



UNIVERSITY OF NAIROBI
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES (CBPS)

IT-ENABLED DYNAMIC CAPABILITIES AND THEIR INFLUENCE
ON ORGANIZATIONAL AGILITY; CASE FOR NAIROBI'S
MEDIUM-SIZED MANUFACTURING FIRMS

A Research Project Submitted in Partial Fulfilment of The Requirements for Award of
The Degree of Masters of Science in Information Technology Management,
School of Computing and Informatics – University of Nairobi

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DECLARATION

This research project is my original work and has not been presented for the award of degree in any other university or institution for any other purpose.

Date: 24th. August. 2021

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This research project has been submitted for examination with my approval as the University supervisor.

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ACKNOWLEDGEMENT

From the formative stages to the final draft of this Masters of Information Technology Management project, I owe immense debt of gratitude to my supervisor, Prof. Oboko. R. O. I do also extend my appreciation to the group's panelists, Prof. Wausi, Prof. Opiyo and Dr. Pauline for their constructive criticism, careful guidance and patience that enabled me to complete the project.

To all my family in its entirety, I dedicate this research project to you, this is your report. I thank you for your never-ending support, encouragement and continuous source of inspiration that went a long way in successfully undertaking this study.

Finally, but most importantly, I sincerely thank Almighty God for giving me the intellect, strength and means to undertake my academic journey!

ABSTRACT

Globalization, fueled by the progressive rate of technological advancement, has exerted profound changes in the way individuals, businesses or society in general operate. Disruptors are fundamentally changing business models across the world and no business, either big or small, can claim to be immune. As such, organizational agility has lately become a predictor of a firm's performance. It represents the capability of a business to rapidly change or adapt itself in response to uncertainty or rapidly changing markets. This study aimed to determine IT-enabled dynamic capabilities implemented in Nairobi's medium-sized manufacturing firms and their influence on organizational agility. The researcher discussed organizational agility from an innovation and operational adjustment perspective. The theories selected to support the study were the Dynamic Capability View Theory, the Core IS Capabilities for Exploiting Information Technology and the IT-Capability Maturity Framework. The measurement model followed the recommendations of 'construct measurement in organizational strategy research' outlined by Venkatraman et al., (1986). It involved operationalization of the study variables through conducting literature review. The study used a descriptive, cross-sectional survey design targeting respondents working within IT, Operations and Business Development functions of 180 medium-sized manufacturing firms head-quartered in Nairobi County. From a sample size calculated as having 229 respondents, a response rate of 77.29 % was achieved. Data collected was then analyzed using Statistical Package for the Social Sciences (SPSS) version 22 as the main analysis tool. Pearson correlation analysis was applied to examine the relationship between the independent variables and the dependent variable. The three independent variables i.e., IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled reconfiguration capabilities were all found to have a positive and significant correlation to the dependent variable (i.e., organizational agility within Nairobi's medium-sized manufacturing firms). Multiple regression analysis was then used to show the association between the independent variables and the dependent variable above. Again, results show that all the three independent variables have a positive and significant influence on the dependent variable. Using stepwise regression analysis, the moderating variable, environmental uncertainty was found to have a significant moderating effect on the relationship between IT-enabled sensing capabilities and organizational agility. Through the results presented, Government and policy makers will have awareness on how to foster IT based strategies designed to aid medium-sized manufacturing firms adapt to the uncertain and highly competitive environment. To the management of medium-sized manufacturing firms, the findings of this study will act as a guide as they seek adaptation and greater business opportunities in this digital era. Finally, the findings of the research contribute to a growing body of knowledge that will provide academicians and researchers with literature for future studies on related topics.

Key Words: Dynamic Capabilities, IT- Capabilities, IT-Enabled Dynamic Capabilities, Medium-Sized Manufacturing Firms, Organizational Agility

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DEFINITION OF TERMS

Digital Technologies: These are conceptual-level elements that capture the functions of electronic tools, systems, devices and resources that generate, process or store data.

Dynamic Capability: This is the ability to purposefully adapt an organization's resource base to the external environment. Dynamic Capability is not a resource but a process that has impact upon resources. The concept is defined by Teece et al. (1997) as "the firm's ability to orchestrate internal and external competences to suit volatile environments".

IT-Enabled: This refers to the use of information technology to achieve predefined objectives or goals.

IT-Enabled Dynamic Capabilities: These are dynamic capabilities which have been enhanced using IT Resources plus IS capabilities in combination with other organizational resources and competences so as to favourably influence organizational agility

Medium-Sized Enterprises: Worldwide, there is no commonly agreed definition that is accepted for small and medium-sized companies. However, most quantitative indicators are employed to define SMEs, such as the size criterion of employee number and the economic criterion of yearly turnover. In Kenya, under the Micro and Small Enterprise Act of 2012, micro enterprises have a maximum annual turnover of KES 500,000 and employ less than 10 people. Small enterprises have between KES 500,000 and 5 million annual turnovers and employ 10-49 people. Medium enterprises are not covered under the act, but have been reported as comprising of enterprises with a turnover of between KES 5 million and 800 million and employing 50-99 employees.

Organizational Agility: This represents the capability of a company to rapidly change or adapt in response to a dynamic business environment. This study has discussed it in the context of Innovation Agility and Operational Adjustment Agility.

ABBREVIATIONS / ACRONYMS

DC:	Dynamic Capabilities
ICT:	Information & Communication Technology
IS:	Information Systems
IT:	Information Technology
IoT:	Internet of Things
IT-CMF:	IT - Capability Maturity Framework
KAAA:	Kenya Agriculture and Agro-Industry Alliance
KAM:	Kenya Association of Manufacturers
OA:	Organizational Agility
RBV:	Resource Based View Theory
SME:	Small and Medium Sized Enterprises
SWOT:	Strengths, Weaknesses, Opportunities & Threats

CHAPTER ONE: INTRODUCTION

1.1 Background Study

The current pace of technological development has brought about immense transformations in the way nations, companies & individuals are organizing production, trading goods, investing capital or carrying out innovation (Martin & Leurent, 2017; Mesfin, 2018). This evolving digital landscape is disrupting almost all sectors of any industry across countries (Schwab, 2016; Salil S., 2019). Digital disruption has been used to describe the transformative impact produced by digital technologies onto how economies and society operate (Autio, 2017). For example, "Industry 4.0" aims to advance digital manufacturing by incorporating sensors, processors and devices which are capable of communicating with each other while expanding the connection of products, value chains & business models (Nagy et al., 2018). We have insights-driven businesses which are currently helping to optimize profitability through greater customer engagement (McCormick et al. 2016). The case of innovative but disruptive business models includes Amazon, Netflix, Airbnb and Uber; which have made products & services more accessible & affordable to larger markets (Fridgen et al., 2018). We also have disrupted brands such as Kodak or Nokia, whose failures have been blamed on unresponsive business models that were negated by rapidly changing technologies & markets (Joshi & Panigrahi, 2020).

Disruptors are fundamentally changing business models across the world and no business, either big or small, can claim to be immune. Not only are firms now required to adapt to market shifts and trends when they occur, but they also need the ability to proactively predict the changes before they impact their business operations (Prats et al., 2018; Salil S. Parekh, 2019). As such, researchers have suggested the need for organizations to deploy information technology and take advantage of the new capabilities to enhance their success (Loebbecke & Picot, 2015; Curraj, 2018). Regrettably, the relationship between the market environment and information technology capabilities, has been developed more in larger enterprises as compared to smaller enterprises. This is owed to the fact that larger enterprises have relatively been the faster adopters of digital-first business models (Zimmermann, 2016; Joensuu-Salo et al., 2017). However, considering the crucial role smaller enterprises play in terms of global economic development, there's need to review their strategic information technology capabilities in light of the competitive, uncertain and highly dynamic business environment.

Here in Kenya, the manufacturing sector is key to its economic development with specific goals been declared a national agenda in efforts to drive and sustain industrial growth (KAM, 2018). Businesses in this sector continue to face unprecedented challenges owing to their inability to adapt to uncertainty or a dynamic business environment (Douglas et al., 2017). A study by Gachara (2017) partly attributes failures within this business segment to innovation rigidity amidst changing consumer preferences. KAAA (2016) alludes small & medium-sized enterprises in Kenya experience failure due to their lack of operational adjustment agility contributed by poor planning, poor market identification and low technical know-how.

After reviewing literature from relevant studies, one characteristic that stands out for organizations to possess in order to adapt and sustain themselves is agility (Nafei, 2016; Prats et al., 2018; Wood, 2019). Agility refers to a company's ability to adapt or renew itself quickly in the face of uncertainty or a changing business environment (Nafei, 2016). Firms with a high level of organizational agility will be better able to respond to new competition, the advent of revolutionary technologies or even rapid market shifts. (Sambamurthy et al., 2007; Argwings, 2015; Nkuda, 2017; Wood, 2019).

This study aimed to determine strategic IT-enabled dynamic capabilities implemented within medium-sized manufacturing firms headquartered in Nairobi County and their influence on organizational agility. The interest in organizational agility within the study was premised on an innovation and an agile operational adjustment perspective.

1.2 Statement of the Problem

Organizational agility has lately become a predictor of firms' performance (Lee et al., 2017). It denotes a company's ability to alter or adapt quickly in the face of uncertainty or fast changing markets. According to KAM (2018), Kenya's medium-sized manufacturing enterprises are faced with a myriad of challenges that range from rapid technological advances, markets' globalization, fragmented supply chains to everchanging consumer preferences. All these challenges continue to create a volatile, uncertain, competitive & ambiguous environment with negative consequences to firms in this segment (KAM, 2018).

To increase chances of firms succeeding in uncertain and highly dynamic environments, information technology capabilities are required in enhancing organizational agility. These capabilities provide, among other benefits, overall visibility of business processes, traceability of transactions and real-time information exchange (Loebbecke & Picot, 2015; Curraj, 2018). However, the mere implementation of technology cannot be used as a predictor of organizational agility and neither does having the latest technology guarantee success (Chae et al., 2014; Mikalef & Pateli, 2017). Nonetheless, research has shown that adopting a dynamic-capabilities approach will point to strategic organizational competencies that can and should be digitally leveraged, so as to enhance agility in uncertain and rapidly changing markets (Sambamurthy et al., 2007; Leonhardt, 2016; Nkuda, 2017). However, scant empirical evidence exists not only on IT-enabled dynamic capabilities within Kenya's medium-sized manufacturing firms, but also of their influence in enhancing organizational agility.

1.3 Purpose of the Study

This study aimed to determine strategic IT-enabled dynamic capabilities implemented within Nairobi's medium sized manufacturing enterprises and their influence on organizational agility.

1.4 Objectives of the Study

- 1) To determine IT-enabled dynamic capabilities implemented for **sensing** business threats or opportunities within selected medium-sized manufacturing firms
- 2) To determine which IT-enabled dynamic capabilities exist for **seizing** business opportunities within the selected medium-sized manufacturing firms
- 3) To determine IT-enabled dynamic capabilities within selected enterprises that are enabling them to remain competitive through the purposeful **re-configuration** of business resources.
- 4) To empirically test the influence 'IT-enabled dynamic capabilities' have on organizational agility within selected medium-sized manufacturing firms.

1.5 Justification of the Study

Globalization through the rapid pace of technological improvement is causing significant changes

in how people, businesses or society in general operate. As the world economy goes more global, businesses world over cannot isolate or avoid the challenges inherent in globalization. Here in Kenya, Vision 2030 economic pillar has selected the manufacturing sector as one of the key priority sectors. Considering the significance of this sector to the country's economy, it's important that Government and policy makers understand how these firms have adapted themselves to the uncertain and highly competitive environment. Hence, to the Government of Kenya and policy makers, this study provides information on the influence IT-enabled dynamic capabilities have on organizational agility within medium-sized manufacturing firms. In addition, being the responsibility of the Government to protect stakeholders, this study provides a roadmap on how strategic IT-enabled business capabilities can be promoted to businesses in this sector.

Secondly, the outcomes of this study will have a significant influence on the management of medium-sized manufacturing firms. This comes as they continue to seek adaptation and even greater opportunities in this digital era. This study will therefore act as a guide to the leadership of these manufacturing firms as they endeavor to reshape their strategic competencies through constant development of associated information technology capabilities.

Finally, the findings of the research contribute to a growing body of knowledge and will provide academicians and researchers with literature for future studies on related topics.

1.6 Assumptions and Limitations of the Study

The study assumed that all the firms studied were comparatively similar in size and were operating within a similar market environment. In addition, the study was based in Nairobi whose findings may not be applicable to other jurisdictions. Limitations existing for this research included the choice of respondents who based on the perception of the study objectives, may have introduced some bias. Also, the limited resources in terms of time and financial capacity may have affected the rigor required to adequately undertake the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on the concept of organizational agility, illustration of the study focus, an overview of medium-sized manufacturing enterprises, IT- capabilities, dynamic capabilities specifically; sensing, seizing and reconfiguring. It also presents theoretical and empirical reviews from which a conceptual framework is derived.

2.1.1 Organizational Agility Overview

The origins of organizational agility can be traced back to the manufacturing industry. It was first defined as a manufacturing system capable of fast-shifting products in real time in order to satisfy the needs of a changing marketplace (Goldman et al., 1995). In recent times, the concept of organizational agility has been described as a complex and multidimensional view that lacks a unified definition (Žitkienė & Deksnys, 2018). Nevertheless, because of its growing importance in today's volatile and uncertain markets, researchers have endeavored to form a basis of its foundation using various concepts in strategic planning.

Sambamurthy et al.,(2003) argue the existence of three forms of strategy logic: *positioning, leverage and opportunity*. According to positioning logic, superior company performance is the result of a firm's strategic position plus the degree to which it implements those positions utilizing an integrated system of activities. Superior performance, according to the logic of leverage, is based on the ability to generate capabilities by integrating and reconfiguring internal and external resources within a firm's social, structural, and cultural contexts. Finally, the logic of opportunity claims that greater company competitiveness is shaped by constant innovation and competitive actions. Sambamurthy et al., (2007) further argue that due to the intensely competitive environment of today's business plus the speed of environmental change, firms that possess the capability to respond accordingly are likely to produce better outcomes.

