IT capability as a strategic resource in the manufacturing industry. 1.3 Focus of the Study According to Drnevich and Croson (2013) IT resources include tangible resources (physical IT infrastructure and human IT resources) and intangible IT resources (e.g. knowledge systems). Information technology capability (ITC) reflects a firm's capability to "source, implement, integrate, and reconfigure IT resources in support and enhancement of business strategies and work processes" (Cai et al., 2016). This study focuses on IT through its collective capabilities drawn from the underlying resources. IT Capability therefore represents a multifaceted construct, and is studied as such in this investigation. Determining the strategic relevance of ITC is the aim of this study. The literature will focus mainly on theoretical and empirical work related to ITC and its impact on enabling sustainable competitive advantage. Innovation and Firm Performance, as supporting constructs, will be investigated in understanding the strategic relevance of IT. The growth in global markets and rapid technology improvements forces organisations to continually adapt, improve, and be innovative (Turulja & Bajgoric, 2016). 1.4 Problem Statement The Productivity Paradox from the 1980s referred to the increase in productivity at the country and firm levels but this did not correspond with the significant growth in information technology (Daulatkar & Sangle, 2015). A key point of contention is that improvements in firm performance promised by IT opportunities were not consistent with the significant investments in such IT (Daulatkar & Sangle, 2015). The correct strategic positioning of IT in an organization is crucial for its success, including its long term competitiveness. Many CEOs and CIOs are faced with this challenge. Daulatkar and Sangle (2016) re-conceptualization of IT business value shows that if the business strategy is prospector, then the IT insourcing is suggested, whereas if the business strategy is defender, then IT outsourcing is preferred. Once this decision sourcing strategy is made, it will be very costly to change. Incorrect IT strategic positioning is therefore a risk to business. Cai et al. (2016) showed ITC to be valuable but not rare and so a common resource. Ong and Chen (2013) researched the relationship between ITC and firm performance, future firm performance, and firm value. Their results showed a negative and statistically significant relationship between these

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