Singh et al. (2013) posit agility as "... consistent, systematic alterations in an organization's structure, processes or outputs, managed not in an ad hoc manner, but as a deliberate strategy in

order to gain a competitive advantage”. They advocate for a two-dimensional approach to agility in terms of both flexibility and execution speed for maximum effect.

Aghina et al., (2020) state that whereas organizational agility was once desirable, it is now essential. Agility across the enterprise combines both stability and speed. It helps remove role ambiguity, enhances innovation plus promotes effective operational adjustment. As per their research on various organizations, the eventual outcome of agile transformation was firms reporting enhanced operational performance, improved customer satisfaction & more employee engagement.

From above arguments, it can be opined that organizational agility reflects the ability of a business to enact change in a swift and efficient manner using internal capabilities in response to external market forces. As such, the interest in organizational agility within this study lies in firm-wide external and internal capabilities leveraged on the effective combination and application of IT/IS-capabilities.

- External capabilities being those that seek strategic market insights so as to inform ***Innovation Agility*** (Volberda, 1997; Sambamurthy et al., 2003; M. Ahsan et al., 2005; Laudien, 2017).
- Internal capabilities being those which informed by the external capabilities, create agility through the renewal or reconfiguration of internal and external resources i.e., ***Operational Adjustment Agility***. In this study, after conducting literature review, operational adjustment agility is further decomposed into four indicators i.e. Technological Fitness; Streamlined Business Processes; a Dynamic Culture and Effective Management (Dove, 2001; Sambamurthy et al.,2003; M. Ahsan et al., 2005; Žitkienė & Deksnys, 2018)

2.1.2 Illustration of the Study Focus

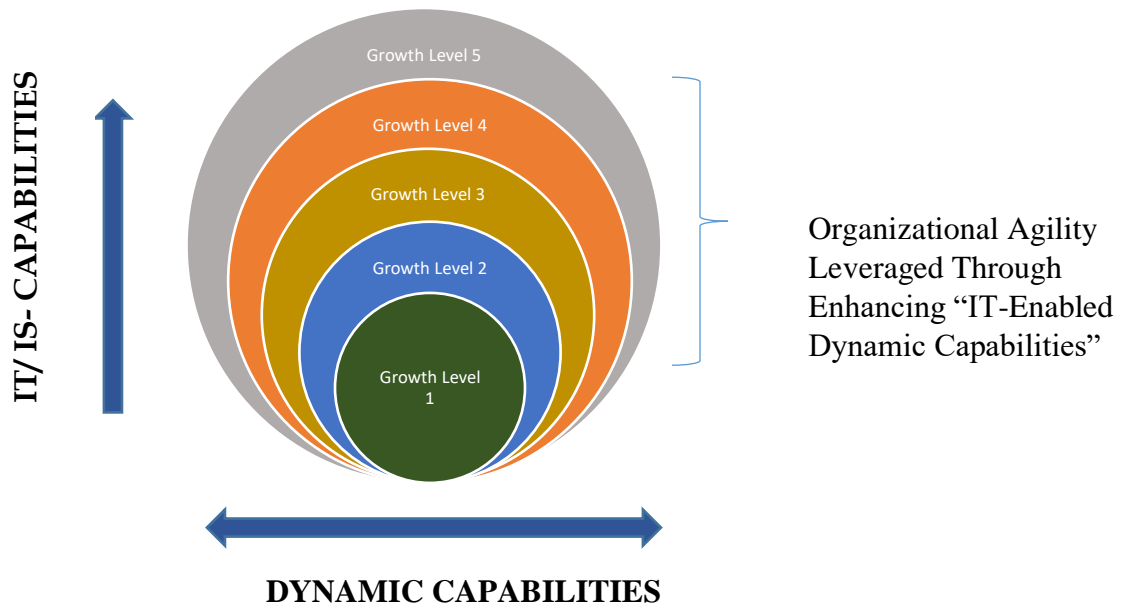


Figure 2. 1: Illustration of the Study Focus: Source Own

The above illustration aims to depict a typical firm undergoing varying levels of business growth. With inherent business complexities presenting at each growth stage, a dynamic business strategy leveraged on effective combination and application of IT/IS-capabilities, will greatly enhance its organizational agility (Lichtenthaler, 2004; Bucăța, 2019).

2.1.3 Why the Need for Enhancing Organizational Agility

Globalization and rapid technological advancement have presented new challenges to small and medium sized enterprises ranging from international markets competition, trade dumping to ever changing consumer preferences and expectations (Mudalige et al., 2016). As the world economy goes more global, businesses world over cannot isolate or avoid the challenges inherent in globalization (Maarof & Mahmud, 2016). Consequently, the threats and opportunities presented in the global economy call for comprehensive and strategic business adaptation. These range from what goods & services are offered; to how they are produced onto even how they are traded. It calls for a review of different concepts e.g., enhanced value chains, both local and international; collaborative networks within peer industries or even faster and deeper penetration of digital capabilities in industries (Mudalige et al., 2016). While there is no comprehensive government

record of medium-sized enterprises in Kenya, they form the core pillars of its economic activity. As such, it remains imperative to safeguard the long-term sustainability and competitiveness of such a crucial component of our economic development.

2.1.4 IT-Capabilities

This refers to the overall ability to effectively and efficiently use information technology. The growth of digital capabilities, rather than technological development, has the greatest impact on organizational success (Bhatt and Grover, 2005; Curley, 2007). New methods of harnessing different technologies e.g., cloud computing, business analytics, Internet of Things, artificial intelligence, open up previously unimagined possibilities and the opportunity to create entirely new goods, services and business models (Matzler et al., 2016).

In building IT-capabilities, various factors have to be taken into consideration. Firstly, technology has to be closely as possible, aligned to the business strategy. Hence, a common vision & collaboration is essential between a firm's business and IT departments. Secondly, the IT architecture should be designed to be efficient, flexible and of high quality. This will help to adjust or improve business processes in a fast and cost-effective manner. Finally, IS service delivery in the context of strategic use of a company's digital assets to achieve business goals, is paramount. This can be achieved through the joint application of specialized knowledge and skills plus effective leadership at both an individual's and the organizational IT levels (Freitas Jr, 2018).

2.1.5 Dynamic Capabilities

The study of dynamic capabilities, i.e., the ability of a company to adjust operations and adapt them to quickly changing environmental conditions has become a hot topic in discussions about strategic management and organizational theory (Teece et al., 1997; Eisenhardt and Martin, 2000; Winter, 2003). In studying capabilities, ordinary capabilities (or zero-order capabilities) have been described as those activities and resources that are responsible for the day-to-day operations of the firm. Dynamic capabilities, also known as first-order capabilities, are described as activities used to manipulate zero order capabilities so as to respond to changes and take advantage of the opportunities in the firm's environment (Helfat and Peteraf, 2003; Winter, 2003).

The ability of an organization to respond quickly but effectively in response to environmental dynamism is the basis for dynamic capabilities (Teece et al., 1997).

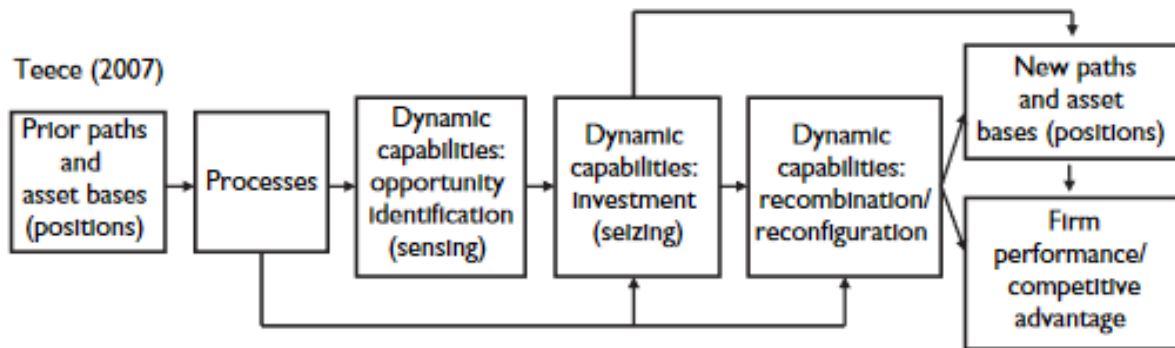


Figure 2. 2: Dynamic Capabilities Chain -Source: (Teece 2007)

2.1.6 IT-Enabled Dynamic Capabilities

As supported by Helfat et al., (2007); Teece et al., (2014), "IT-Enabled Dynamic Capabilities" in this study can be stated as: *'those dynamic capabilities which have been enhanced using IT Resources plus IS capabilities in conjunction with other organizational assets and competencies, so as to positively influence organizational agility'*.

2.2 Theoretical Reviews

Different strategic planning frameworks for linkage of IT to business strategies have been developed. Strategic IT planning frameworks aim at achieving effective business/ IT alignment. However, given environmental dynamism, challenges of business/ IT alignment are bound to arise (Wang, 2015). A review of Strength Weakness Opportunity Threats analysis (SWOT) & Earl's Multiple Methodology, both strategic planning tools, reveal their weakness as being their inability to handle uncertainty or rapidly changing markets (Wright et al., 1994; Manuel & Magalhães R, 1999; Cardoso et al., 2017). Based on the research objectives of this study, the frameworks considered closely address the challenge of solving environmental dynamism in marketplaces.

2.2.1 Dynamic Capabilities View Theory

The dynamic capabilities view theory has arisen as an attempt to disentangle the complicated problem of maintaining competitive advantage in today's dynamic environment. (Teece et al., 1997; Eisenhardt and Martin, 2000; Helfat et al., 2007). Adopting a capability centric view-point involves understanding what organizational competencies can and should be developed in order to adapt

firms to highly dynamic and uncertain environments. This helps develop a competitive advantage that efficiently responds to external challenges (McLaughlin, 2012).

Dynamic Capabilities View theory is an extension of the Resource-Based View theory which focuses on business resources that are rare, valuable, inimitable and non-substitutable (Barney 1991). According to RBV theory, simply having such resources is enough to obtain a competitive advantage. While this direct link could be shown in a reasonably stable context, the RBV's arguments were insufficient to explain competitive advantage in dynamic marketplaces due to globalization, rapid technical advancement, and the opening up of global commerce (Eisenhardt & Martin, 2000; Wade & Hulland, 2004). The DCV theory posits that a company's ability to integrate, grow and reconfigure internal and external competencies in order to respond to a fast-changing environment, is paramount (Teece et al., 1997). These dynamic capabilities have been decomposed into three entrepreneurial capabilities namely: Sensing, Seizing & Re-Configuration (Teece et al., 2014). The basis being that companies that can see and embrace new possibilities through reorganizing their resources skills, ultimately create and sustain a competitive advantage (Teece et al., 2014).

2.2.2 Core IS Capabilities for Exploiting Information Technology

Feeny & Willcocks (1998) published a paper titled '*Core IS capabilities for exploiting information technology*' which is also called the '*nine-core IS capabilities*' framework. The framework is composed of three inter-dependent core groups i.e., Business and IT vision; Design of IT architecture & the Delivery of IS services.

The framework was developed to support organizations faced with an increasingly uncertain marketplace, rising rivalry from worldwide players and growing consumer power, to effectively and efficiently leverage information systems to perform transactions. Feeny & Willcocks (1998) were aware that a shared vision, leadership, planning, implementation, and environmental awareness are all essential components of any successful corporate strategy.

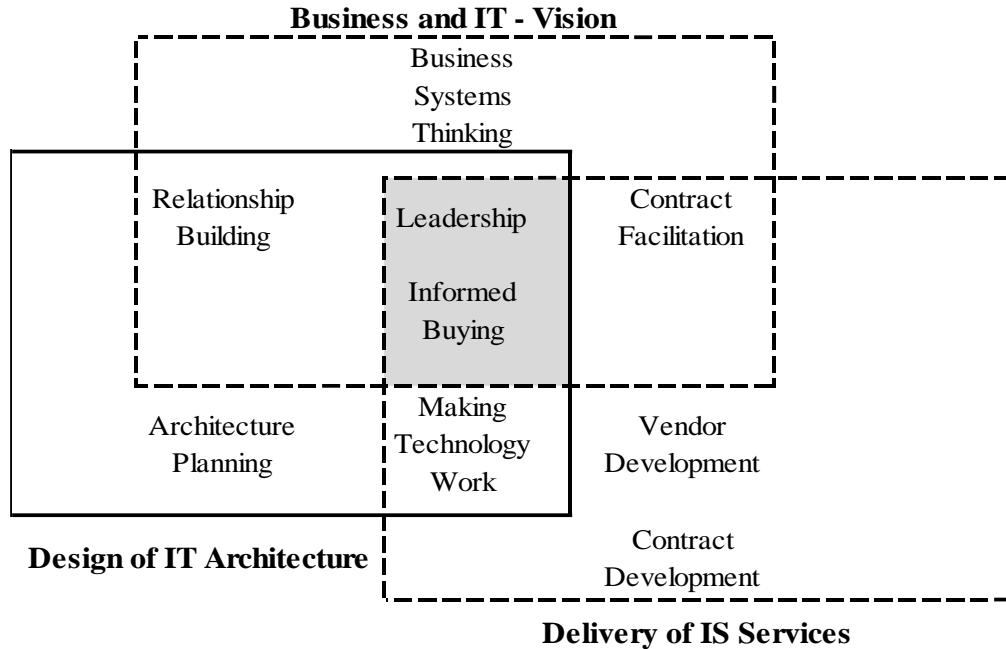


Figure 2. 3: Nine Core IS Capabilities - Source: (Feeny & Willcocks, 1998)

2.2.3 IT-Capability Maturity Framework

The IT-CMF is a framework of the key processes encapsulated in the IT capability of an organization. It was launched by the ‘The Innovation Value Institute (IVI) at the National University of Ireland (NUI)’. It consists of a five-stage maturity model used to organize and structure a framework for mapping IT improvement efforts.

SUMMARY OF THE MATURITY LEVELS		
Level	Characteristic	Description
1	Initial	Processes are reactive and unpredictable. Success is based on individual effort
2	Managed	Processes are basic and consistent. Repeatable process for similar projects
3	Defined	Processes are well defined, documented and integrated for a business function or domain area
4	Advanced	Processes are quantitatively measured and controlled. Scope covers the entire organization
5	Optimised	Processes are world class and embedded in corporate culture. Main focus is on process improvement

Figure 2. 4: IT Capability Maturity Summary - Source: Curley (2007)

Main function of the IT-CMF is to serve as an assessment tool and management system, complete with improvement roadmaps for managing and continually improving IT, in support of improved value delivery (Martin Curley & Kenneally, 2014). The IT-CMF consists of four macro capabilities namely: managing IT for business value; managing the IT budget; managing IT like a business and lastly, managing the IT capability.

Success is not guaranteed by merely implementing the latest technology, rather, the development of IT capability has the greatest impact on organizational performance (Bhatt and Grover, 2005; Curley, 2007). As illustrated in figure 2.5, IT Capability is at the center of the company’s activities and acts as the bridge to generate business value.

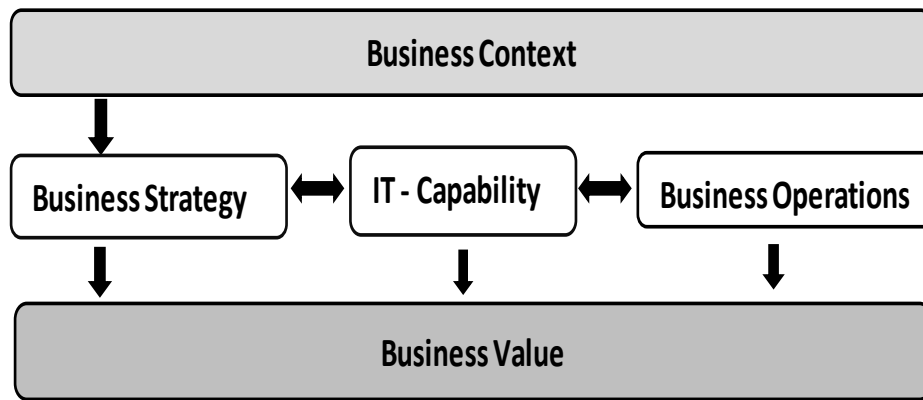


Figure 2. 5: IT Capability in Context - Source Martin Curley & Kenneally, 2014

2.3 Empirical Literature Review

Dynamic capabilities have been proposed as three entrepreneurial capabilities namely *Sensing*, *Seizing* and *Reconfiguring* (Teece et al., 2014). There is a widespread view that IT delivers no inherent value in its own right. However, the realization of business value materializes through the creation of distinct IT capabilities; the associated business changes plus innovations that are enabled by those IT capabilities (Teece, 1998; Pavlou and El Sawy, 2011). This study focused on IT capabilities (i.e., Business/ IT alignment, IT infrastructure capabilities & IS services delivery) integrated into Dynamic Capabilities (i.e., sensing, seizing and re-configuration). Conceptualizing IT capabilities from a dynamic capabilities’ perspective helps depict how their synergetic relationship significantly influences organizational agility.

2.3.1 IT-Enabled Sensing Capabilities and Organizational Agility

It involves analysis of both the internal and environment in which the business operates so as to identify, interpret then react to the threats or opportunities. Through conducting literature review, IT-enabled sensing capabilities namely., Market Insights & Analysis, Collaborative Networks and Information Management are considered to have significant influence on organizational agility.

- ❖ **Market Insights & Analysis:** A study by (Chien & Tsai, 2012) suggests that knowledge about customers and competitors is a resource that has a favorable impact on dynamic capacities. Further, its crucial for companies to identify superior technologies in the market in order to adjust their operations accordingly. Zain et al (2005) observes that due to a human's mind limitation in general awareness of potential opportunities, a firm may fail to react to important business stimuli. Consequently, to avoid such losses, organizations must put in place capabilities and processes to quickly scan and understand changes in the business environment. Obtaining such market information and performing analysis, requires IT resources devoted to competitive intelligence or an analytical process that can be a proxy for it (MacInerney-May, 2012).
- ❖ **Network Collaboration** Teece (2007) argues that in order to remain competitive, companies must be aware of their entire business ecosystem (e.g., local and global customers, suppliers & partners) not just their immediate surrounding and direct competitors. Teece (2007) adds that companies with strong dynamic capabilities are largely entrepreneurial and need to shape their innovation efforts through collaborating with other institutions or entities. In this regard, medium sized manufacturers must create their IT capabilities within collaborative or dispersed networks so as to further innovation plus collectively, counter the issue of increased local or global competition (Carcary et al., 2016).
- ❖ **Information Management:** In the organizational agenda, information & its management have increased in prominence forming a major business strategy referred to as knowledge management. Knowledge management serves to create a collective and dynamic organizational memory that allows businesses to learn from their own mistakes. (Philip, 2014). Advances in digital technology and internet penetration has allowed easy exchange of information across people and businesses. As a result, organizations must understand information flow internally and throughout external value chains in order to promote organizational agility (Culibrk & Zivlak, 2020).

2.3.2 IT-Enabled Seizing Capabilities and Organizational Agility

This involves making unbiased decisions about the right business models. It also includes the access to funding and the required human resources required to drive transformation (Cepeda & Vera, 2007).

- ❖ **Strategic Asset Investment:** The link between external factor stimuli & strategy creation is important for the acquisition of strategic IT capabilities & development. (Kaplan & Norton, 2000). Yi Wang (2018) explores the role of Information Systems in the survival of SMEs within a dynamic environment. The study outcomes support the dynamic capabilities theory that indeed, information systems act as enablers of organizational capability development. Accordingly, seizing opportunities linked to IT capabilities require firms to have access to affordable digital technologies, services and the necessary human skills & knowledge (Teece, 2007). It involves making informed selection & mobilization of IT resources that clearly address business needs, opportunities and captures value from them.

- ❖ **Continuous Learning:** Organizational learning is the ability to constantly improve human skills and knowledge, then systematize these competences to create value in a changing business context (Ipek, 2012). It involves emphasis on routinized activities directed towards adaptation to dynamic business operations. Learning forms a crucial element in the management of innovation agility and performance. Through appropriate IT upskilling or re-skilling, employees can be empowered to undertake their work effectively while feeling less tormented by disruptive technological changes (Ipek, 2012).

- ❖ **Innovation:** As new business opportunities or needs are sensed, they must be swiftly addressed through the creation of new products, methods, or services (Teece, 2007). IT capabilities form important facilitators of innovation. They allow businesses to reach beyond their geographical limits, combine scattered knowledge resources, increase cooperation while lowering operational expenses. Patrick Mikalef (2016) empirically explores the relationship between IT-enabled dynamic capabilities and a firm's innovative capabilities. The data collected was examined using Partial Least Squares Structural Equation Modeling after a survey of 322 international enterprises was undertaken (PLS-SEM). The findings reveal that indeed, IT-enabled dynamic capabilities, do have a major impact on a company's ability to innovate.

2.3.3 IT-Enabled Re-configuring Capabilities on Organizational Agility

The capability to re-arrange organizational structures and assets of the company in a volatile environment is key to maintaining a sustainable and profitable growth (Teece, 2007). According to Yeow et al (2018), reconfiguration plays an important role when it comes to re-organizing existing resources to align with new strategies. IT-enabled reconfiguration capabilities will help firms adapt quickly and economically through informed allocation of resources or processes so as to address current gaps in the organization's asset base.

- ❖ **Change Management** - The technique of creating dynamic capabilities is frequently misunderstood. However, a study by Szymon et al (2021) empirically reveals that sensing capabilities remain the main factor that influence the seizing and re-configuration capabilities. Consequently, focusing on IT-enabled sensing capabilities greatly guides the process of orchestrating and managing change. As people must have a clear reason & understanding of the envisaged changes, this process can only be achieved via deliberate, clear & consistent communication; It's critical for leaders to act as frontline change sponsors (Sandberg, 2014). The involvement of middle managers across business units not only adds value to the implementation of strategy, but also to its formulation & eventual success (Ouakouak et al., 2014).
- ❖ **Governance** – “Gartner” defines governance as creation of business value from IT-enabled investments through procedures, structures, and relational mechanisms. Integrating Business/ IT governance into the dynamic capabilities view framework, will allow firms to have secure, real time and dependable information, necessary for creating, modifying and implementing new products and services, (Khalil & Belitski, 2020).
- ❖ **Integration**– The ability of a company to quickly re-orchestrate and reconfigure externally obtained capabilities while exploiting internal resources is the focus of this category. This may include externally sourced vendors, technical platforms or internal business know-how (Shuen, 2008).

2.3.4 Organizational Agility

Kristensen & Shafiee, (2019) report states that businesses operating in highly dynamic & uncertain environments, need to develop dynamic capabilities in order to become agile organizations. Their

study's goal is to look into the influence of organizational design on increasing organizational agility. The paper presents a theoretical framework that integrates dynamic capabilities, structural contingency theory plus other new paradigms revolving around organization design. The study's framework consists of eighteen key agile organizational design concepts divided into four sections. i.e., technology; processes; people and culture; organizational structure and governance. In its conclusion, the research states that organizational agility is a deliberate process of adjusting those four segments to constantly create and sustain value within opportunities. Elsewhere, Baškarada & Koronios (2018) study using a high-level conceptual framework based on dynamic capabilities, strives to contribute to the operationalization of organizational agility. Being a conceptual paper, they approached the study design from existing literature. Organizational agility, according to their study, is defined as the quick, continuous, and systematic adaptation of entrepreneurial innovation with the purpose of gaining a competitive advantage. Their “5S Organizational Agility Framework” identified five dynamic skills as the major constructs of organizational agility namely., sensing, searching, seizing, shifting, and shaping. However, been a conceptual study it lacks empirical results. Felipe et al., (2016) study aimed to create a model that could explain and predict organizational agility. One of the study's goals was to see if there was a link between information systems capabilities and organizational agility. The other objectives were to determine the role of organizational learning as a mediating factor and organization culture as a moderating factor towards organizational agility. Using partial least squares (PLS) and the PROCESS macro, the study established a connection of the proposed relations. The findings demonstrated that the impact of IS Capabilities on organizational agility is more an indirect effect than a direct one. The study suggests further improvements on the model so as to provide a practical guide that will increase the level of Organization Agility.

2.4 Conceptual Framework

Forming thoughts about correlations between variables and displaying these relationships graphically or diagrammatically is what a conceptual framework entails. In this study, the model posits that the synergetic combination between IT capabilities & dynamic capabilities will significantly influence organizational agility. IT-enabled **sensing** capabilities contributing towards the search and exploration of new technological & market opportunities. Further, IT-enabled sensing capabilities operating as a precursor and major influencer of the other two core capabilities.

IT-enabled **seizing** capabilities guiding the process conversion of opportunities into new products and services. IT-enabled **re-configuration** capabilities helping in the renewal; recombination of assets and organizational structure so as to ensure the operational adjustment agility of the firm. Finally, **environmental uncertainty** acting as a moderating variable between the three independent variables and the dependent variable, organizational agility.

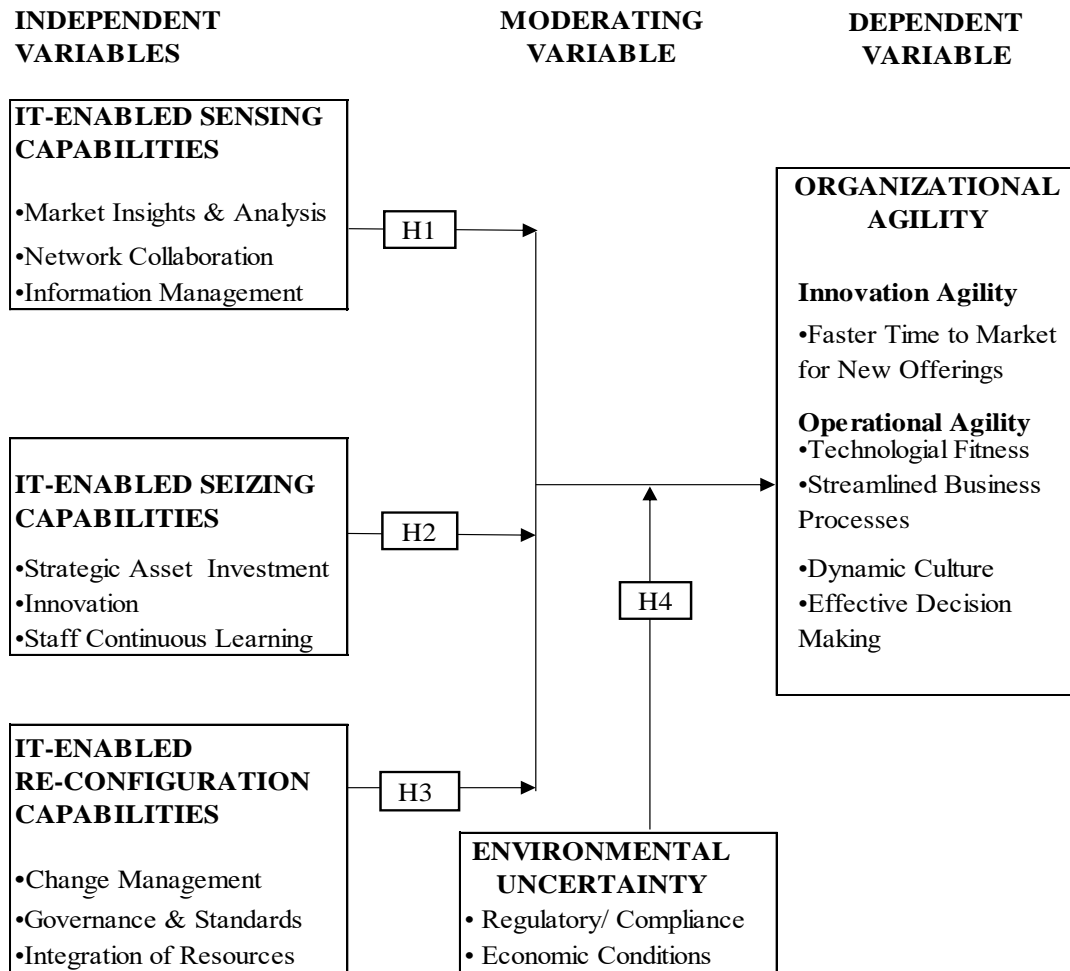


Figure 2. 6: Conceptual Framework

The study then formulated the following hypotheses:

- H1:** IT-enabled sensing capabilities have significant influence on organizational agility
- H2:** IT-enabled seizing capabilities have significant influence on organizational agility
- H3:** IT-enabled reconfiguration capabilities have significant influence on organizational agility
- H4:** The association between IT-enabled dynamic capabilities and organizational agility is moderated by environmental uncertainty.

2.4.2 Operationalization of the Research Variables

The methodology for this study follows the recommendations of ‘construct measurement in organizational strategy research’ outlined by Venkatraman et al., (1986). The variables are operationalized by developing a measurement instrument informed through conducting literature review.

Table 2. 1 Operationalization of Research Variables (Source: Own Literature Review)

INDEPENDENT VARIABLE	INDICATOR	OPERATIONAL DEFINITION	MEASUREMENT SCALE	SUPPORTING REFERENCES FROM LITERATURE
IT- ENABLED SENSING CAPABILITIES	Market Scanning	Search & exploration of new technological and business opportunities	5-Point Likert Scale	Pavlou & El Sawy (2006); Teece (2007) Schreyogg &Kliesch-Eberl (2007)
	Network Collaboration	Integration of IT capabilities within the business ecosystem so as to harness critical supply chain benefits	5-Point Likert Scale	Zahra& George (2002); Chen, & Lee (2009); Sandberg (2014); Karayanni (2015)
	Information Management	Capability to share business process-knowledge or data so as to aid internal or external work coordination	5-Point Likert Scale	Eisenhardt and Martin (2000); Villar et al. (2014)
IT- ENABLED SEIZING CAPABILITIES	Strategic Asset Investment	Investment in technology & functional activities designed to reach the target market	5-Point Likert Scale	Zollo and Winter (2002); Teece (2007); Shanks et al., (2018)
	Innovation	Informed development of new products, processes & services to address market needs	5-Point Likert Scale	Teece (2007); Sandberg (2014); da Costa and Porto (2014); Janssen et al. (2015); Shafia et al. (2016).
	Staff Continuous Learning	Re-skilling & up-skilling initiatives to address capabilities gaps	5-Point Likert Scale	Zahra and George (2002); Sandberg (2014)
IT- ENABLED RE-CONFIGURING CAPABILITIES	Change Management	Detailed strategy roadmaps to drive business/IT transformation	5-Point Likert Scale	Eisenhardt and Martin (2000); Sandberg (2014)
	Governance	Technology, organizational structures, process workflows with accountabilities developed & supported within the organization	5-Point Likert Scale	Di Stefano et al. (2014); Sandberg (2014); Ouakouak et al. (2014)
	Integration	Informed renewal, re-allocation, recombination or retirement of resources in response to business requirements	5-Point Likert Scale	Eisenhardt and Martin (2000); Helfat and Peteraf (2003); Sandberg (2014)

DEPENDENT VARIABLE	INDICATOR	OPERATIONAL DEFINITION	MEASUREMENT SCALE	SUPPORTING REFERENCES FROM LITERATURE
ORGANIZATIONAL AGILITY	Innovation Agility	Relative to competitors, the firm possesses faster ‘time to market’ capabilities for new products & services	5-Point Likert Scale	Volberda (1997); Sambamurthy et al. (2003); M. Ahsan et al., (2005)
	Operational Adjustment Agility	Relative to business needs, the firm possesses <ul style="list-style-type: none"> • greater technological fitness; • streamlined business processes; • dynamic culture & • effective orchestration of resources 	5-Point Likert Scale	Dove (2001); Sambamurthy et al. (2003); M. Ahsan et al., (2005); Kristensen & Shafiee, (2019)
MODERATING VARIABLE	INDICATOR	OPERATIONAL DEFINITION	MEASUREMENT SCALE	SUPPORTING REFERENCES FROM LITERATURE
ENVIRONMENTAL UNCERTAINTY	Regulatory/ Compliance	Legislation governing data handling & privacy	5-Point Likert Scale	Charles Sabel et al., (2017); Knut Blind (2017)
	Prevailing Economic Conditions	Influence of purchasing power on customer demands, expectations and preferences	5-Point Likert Scale	Burns& Stalker (1961); Lawrence & Lorsch (1967)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Bowling (2014) defines research methodology as an approach by which a phenomenon is scientifically reviewed and inferences made about the findings.

3.2 Research Philosophy

The design and instruments used to answer the research questions may be informed by the research philosophy (Oates, 2006). We have three major research philosophies; positivism, interpretivism and pragmatic, (Oates, 2006). This study adopted a positivism philosophy based on the following reasons:

- The research outcome would be independent and not subjectively influenced by the researcher. This fits with the positivism characteristic about naive realism and the separable nature of a researcher and reality.
- When it came to the research questions, the researchers wanted to see if there was a link between IT-enabled dynamic capabilities and organizational agility. If true, then what correlation relationship exists? (Is it perfect negative or perfect positive?)
- The research conceptual framework had a number of variables which needed to be measured descriptively. The framework was operationalized so as to measure the variables and make deductions from it.

3.3 Research Design

Lewis (2015) states that taking logical measures to link research objectives, theoretical framework, and issues relevant to data collection, analysis and interpretation in a coherent manner is what research design entails. This study was designed as a descriptive, cross-sectional survey. A descriptive study can be used to accurately and systematically describe a population, situation, or event in its natural state. Further, the researcher has no control over the variables identified (Cooper & Schindler, 2008). Survey was considered appropriate as it involves collecting data from a large sample both systematically and economically. To determine the relationship between the independent, moderating, and dependent variables, the study used both correlational and regression analysis (Kothari, 2004).

3.4 Target Population

This refers to the total number of people or items whose characteristics a researcher wants to establish (Saunders *et al*, 2012). Based on this research's nature and objectives, the target population was all 180 medium-sized manufacturing firms headquartered in Nairobi County (Appendix III, Source: Kenya Association of Manufacturers 2020). Companies that feature in this list most likely have an understanding on the importance of organizational agility.

3.5 Sampling Techniques and Sample Size

Kothari (2004) states that a sampling technique refers to the procedures a researcher adopts in selecting items for a sample. Characteristics of a good sample size include one that is truly demonstrative of the sample, feasible in the context of funds available and whose results from the sample study can easily be replicated (Kothari, 2004). The study adopted a multistage sampling method which involves taking samples using smaller and smaller sampling units in each stage.

In the first stage, the study adopted a homogenous purposive sampling technique to select respondents from the elements of the population for the study. Saunders *et al*. (2012) state that purposive sampling is a judgmental, selective and non-probability sampling method that involves researchers relying on their own judgment in the selection of members of a population in a study. The targeted respondents were the function heads of operations, information technology and business development. In the second stage, the study items were stratified into nine sub-groups (according to industry subsector) with each population item been placed into only one of the nine strata (as shown in table 2.2). Such data is typically stratified or categorized depending on shared features or attributes of individuals of a population (Creswell, 2014). A total of 3 respondents from 180 companies accounted for a total of 540 respondents. The sample size was then determined using stratified random sampling. Stratified random sampling is a type of probability sampling that divides the target population into smaller groups called strata. Because it minimizes selection bias, the stratified random sampling technique was adopted in this investigation. The sample size was calculated using Slovin's Formula, which takes the population size into account.

$$n = \frac{N}{1+NE^2} \quad \text{where; } n = \text{no. of samples; } N = \text{total population; and } E = \text{error margin (0.05)}$$

$$\text{Hence: } n = \frac{540}{1+(540*0.05^2)} = 229$$

Table 2. 2: Sample Size for Target Respondents

Industry Subsector	Operations	Information Technology	Business Development	Total
Food, Beverage & Tobacco	9	9	9	28
Clothing, Textile & Leather	8	8	8	23
Wood & Furniture	4	4	4	13
Construction	12	12	12	36
Oil And Mining	4	4	4	11
Medical & Health Care	20	20	20	59
Metal Products	4	4	4	13
Machinery	6	6	6	17
Chemicals & Synthetics	10	10	10	31
Total	76	76	76	229

3.6 Data Collection Instruments

Data collection, according to Burns & Grove (2003), is the exact & systematic gathering of information related to the research sub-problems through methods such as interviews, participant observations, focus-group discussions, narratives and case studies. This research required the collection of both primary and secondary data. Primary data according to Kothari (2004), is information gathered directly from the field by a researcher. In this study, primary data was collected from original sources utilizing structured questionnaires, while secondary data was collected from websites that contained pertinent study content. Questionnaires were used in this study because they enable an investigator to cheaply gather information from a big audience. In addition, questionnaires form one of the most reliable ways of collecting quantitative data (Guthrie, 2010). Survey items were constructed using a Likert scale from 1 – implying strongly disagree to 5 – implying strongly agree. The data collection instruments were structured in such a manner that all the study objectives were adequately captured and the respondents guided properly at achieving the target response concerning the subject matter.

3.7 Data Collection Procedure

The researcher got a letter of authorization to collect data from the Graduate School Department prior to data collection. In addition, the researcher trained research assistants to assist with data gathering. After that, a list of contact people from whom e-mail invitations to participate in an

online questionnaire created with Google Forms was created. Additionally, reminders were sent within three days interval for any unresponsive emails.

3.8 Validity and Reliability

The reliability and validity of the data collection instruments have a big impact on the correctness of the data collected (Mugenda & Mugenda, 2003). The degree to which an instrument accurately assesses all it claims to measure is referred to as validity. There were two types of validity used in this study: content validity and face validity. Content validity, according to Collis and Hussey (2014), indicates the extent to which items adequately represent or measure the characteristic that a researcher intends to measure. The study's content validity was improved by organizing the questionnaire according to the study's objectives and indicators. Face validity refers to how closely a measure appears to be linked to a specific construct (Greenfield & Greener, 2016). When test content simply appears to be relevant to the individual carrying out the test, then it has face validity. It examines questionnaire appearance in terms of readability, feasibility, style consistency, formatting, and language clarity. In this study, both content and face validity were enhanced by using reviews from experts in field as well as researcher's university supervisor.

A pilot test of 22 participants from five firms of the target population, who later did not participate in the study, undertook a reliability test to prove the consistency of target respondents' answers to all the items to be measured (Sekaran & Bougie, 2009). An internal consistency technique was applied using Cronbach's Alpha. Alpha value ranges between 0 and 1 with a figure tending to 1 indicating more reliability. According to Babbie (2017), Cronbach's Alpha coefficient of 0.6-0.7 is a commonly accepted rule of thumb that indicates acceptable reliability while 0.8 or higher, indicates good reliability. In this study, 0.7 Cronbach's Alpha was considered acceptable.

As indicated in Table 2.3, the findings "IT-enabled sensing capabilities" had a Cronbach's Alpha of 0.836, which was higher than 0.7, indicating that the construct was trustworthy. Cronbach's Alpha for IT-enabled seizing capabilities was 0.771, indicating it was likewise rated dependable. Results show that "IT-enabled re-configuration" capabilities had a Cronbach's Alpha of 0.802, which implies that the construct "IT-enabled re-configuration capabilities" was also reliable.

Environmental uncertainty which formed the moderating variable had a Cronbach Alpha of 0.794, hence the construct was also considered reliable. Finally, organizational agility had a Cronbach's Alpha of 0.785, which is higher than 0.7, indicating that it too was reliable.

Table 2. 3: Reliability Test Results

Variables	Cronbach's Alpha	No. of Items
IT-Enabled Dynamic Capabilities for Sensing	.836	6
IT-Enabled Dynamic Capabilities for Seizing	.771	6
IT-Enabled Dynamic Capabilities for Re-Configuration	.802	8
Environmental Uncertainty	.794	2
Organizational Agility	.785	6

3.9 Data Analysis and Presentation

The data analysis process began with data preparation. This involves ensuring data correctness and converting raw data into reduced and categorised forms that are more suitable for analysis (Cooper & Schindler, 2008). The acquired quantitative data was then analyzed using the Statistical Package for the Social Sciences (SPSS) version 22 as the primary data analysis tool. After that, descriptive statistics like mean, standard deviations, frequency, and percentages were used to obtain the quantitative data. Both correlation and regression analysis were employed to perform inferential statistics. To tabulate the data, metrics of dispersion and graphical representations were used in addition to measures of central tendencies.

3.10 Ethical Considerations

Authorization and clearance of the study was sought from the school department. The researcher notified the participants of this study its objectives and the confidentiality of the information obtained while performing the research. The participants were also informed of their right to refuse to participate or withdraw from at any point from the interview. Confidentiality of participants was ensured by not requiring respondents to indicate their names on the questionnaire.

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This part explains how the data was analyzed, how the results were interpreted, and how the research findings were presented in accordance with the research's overall goal. The purpose of this study was to determine IT-enabled dynamic capabilities implemented in Nairobi's medium sized manufacturing enterprises and their influence in promoting organizational agility. The results were presented in table and figures including bar graphs as well as pie charts.

4.2 Response Rate

The study's sample size was 229 respondents from medium-sized manufacturing companies headquartered in Nairobi County. 229 questionnaires were issued to respondents during the data collecting phase with 177 of them being completed and returned to the researcher. This represents a response rate of 77.29%. A response rate of over 70% is considered exceptional while a response rate of over 50% is considered appropriate for data analysis reporting (Creswell 2014). As a result, the response rate in this study was appropriate for drawing conclusions and providing suggestions.

4.3 General Information

The respondents' general information comprised of their gender, age, highest education level, department, duration of the company's existence, firm's size plus duration of working in the organization.

4.3.1 Gender of the Respondents

The respondents were requested to indicate their gender and the results were presented in Figure 4.1. From the results, 62.7% of the respondents indicated they were male while the rest (37.3%) indicated they were female. This showed that most of the heads of departments in manufacturing firms in Nairobi County were male.

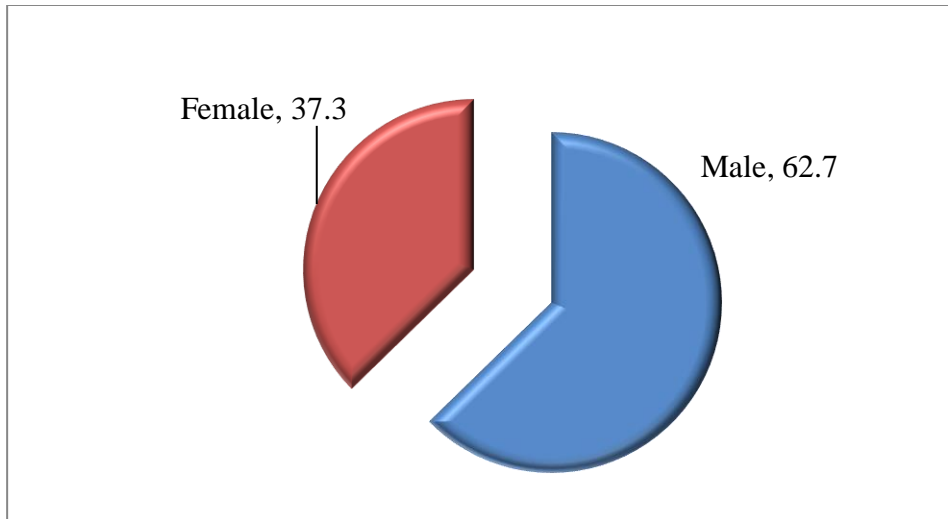


Figure 4. 1: Gender of Respondents

4.3.2 Age of the Respondents

The respondents were also asked to point out their age brackets. The results were as depicted in Figure 4.2. According to the findings, 64.4 percent of respondents were between the ages of 30&39, 13.6 percent said they were between the ages of 40 & 49, and the same number said they were under the age of 29. Another 8.5 percent indicated that they were above 50 years of age. This implies that the majority of the department heads in Nairobi’s medium sized manufacturing firms are aged between 30 & 39 years.

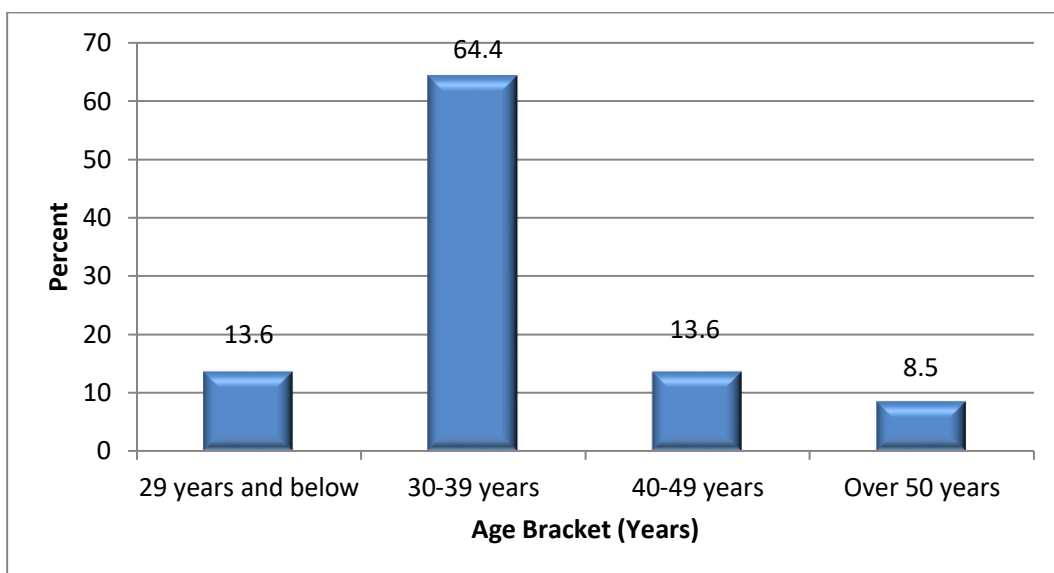


Figure 4. 2: Age of the Respondents

4.3.3 Respondents' Highest Level of Education

In addition, respondents were asked to state their highest level of schooling. The outcomes are depicted in Figure 4.3. According to the statistics, 66.1 % of the employees had bachelor degrees as their highest level of education, 15.3% had a diploma, 11.9% had master degrees, and 6.8 % had PHD degrees. This implies that most of the heads of departments in Nairobi's medium-sized manufacturing firms possess bachelor degrees.

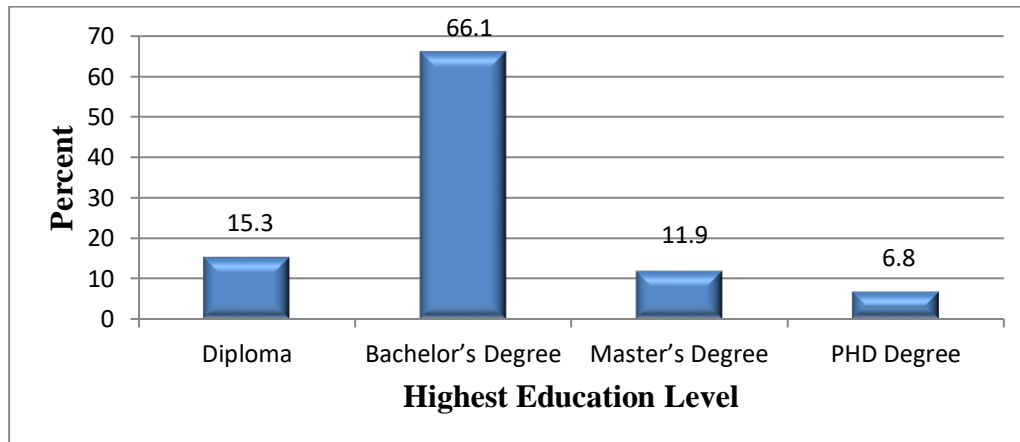


Figure 4. 3: Respondents' Highest Level of Education

4.3.4 Respondents' Department

The respondents were also requested to indicate their respective departments in which they were working. The results were as shown in Figure 4.4. As captured, 40.11% of the staff indicated they work in the operations department, 34.46% indicated they work in the business development department and 25.42% indicated they work in the information technology department. This implies that the majority of the respondents in this study were heads of operations departments followed by business development and then information technology departments.

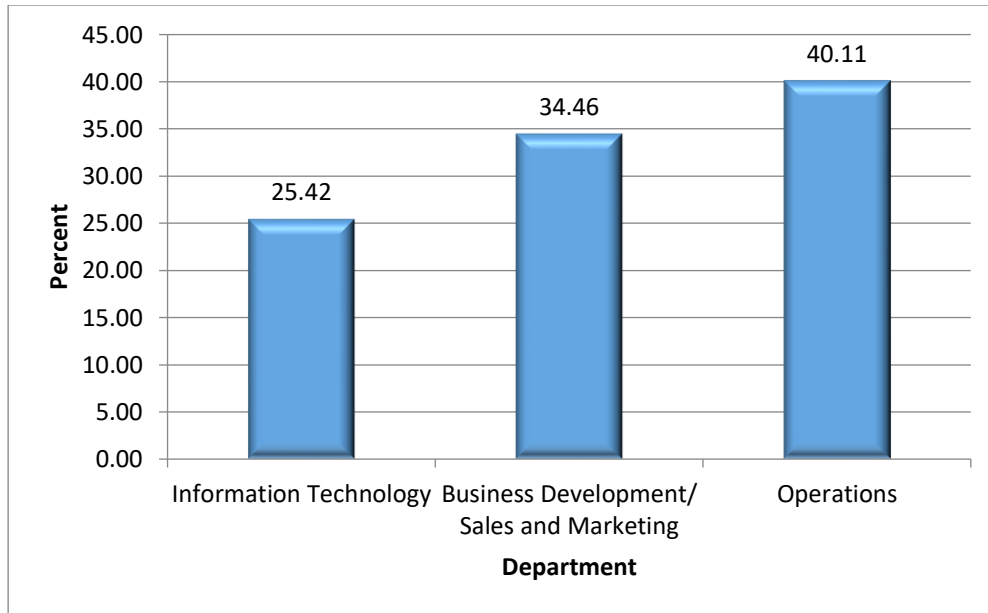


Figure 4. 4: Respondents' Department

4.3.5 Duration of the Company's Existence

The respondents were asked to state how long their businesses had been in operation. According to the data, 83.1 percent of respondents stated their organization has been around for more than ten years, 10.2 percent stated it has been around for seven to ten years, and 6.8 percent stated it has been around for three to six years. This went to show that most of the medium sized manufacturing firms surveyed had been in existence for more than 10 years.

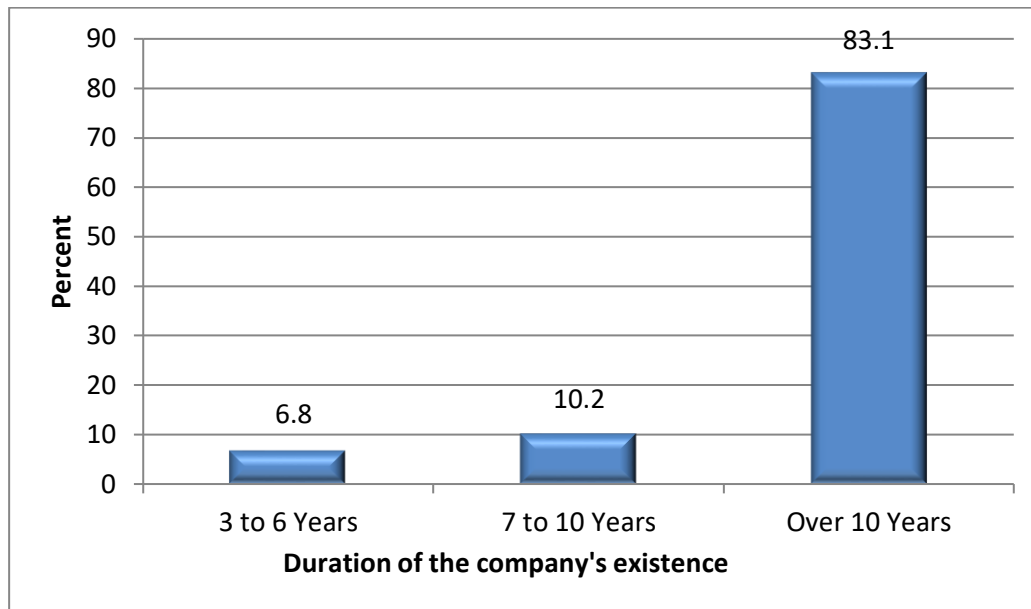


Figure 4. 5: Duration of the Company's Existence

4.3.6 Firms' Size

This focus of this study was medium-sized manufacturing enterprises and most of them are said to have between 50 and 100 employees. The respondents were asked to specify the size of their company in terms of employees. The outcomes are depicted in Figure 4.6. According to the findings, 88.1 percent of respondents said their companies had between 21 and 100 employees., 10.7% indicated between 101 and 250 employees and 1.1% indicated between 1 and 20 employees.

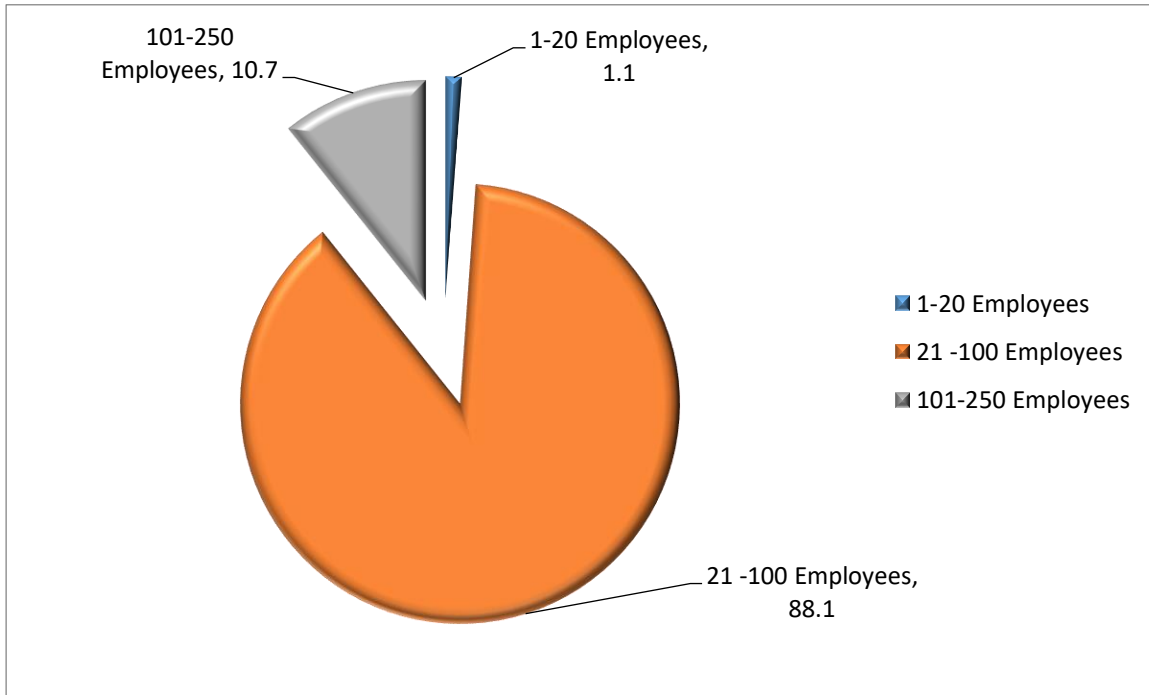


Figure 4. 6: Firms' Size

4.3.7 Period of working in the Organization

The respondents were asked to state how long they had worked for their respective companies. The results are depicted in Figure 4.7. According to the data, 72.9 percent of respondents said they had worked in their organization for 6 to 10 years, 13.6 percent for more than 10 years, 8.5 percent for 4 to 5 years, and 5.1 percent said they had worked there for 1 to 3 years. That indicated that the majority of the heads of departments in these manufacturing firms had been with their companies for between 6 and 10 years, and so had the necessary information to achieve the study's objectives.

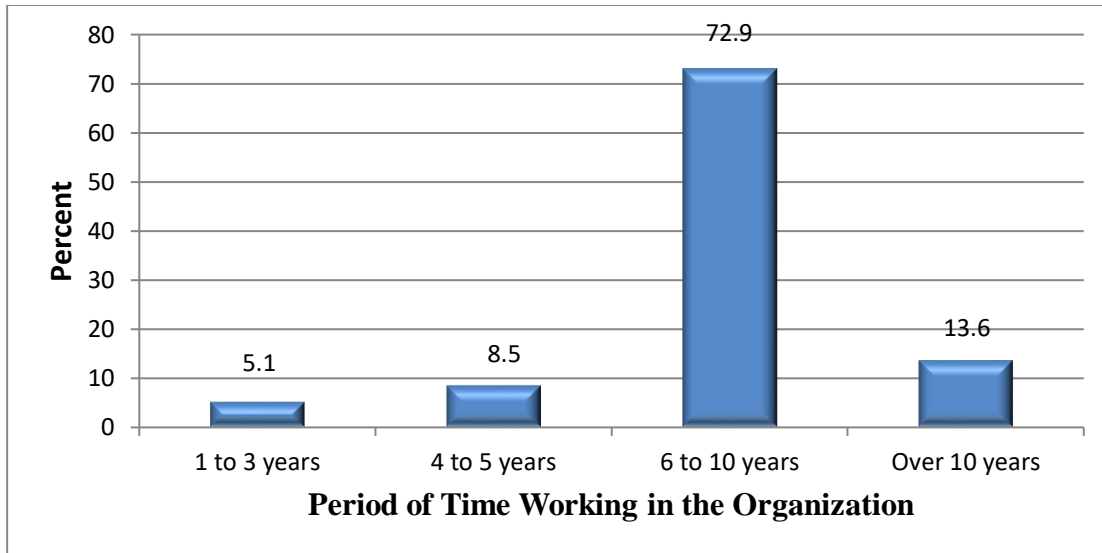


Figure 4. 7: Period of working in the Organization

4.4 Determining IT- Enabled Sensing Capabilities

The respondents were asked to rate how much they agreed with various assertions about their manufacturing firms' IT-enabled sensing capabilities. Table 4.1 summarizes the findings. As indicated in the findings, the participants agreed that their companies routinely collect data from various digital sources and utilize analytic approaches to acquire market insights, with a mean of 3.780 (std. dv = 0.924). Further, the respondents agreed that their firms were constantly evaluating latest IT resources that can help improve businesses with a mean of 3.797 (std. dv = 0.685). These findings agree with Bhatt and Grover (2005) findings i.e., adopting market scanning mechanisms offers the potential to radically create new products, services and business models that meets customer needs. Further, as seen by a mean of 1.407 (std. dv = 0.807), the participants strongly disputed that their companies had included the "voice of the customer" through online review platforms, social media listening or any other such methods. Also, the respondents strongly disagreed with the notion that their companies' IT systems had been connected with those of major suppliers and partners, allowing them to capitalize on crucial value chain benefits. This is shown by a mean of 1.339 (std. dv = 0.730). These findings contradict Freitas Jr's (2018) conclusions that linking a company's IT systems with those of other stakeholders is critical for developing IT capabilities to exploit value chain benefits hence, improving the firm's performance. The respondents believed that the organization's information technology skills had facilitated easy

information interchange among people, departments, and organizations, as evidenced by a mean of 3.814 (std. dv =0.835). However, as seen by a mean of 1.356 (std. dv = 0.973), the respondents strongly disagreed that information technology capabilities are in place to secure intellectual property and data within the firm. Further, with a mean of 1.237 (std. dv = 0.465), the respondents strongly disagreed that knowledge or previous learning within the organization had been made easily available and dependable by employing information technology capabilities. These findings contradict Matzler et al (2016) assertions that information technology capabilities help to store knowledge or past learning of an organization in a secure and accessible manner for future actions & behaviours.

Table 4. 1: IT-Enabled Sensing Capabilities

	1	2	3	4	5	Mean	Std. Deviation
Market Scanning							
•The company has IT capabilities to collect data from various digital sources then use analytic techniques to gather market insights.	6.8	5.1	0.00	79.7	8.5	3.780	0.924
•The company is constantly evaluating latest IT resources that can help improve the business.	3.4	5.1	0.00	91.5	0.00	3.797	0.685
Collaborative Networks							
•The company’s IT systems are integrated with those of our key suppliers and partners in turn helping us harness key value chain benefits	78.0	13.6	5.1	3.4	0.00	1.339	0.730
•The company has incorporated “voice of the customer” through online review platforms, social media listening etc.	74.6	15.3	5.1	5.1	0.00	1.407	0.807
Information Management							
•Knowledge or past learning within the organization is made easily accessible and reliable using IT capabilities	78.0	20.3	1.7	0.00	0.00	1.237	0.465
•Intellectual property & data is securely stored within the IT systems	84.7	6.8	0.00	5.1	3.4	1.356	0.973
•In our organization information technology has enabled easy exchange of information across people, departments and organizations	5.1	5.1	0.00	83.1	6.8	3.814	0.835

4.5 Determining IT- Enabled Seizing Capabilities

The respondents were asked to rate how much they agreed with several assertions about their companies' IT-enabled seizing skills. The outcomes are shown in Table 4.2. The respondents agreed that competent staff existed to enable and support business-enabling IT capabilities, as evidenced by a mean of 3.831 (std. dv = 0.742) in the results.). Further, by a mean of 2.068 (std. dv = 0.550), respondents disagreed with the statement stating that there was adequate financing to enable a contemporary IT infrastructure that primarily supports the business. These findings are contrary to Helfat and Peteraf (2003) arguments that sufficient funding is critical in ensuring that firms adopt modern IT capabilities to support their business processes.

The respondents believed that IT re-skilling or up-skilling among personnel supports the absorption of technical advances without opposition, with a mean of 4.000 (std. dv = 0.554). The results are in agreement with Teece et al., (1997) results, i.e., improving staff knowledge and skills through training helps them to easily adopt new technology. Additionally, they agreed with a mean of 3.831 (std. dv = 0.787) that their companies ensured that their employees continuously distilled past experiences into future actions and behaviors. With a mean of 3.932 (std. dv = 0.609), the respondents also agreed that mapping business knowledge into IT capabilities has enabled the improvement of internal business processes through enhancing visibility, greater traceability and reliable information. Furthermore, they felt that the ability to answer market demand and preferences through IT skills had permitted quick and easy diversification of product or service offerings, as seen by a mean of 3.797 (std. dv = 0.779). These finding concur with Helfat and Peteraf, (2003) arguments that use of IT capabilities enables firms make informed decision on the diversification of products or service offered hence improving a firms' productivity and performance.

Table 4. 2: IT- Enabled Seizing Capabilities

	1	2	3	4	5	Mean	Std. Deviation
Strategic Asset Investment							
• There is adequate funding to enable a modern IT infrastructure that largely supports the business	6.8	84.7	3.4	5.1	0.00	2.068	0.550
• There is competent staff that enable and support business/ IT capabilities	3.4	5.1	1.7	84.7	5.1	3.831	0.742
Staff Continuous Learning							
• IT re-skilling or up-skilling amongst staff ensures the uptake of technological changes without resistance	0.00	5.1	0.00	84.7	10.2	4.000	0.554
• The firm ensures that staff continuously distil past experiences into future actions and behaviours	5.1	3.4	0.00	86.4	5.1	3.831	0.787
Innovation							
• Using IT, the capability to address market demand & preferences has ensured fast and easy diversification of our products / service offerings	5.1	3.4	1.7	86.4	3.4	3.797	0.779
• Mapping business processes into IT capabilities has enabled improvement in internal business processes	1.7	3.4	1.7	86.4	6.8	3.932	0.609

4.6 Determining IT- Enabled Re-Configuration Capabilities

Respondents from Nairobi's medium-sized manufacturing businesses were asked to rate how much they agreed with various assertions about IT-enabled re-configuration capabilities. The outcomes are shown in Table 4.3. According to the data, the respondents agreed that there were clear business strategies with well-detailed implementation roadmaps, as evidenced by a mean of 3.814 (std. dv = 0.772). Nonetheless, a mean of 2.068 (std. dv = 0.550) respondents disagreed with the statement that senior management is actively involved in achieving the business/IT strategy. Furthermore, a mean of 1.983 (std. dv = 0.345) respondents disagreed with the statement that the entire organization fully collaborates during roll out of new business-enabling IT capabilities. This is contrary to Feeny and Wilcox (1998) that a common vision and total collaboration within the entire organization is essential to enable exchange of ideas on the most appropriate way to align modern technology with the business goals. The respondents agreed that delivery of information services within their organizations was effective with a mean of 3.898 (std. dv = 0.575). These findings support Magalhães' (1999) conclusions that coordination between the business and IT departments enables effective information service delivery to meet consumer expectations. Furthermore, the

respondents thought that their firms were effective in finding and selecting IT-capabilities that effectively satisfied business demands, as evidenced by a mean of 3.864 (std. dv = 0.726). A mean of 3.797 (std. dv = 0.881) of respondents thought that their firms were effective in implementing IT capabilities that truly addressed business demands. The respondents agreed with a mean of 3.848 (std. dv = 0.822) that their firms' resources were effectively integrated, reallocated, or retired in response to changing business requirements by utilizing IT capabilities. The respondents also agreed that the personnel experience, skills and performance metrics in their organizations were effectively tracked and integrated as evidenced by a mean of 3.797 (std. dv = 0.779). These findings conform to Cardoso et al. (2017) arguments that staffs' experience, skills & performance metrics in the organization should be effectively managed in the organization in order to achieve business goals.

Table 4. 3: IT- Enabled Re-Configuration Capabilities

	1	2	3	4	5	Mean	Std. Deviation
Change Management							
• There is clear business strategy with well detailed roadmaps informed using IT capabilities	3.4	6.8	0.00	84.7	5.1	3.814	0.772
• Senior management is actively involved in championing delivery of the business/ IT strategy	6.8	84.7	3.4	5.1	0.00	2.068	0.550
• The whole organization truly collaborates during roll out of new business enabling IT capabilities	6.8	88.1	5.1	0.00	0.00	1.983	0.345
Governance							
• Clarity of roles & accountability ensures business and IT units are effective in identifying IT-capabilities that truly meet business needs	3.4	3.4	3.4	83.1	6.8	3.864	0.726
• Business/ IT units are adequately resourced plus knowledgeable so as to ensure effective implementation of business enabling IT capabilities	5.1	6.8	0.00	79.7	8.5	3.797	0.881
• There exists competent human skills and knowledge that ensure effective delivery & support of IS services	1.7	3.4	1.7	89.8	3.4	3.898	0.575
Integration							
• Using IT- Capabilities, resources in our organization are effectively integrated, reallocated or retired in response to business needs	3.4	6.8	1.7	78.0	10.2	3.848	0.822
• Using IT Capabilities, personnel experience, skills & performance metrics in our organization are effectively tracked and managed	3.4	6.8	1.7	83.1	5.1	3.797	0.779

4.7 Environmental Uncertainty

The respondents were asked to indicate their level of agreement with survey items constructed using a Likert scale from 1 – strongly disagree to 5 – strongly agree. The respondents agreed with a mean of 3.909 (std. dv =.912) to the statement that current economic conditions have a significant impact on demand and supply chain processes, as shown in Table 4.4. They also agreed that regulatory/ compliance regulations governing data processing and privacy determined the nature and sources of the information they collect, with a mean of 3.858 (std. dv =0.871).

Table 4. 4: Environmental Uncertainty

	1	2	3	4	5	Mean	Std. Deviation
• Prevailing economic conditions greatly affects our demand and supply chain activities	2.8	5.6	12.4	55.9	23.2	3.909	.912
• Regulatory/ compliance rules governing data handling and privacy determines the nature and sources of the information the firm handles	3.4	4.5	11.9	63.3	16.9	3.858	.871

4.8 Organizational Agility

The respondents were asked to rate how much they agreed with several claims about organizational agility in Nairobi's medium-sized manufacturing companies. The findings are depicted in Table 4.5. According to the findings, respondents agreed that re-orchestrating processes in regard to company strategy was considerably faster than competitors, as evidenced by a mean of 4.017 (std. dv = 0.538). The participants agreed that their firms were much faster than their competitors in generating new products/services for their clients, as evidenced by a mean of 3.898 (std. dv = 0.731). These findings are in line with Goldman et al., (1995) arguments that adopting robust IT capabilities helps to address the needs of a dynamic market by quickly innovating products to meet consumer expectations.

The respondents felt that as a result of streamlined processes enabled using IT capabilities, work flow within and between teams was more streamlined, with no duplication or role ambiguity from a mean of 3.898 (std. dv = 0.731). Furthermore, with a mean of 3.831 (std. dv =0.695), the respondents agreed that in terms of addressing market insights, the company leaned more to agile/ iterative strategies co-created with staff as opposed to top-management long-term linear planning

strategies. Moreover, the respondents agreed that due to greater availability and reliability of data, leadership had greater confidence in making strategic business decisions. A mean of 3.814 (std. dv = 0.815) demonstrated this. A mean of 3.814 (std. dv = 0.794) of the respondents likewise agreed that relative to their market peers, their information technology capabilities were highly effective and served as a primary source of competitive edge. These findings conform to Sambamurthy et al., (2003) findings that alignment of technology with the business strategy enables a competitive edge.

Table 4. 5: Organizational Agility in Nairobi’s Medium Sized Manufacturing Firms

	1	2	3	4	5	Mean	Std. Deviation
Innovation Capability							
• Relative to our competitors, we are much faster in developing new products/ services	3.4	3.4	1.7	83.1	8.5	3.898	0.731
• Relative to our competitors, re-engineering business processes in response to market shifts is much faster	0.00	3.4	3.4	81.4	11.9	4.017	0.538
Operational Adjustment Agility							
• Relative to our market peers, our IT capabilities are highly effective and a primary source of our competitive edge	5.1	3.4	1.7	84.7	5.1	3.814	0.794
• In relation to business processes, work flow within and across teams is more streamlined devoid of duplication or role ambiguity	3.4	3.4	1.7	83.1	8.5	3.898	0.731
• With respect to addressing market insights, the company leans more to agile/ iterative strategies co-created with staff as opposed to long term, linear planning strategies driven by management	3.4	3.4	3.4	86.4	3.4	3.831	0.695
• Due to greater availability and reliability of data, leadership has greater confidence in executing strategic decisions	5.1	3.4	3.4	81.4	6.8	3.814	0.815

4.9 Inferential Statistics

The study applied both correlation and regression analysis to test the relationship between the independent variables namely: IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled re-configuration capabilities and the dependent variable; organizational agility in Nairobi’s medium-sized manufacturing firms.

4.9.1 Correlation Analysis for IT-Enabled Dynamic Capabilities and Organizational Agility

Pearson correlation was used to assess the relationship between independent variables and the dependent variable. This research adopted the Saunders *et al.* (2012) guide whereby weak

relationship is indicated by 0.20-0.39, moderate relationship is represented by 0.40 - 0.59, strong relationship is indicated by 0.60-0.79 while very strong relationship is indicated by 0.8-1.0.

As illustrated in Table 4.6, IT-enabled sensing capabilities and organizational agility of Nairobi's medium sized manufacturing firms have a positive and significant correlation ($r=0.804$, $p\text{-value}=0.000$). The significant level (0.05) was higher than the p value (0.000) thus indicating that there was a significant relationship. These results concur with the results of Žitkienė & Deksnys, (2018) that IT-enabled sensing capabilities have significant influence on organizational agility.

The findings also demonstrated a positive and substantial correlation ($r=0.890$, $p\text{-value}=0.000$) between IT-enabled seizing capabilities and organizational agility of Nairobi's medium-sized manufacturing enterprises. The significant level (0.05) was higher than the p -value (0.000), indicating that there was a significant relationship. The findings are in line with Winter (2003) findings that IT-enabled seizing capabilities (i.e., asset investment and continuous learning to improve ordinary capabilities) significantly influences organizational agility. Further, the results revealed that IT-enabled re-configuration capabilities and organizational agility of Nairobi's medium sized manufacturing firms have a positive and significant correlation ($r=0.876$, $p\text{-value}=0.000$). The significant level (0.05) was higher than the p value (0.000), indicating that there was a significant relationship. The findings agree with Teece (2007) that the capability to re-arrange organizational structures and assets of the company in a volatile environment is key to maintaining a sustainable and profitable growth. Environmental uncertainty has a positive and substantial relationship with organizational agility ($r=.856$, $p\text{-value}=0.000$), according to the findings.

Table 4. 6: Correlations Coefficients

		Organizational Agility	Dynamic Capabilities for Sensing	Dynamic Capabilities for Seizing	Dynamic Capabilities for Re- Configuration	Environmental Uncertainty
Organizational Agility	Pearson Correlation	1				
	Sig. (2- tailed)					
	N	177				
Dynamic Capabilities for Sensing	Pearson Correlation	.804**	1			
	Sig. (2- tailed)	.000				
	N	177	177			
Dynamic Capabilities for Seizing	Pearson Correlation	.890**	.118	1		
	Sig. (2- tailed)	.000	.102			
	N	177	177	177		
Dynamic Capabilities for Re- Configuration	Pearson Correlation	.876**	.076	.182	1	
	Sig. (2- tailed)	.000	.206	.087		
	N	177	177	177	177	
Environmental Uncertainty	Pearson Correlation	.856**	.813**	.835**	.863**	1
	Sig. (2- tailed)	.000	.000	.000	.000	
	N	177	177	177	177	177

** . Correlation is significant at the 0.01 level (2-tailed).

4.9.2 Regression Analysis for IT-Enabled Dynamic Capabilities and Organizational Agility

To demonstrate the relationship between the dependent variable and the independent variable, multiple regression analysis was utilized (organizational agility of Nairobi's medium sized manufacturing firms) and independent variables (IT-enabled dynamic capability for sensing, IT-enabled dynamic capability for seizing and IT-enabled dynamic capability for reconfiguration).

The multivariate regression model applied was

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where; Y = is the dependent variable (organizational agility of Nairobi's medium sized manufacturing firms), β_0 = Constant Term; β_1 - β_3 = regression coefficients; X_1 = IT- enabled sensing capabilities; X_2 = IT- enabled seizing capabilities; X_3 = IT- enabled re-configuration capabilities and ε = error term.

The r-squared illustrates how the independent variable can explain variation in the dependent variable. The R-squared in this study was 0.745, indicating that the independent variables (IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled re-configuration capabilities) could explain 74.5% of the dependent variable (organizational agility of Nairobi's medium sized manufacturing firms).

Table 4. 7: Model Summary for IT-Enabled Dynamic Capabilities & Organizational Agility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.863 ^a	0.745	0.715	0.08557

a. Predictors: (Constant), Dynamic Capabilities-Re-configuration, Dynamic Capabilities-Sensing, Dynamic Capabilities-Seizing

Analysis of variance was employed in this study to determine whether the model was a good match for the data. The computed F (195.745) was larger than the F critical value (2.680), while the p-value (0.000) was less than the significant level, as shown in Table 4.8. (0.05). As a result, the model fit the data well and could be used to explain the impact of the independent variables (IT-enabled dynamic capability for sensing, IT-enabled dynamic capability for seizing and IT-enabled dynamic capability for reconfiguration) on the dependent variable (organizational agility of Nairobi's medium sized manufacturing firms).

Table 4. 8: ANOVA for Dynamic Capabilities and Organizational Agility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55.813	3	18.604	195.745	.000 ^b
	Residual	10.835	114	0.095		
	Total	66.648	117			

a. Dependent Variable: Organizational Agility

b. Predictors: (Constant), Dynamic Capabilities-Re-configuration, Dynamic Capabilities-Sensing, Dynamic Capabilities-Seizing

The regression formula applied was $Y = 0.368 + 0.271X_1 + 0.838X_2 + 0.328X_3$

The researcher then went on to test the stated hypotheses:

H1: IT-enabled sensing capabilities have significant influence on organizational agility

The results revealed that IT-enabled sensing capabilities have a positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_1=0.271$, p value= 0.012). The significant level (0.05) was higher than the p value (0.012) hence indicating a significant association. This indicates that an improvement in IT-enabled sensing capabilities would lead to a positive change in organizational agility of Nairobi's medium sized manufacturing firms. These results concur with the results of Žitkienė & Deksnys, (2018) that dynamic capabilities for sensing have a significant effect on organizational agility

H2: IT-enabled seizing capabilities have significant influence on organizational agility

In addition, the results revealed that IT-enabled seizing have a positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_2= 0.838$, p-value= 0.000). The significant level (0.05) was higher than the p value (0.000) hence indicating a significant association. This implies that an improvement in IT-enabled seizing capabilities would lead to an improvement in organizational agility of Nairobi's medium sized manufacturing firms. The findings are in line with Winter (2003) findings that dynamic capabilities for seizing (asset investment and continuous learning to improve ordinary capabilities) influences the organizational agility significantly.

H3: IT-enabled re-configuration capabilities have significant influence on organizational agility

The results showed that IT-enabled re-configuration capabilities have positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_3=0.328$, p-value=0.004). The significant level (0.05) was higher than the p value (0.004) hence indicating a significant association. This implies that an improvement in IT-enabled re-configuration capabilities would lead to an improvement in organizational agility of Nairobi's medium sized manufacturing firms.

Table 4. 9: Coefficients for Dynamic Capabilities and Organizational Agility

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.368	0.107		3.439	0.000
	Dynamic Capabilities-Sensing	0.271	0.104	0.259	2.606	0.012
	Dynamic Capabilities-Seizing	0.838	0.153	0.754	5.477	0.000
	Dynamic Capabilities-Re-configuration	0.328	0.103	0.294	3.184	0.004

a. Dependent Variable: Organizational Agility

4.9.3 Moderating Effect Analysis

Moderation occurs when a third variable (moderating variable) influences the relationship between the dependent variable and the independent variables. The effect that the moderating variable has is referred to as an interaction as it affects the direction or strength of the relationship between the dependent and independent variable. To determine the moderating effect of environmental uncertainty on the relationship between the dependent and independent variable, this study used step-wise regression analysis. The null hypothesis was stated as follows:

H4: The association between IT-enabled dynamic capabilities and organizational agility is moderated by environmental uncertainty.

The regression model for the moderating effect was as follows:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_zX + \beta_{1z}X_1Z + \beta_{2z}X_2Z + \beta_{3z}X_3Z + \varepsilon$$

Where: Y = Organizational agility; β_0 = Constant' β_i = is the coefficient of X_i for $i=1,2,3$; X_1 = IT-enabled sensing capabilities;

X_2 = IT-enabled dynamic seizing capabilities; X_3 = IT-enabled re-configuration capabilities;

Z = Hypothesized moderator (environmental uncertainty);

β_z = Coefficient of $X_i *Z$ which is the interaction term between environmental uncertainty and each of the dependent variables for $i=1,2,3$; ε = Error term.

The first model included: IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled re-configuration capabilities. The R-squared 0.745, shows that the independent variables (IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled re-configuration capabilities) could explain 74.5% of the dependent variable (organizational agility of Nairobi's medium sized manufacturing firms). The second model comprised of three independent variables, the moderating variable; environmental uncertainty and the interactions between all the independent variables and environmental uncertainty (IT-enabled sensing capabilities, IT-enabled seizing capabilities and IT-enabled re-configuration capabilities * environmental uncertainty). The R-squared was 0.699 which implies that 69.9% of organizational agility could be explained by the stated variables. The outcomes depict that the introduction of environmental uncertainty in the second model led to a 4.6% decrease in R-squared.

Table 4. 10: Model Summary for IT-Enabled Dynamic Capabilities, Environmental Uncertainty and Organizational Agility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.863 ^a	0.745	0.715	0.0855
2	0.836 ^b	0.699	0.683	0.0597

a. Predictors: (Constant), Dynamic Capabilities for Re-Configuration, Dynamic Capabilities for Sensing, Dynamic Capabilities for Seizing

b. Predictors: (Constant), Dynamic Capabilities for Re-Configuration, Dynamic Capabilities for Sensing, Dynamic Capabilities for Seizing, Environmental Uncertainty, Dynamic Capabilities for Seizing * Environmental Uncertainty, Dynamic Capabilities for Sensing * Environmental Uncertainty, Dynamic Capabilities for Re-Configuration * Environmental Uncertainty

This research used analysis of variance in assessing whether the model was a good fit for the data. From the findings, and as portrayed in Table 4.11, the F-calculated for the first model was 195.745 while that of the second model was 175.567. Since the F-calculated for the two models were greater than the F-critical (2.400) for the first model and for the second model (2.10), the two models were found to be a good fit for the data. The two models can therefore be used to make prediction of the moderating effect of environmental uncertainty on the relationship between IT-enabled dynamic capabilities and organizational agility.

Table 4. 11: ANOVA for IT-Enabled Dynamic Capabilities, Environmental Uncertainty and Organizational Agility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55.813	3	18.604	195.745	.000 ^b
	Residual	10.835	114	0.095		
	Total	66.648	117			
2	Regression	84.37	7	12.053	175.567	.000 ^c
	Residual	11.602	169	0.069		
	Total	95.972	176			

a. Dependent Variable: Organizational Agility

b. Predictors: (Constant), Dynamic Capabilities for Re-Configuration, Dynamic Capabilities for Sensing, Dynamic Capabilities for Seizing

c. Predictors: (Constant), Dynamic Capabilities for Re-Configuration, Dynamic Capabilities for Sensing, Dynamic Capabilities for Seizing, Environmental Uncertainty, Dynamic Capabilities for Seizing * Environmental Uncertainty, Dynamic Capabilities for Sensing * Environmental Uncertainty, Dynamic Capabilities for Re-Configuration * Environmental Uncertainty

In the first model, the results revealed that IT-enabled sensing capabilities have a positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_1=0.271$, p value= 0.012). The significant level (0.05) was higher than the p value (0.012) hence indicating a significant association. In addition, the results revealed that IT-enabled seizing capabilities have a positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_2= 0.838$, p-value= 0.000). The significant level (0.05) was higher than the p value (0.000) hence indicating a significant association. Furthermore, the results showed that IT-enabled re-configuration capabilities have positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_3=0.328$, p-value=0.004). The significant level (0.05) was higher than the p value (0.004) hence indicating a significant association.

By replacing the beta values as well as the constant term in the second regression model, the model resulting from the second phase in regression modeling is as follows:

$$Y = -1.235 + 1.226X_1 + 0.906X_2 - 0.173X_3 + 0.482Z - 0.213Z - 0.089Z + 0.079X_3Z + \varepsilon$$

Environmental uncertainty had a statistically significant effect on organizational agility of Nairobi's medium-sized manufacturing enterprises, according to the second model ($\beta_4=0.482$, p value= 0.000). In addition, the results show that IT-enabled dynamic capabilities for sensing * environmental uncertainty had an inverse effect on organizational agility of Nairobi's medium sized

manufacturing firms ($\beta_5 = -0.213$, p value = 0.000). The results also show that IT-enabled dynamic capabilities for seizing * environmental uncertainty had no statistically significant effect on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_6 = -0.089$, p value = 0.061). In addition, the results show that IT-enabled dynamic capabilities for re-configuration * environmental uncertainty had no statistically significant effect on organizational agility of Nairobi's medium sized manufacturing firms ($\beta_7 = 0.079$, p value = 0.147). Therefore, environmental uncertainty was moderating the relationship between IT-enabled sensing capabilities & organizational agility of Nairobi's medium sized manufacturing firms. However, there was no statistically significant moderating influence on the association between IT-enabled seizing & IT-enabled re-configuration skills & organizational agility in Nairobi's medium-sized manufacturing enterprises.

Table 4. 12: Coefficients for IT-Enabled Dynamic Capabilities, Environmental Uncertainty and Organizational Agility

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.368	0.107		3.439	0.000
	IT-enabled Dynamic Capabilities for Sensing	0.271	0.104	0.259	2.606	0.012
	IT-enabled Dynamic Capabilities for Seizing	0.838	0.153	0.754	5.477	0.000
	IT-enabled Dynamic Capabilities for Re-Configuration	0.328	0.103	0.294	3.184	0.004
2	(Constant)	-1.235	.106		-11.693	.000
	IT-enabled Dynamic Capabilities for Sensing	1.226	.179	1.023	6.865	.000
	IT-enabled Dynamic Capabilities for Seizing	.901	.149	.810	6.037	.000
	IT-enabled Dynamic Capabilities for Re-Configuration	-.173	.180	-.155	-.958	.339
	Environmental Uncertainty	.482	.037	.609	12.873	.000
	IT-enabled Dynamic Capabilities for Sensing * Environmental Uncertainty	-.213	.035	-1.203	-6.039	.000
	IT-enabled Dynamic Capabilities for Seizing * Environmental Uncertainty	-.089	.047	-.571	-1.883	.061
	IT-enabled Dynamic Capabilities for Re-Configuration * Environmental Uncertainty	.079	.054	.494	1.458	.147

a. Dependent Variable: Organizational Agility

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter contains a summary of the findings, conclusions, and recommendations for future research based on the study's objectives. The study's goal was to see how IT-enabled dynamic capabilities were applied in Nairobi's medium-sized manufacturing businesses and how they influenced organizational agility.

5.2 Summary of the Findings

The findings on the impact of IT-enabled dynamic capabilities on organizational agility as well as the moderating effect of environmental uncertainty, are summarized in this section.

5.2.1 Influence of IT- Enabled Sensing Capabilities and Organizational Agility

The study found that IT-enabled sensing capabilities have a positive and significant influence on organizational agility of Nairobi's medium sized manufacturing firms. Therefore, an improvement in IT-enabled sensing capabilities would lead to a positive change in organizational agility of Nairobi's medium sized manufacturing firms.

The study revealed that the firms were constantly evaluating latest IT resources that can help improve their businesses. In addition, medium sized manufacturing firms in Nairobi County systematically collect data from various digital sources and make use of analytic techniques to gather market insights.

The study found that medium sized manufacturing firms have not yet incorporated the "voice of the customer" via online review platforms, social media listening among others. In addition, most of the medium sized manufacturing firms' IT capabilities were not integrated with those of the key suppliers and partners thus missing out on operational efficiencies plus the opportunity to harness key value chain benefits.

The study established that IT capabilities in medium-sized manufacturing firms had enabled easy exchange of information across people, departments and organizations. However, knowledge or past learning within the organization had not been made easily accessible and reliable using information technology. Further, intellectual property and data within the organizations was not very well secured within the organization.

5.2.2 Influence of IT- Enabled Seizing Capabilities and Organizational Agility

The study established that IT-enabled seizing capabilities have a positive and significant influence on organizational agility within Nairobi's medium sized manufacturing firms. Therefore, an improvement in IT-enabled seizing capabilities would lead to an improvement in organizational agility of Nairobi's medium sized manufacturing firms.

The study further established that medium sized manufacturing firms had sufficiently competent staff to enable and support IT functions. The study also revealed that IT re-skilling or up skilling amongst the staffs does ensure the uptake of technological changes without resistance. In addition, the study established that firms considered in this study, ensure their staff continuously distill past experiences into future actions and behaviors, exploit IT capabilities to ensure improvement in internal business processes plus harness IT capabilities to guise fast and easy diversification of products or service offerings. Nonetheless, the study established that there is inadequate funding to enable modern IT infrastructure that largely support business processes.

5.2.3 Influence of IT- Enabled Re-Configuration Capabilities & Organizational Agility

The study found that IT-enabled re-configuration competencies had positive & significant influence on organizational agility in Nairobi's medium-sized manufacturing enterprises. As such, an improvement in IT-enabled re-configuration capabilities would lead to an improvement in organizational agility of Nairobi's medium sized manufacturing firms.

It was established through this study that there exist clear business strategies with well detailed implementation roadmap informed through the use of IT capabilities. Further, medium sized manufacturing firms in Nairobi County were effective in the delivery of IS services. In addition, the study established that medium sized manufacturing firms were effective in identifying & selecting IS/IT- capabilities that truly addresses business needs. Furthermore, the study found that the organizations were effective in implementing IS/ IT- capabilities that truly addresses business needs. The findings further indicated that using IT- Capabilities, resources in the organization are effectively integrated, reallocated or retired in response to business needs. Further, it was found that the personnel experience, skills and performance metrics in the organization are effectively tracked and managed. Nonetheless, the study revealed that the top management is not actively involved and

visible in delivering the business/ IT strategy. Moreover, the study established that within the organizations, departments do not fully collaborate in the orchestration of business enabling IT-capabilities.

5.2.4 Influence of Environmental Uncertainty and Organizational Agility

The study established that environmental uncertainty was moderating the relationship between IT-enabled sensing capabilities and organizational agility of Nairobi's medium-sized manufacturing firms, but no statistically significant moderating effect on the relationship between IT-enabled seizing capabilities and organizational agility or IT-enabled re-configuration capabilities and organizational agility of Nairobi's medium sized manufacturing firms.

The study found prevailing economic conditions greatly affect the demand and supply chain activities. In addition, the study revealed that regulatory/ compliance rules governing data handling and privacy determines the nature and sources of the information handled.

5.3 Conclusions

The study concludes that IT-enabled sensing capabilities through market scanning, collaboration and information management have positive & significant effect on organizational agility of Nairobi's medium sized manufacturing firms. In addition, IT- enabled seizing capabilities through asset investment, innovation and continuous learning have a positive and significant influence on organizational agility in Nairobi's medium sized manufacturing firms. Also, the study concludes that IT- enabled re-configuration capabilities through change management, governance and integration have positive and significant influence on organizational agility in Nairobi's medium sized manufacturing firms.

The study further concludes that environmental uncertainty was moderating the relationship between dynamic capabilities for sensing and organizational agility of Nairobi's medium sized manufacturing firms, but no statistically significant moderating effect on the relationship between IT-enabled seizing capabilities and organizational agility or IT-enabled re-configuration capabilities and organizational agility of Nairobi's medium sized manufacturing firms.

5.4 Recommendations for Practise

The study found that medium sized manufacturing firms had not incorporated the “voice of the customer” through online review platforms, social media listening among others. This research therefore suggests that management of these medium-sized manufacturing firms should purpose to create greater online review platforms plus develop more social media listening so as to have more feedback or suggestions from their customers.

The study found that IT systems in Nairobi’s medium-sized manufacturing firms’ were not integrated with those of the key suppliers and partners. This study therefore recommends that the management of these firms should endeavour to integrate their IT systems with those of their business ecosystem so that they can increase efficiencies plus harness critical value chain benefits. The integration of the systems with those of suppliers and partners will minimize cases of fragmented supply chains and greatly enhance their production efficiency.

The study also established that intellectual property and data within most of these organizations was not fully secured. The study therefore recommends that the management of medium sized manufacturing firms in Nairobi County should adopt more rigorous data security measures to prevent information breach. In addition, medium sized manufacturing firms should use knowledge management systems to increase the reliability and accessibility of knowledge or the organizational memory.

The study established that there was inadequate funding to enable modern IT infrastructure to largely support business processes. As such, the study suggests that the management of the medium sized manufacturing firms should set aside sufficient fund for acquiring modern ICT infrastructure and facilitate training of personnel on how to effectively use technology to enhance the production process.

The study found that IT re-skilling or up skilling amongst the staffs ensures the uptake of technological changes without resistance. This study therefore recommends frequent training within medium sized manufacturing firms through conducting of seminars and workshops so as to improve the business/ IT capabilities of the employees.

The study found that the management of medium sized manufacturing firms was not actively involved and visible in delivering the business enabling IT strategy. It also established lack of organization wide collaboration during times of project roll outs. This study therefore recommends that the management should show commitment in the formulation and implementation of business enabling technology strategy so as to enhance the success of technology adoption.

5.5 Recommendation for Further Studies

The aim of the study was to determine IT- enabled dynamic capabilities implemented within Nairobi's medium sized manufacturing firms and their influence in promoting organizational agility. Nevertheless, the study was limited to medium-sized manufacturing firms in Nairobi County. Hence the study suggests further research should be done in smaller and larger sized manufacturing firms in other Counties. In addition, the study found that 74.5% of the organizational agility in Nairobi's medium sized manufacturing firms could be explained through IT-enabled dynamic capabilities. Therefore, the study recommends that further research should be conducted so as to examine other factors that influence organizational agility of medium sized manufacturing firms in Nairobi County.

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APPENDICES

Appendix 1: Letter of Introduction



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31 May 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: MUTUA MICHAEL MWINZI:REG.NO.P54/11764/2018

This is to confirm that the above named is a bona fide student of the University of Nairobi, School of Computing and Informatics.

He is pursuing M.Sc in Information Technology Management course and would like to collect data for his research project entitled: "**Digital-Enabled Dynamic Capabilities and their influence of Organizational Agility; A case for Kenya's SME'S**" under the supervision of Prof. Robert O.Oboko

Any assistance accorded to him will be highly appreciated.

Yours faithfully


School of Computing & Informatics
University of NAIROBI
P. O. Box 30197

PROF. ROBERT O. OBOKO
DIRECTOR
SCHOOL OF COMPUTING & INFORMATICS

ROO:am

Appendix II: Questionnaire

This questionnaire is purposed for a study to determine IT-enabled dynamic capabilities deployed within medium-sized manufacturing firms and their influence in enhancing organizational agility. The information sought is meant for research only and all sources will be kept confidential. Please do not write your name anywhere on the questionnaire.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender:

Male [] Female []

2. Age:

29 years and below [] 30-39 years []

40-49 years [] Over 50 years []

3. Highest Education Level

Diploma [] Bachelor's Degree []

Master's Degree [] PHD Degree []

Others (Please specify)

4. Function/ Department

IT [] Business Development/ Sales &Marketing [] Operations []

Others (Please specify)

5. For how long has the company been in existence?

Below 3 Years [] 3 to 6 Years []

7 to 10 Years [] Over 10 Years []

6. What is the firm's size in terms of the number of employees?

1-20 Employees [] 21 -100 Employees [] 101-250 Employees []

7. How long have you worked in your current organization?

1 to 3 years [] 4 to 5 years []

6 to 10 years [] Over 10 years []

USING THE LIKERT SCALES IN SECTIONS B, C, D & E, KINDLY TICK (√) YOUR DEGREE OF AGREEMENT OR DISSAGREEMNT WITH THE STATEMENTS PROVIDED WHERE:

[5] Symbolizes Strongly Agree; [4] Symbolizes Agree; [3] Symbolizes neither Agree nor Disagree; [2] Symbolizes Disagree and [1] Symbolizes Strongly Disagree

SECTION B: DETERMING IT-ENABLED SENSING CAPABILITIES FOR

Please rank from strongly agree to strongly disagree

Item No	Statement	1	2	3	4	5
Market Scanning						
SEN1	We have effective IT capabilities to aid in collecting data from digital sources then use analytics to identify market insights & trends					
SEN2	The company constantly scouts & evaluates latest technological capabilities that can be implemented to enhance the business					
Collaborative Networks						
SEN3	The company’s IT capabilities are integrated with those of key value chain partners e.g., suppliers, partner networks					
SEN4	The company has incorporated “voice of the customer” through online review platforms, social media etc.					
Information Management						
SEN5	Knowledge or past learning within the organization is made easily accessible and reliable using effective IT capabilities					
SEN6	Information technology has enabled easy exchange of data within and across employees, departments and throughout the entire organization					

INFLUENCE OF ENVIRONMENTAL UNCERTAINTY ON DYNAMIC CAPABILITIES

Environmental Uncertainty						
SEN7	Prevailing economic conditions greatly affects our demand and supply chain activities					
SEN8	Regulatory/ compliance rules governing data handling and privacy determines the nature and sources of our information we obtain					

SECTION C: DETERMING IT-ENABLED SENSING CAPABILITIES

Please rank from strongly agree to strongly disagree

Item No.	Statement	1	2	3	4	5
Asset Investment						
SEI1	Adequate funding has enabled a modern IT infrastructure that largely supports the business processes					
SEI2	There is competent staff that to support business-enabling IT capabilities					
Continuous Learning						
SEI3	IT re-skilling or upskilling amongst staff ensures the effective uptake of technological changes without resistance					
SEI4	The firm utilizes IT capabilities to ensure that staff continuously distill past experiences into future actions and behaviors					
Innovation						
SEI5	Insights obtained from data analytics ensures fast and easy diversification of our product/ service offerings					
SEI6	Mapping business processes into IT capabilities has enabled improvement in internal business processes through having predictive and routinized activities					

SECTION D: DETERMINING IT-ENABLED RE-CONFIGURATION CAPABILITIES

Please rank from strongly agree to strongly disagree

Item No	Statement	1	2	3	4	5
Change Management						
REC1	There is clear execution of business changes with well detailed roadmaps informed using IT capabilities					
REC2	Senior management is actively involved in championing delivery of the business/ IT strategy					
REC3	The entire organization is involved and actively participates during roll out of business enabling IT capabilities					
Governance						
REC4	Clarity of roles & accountability ensure the business and IT units are effective in identifying IT- capabilities that truly meet business needs					
REC5	Business/ IT units are adequately resourced plus knowledgeable so as to implement enabling IT capabilities that address the business requirements					
REC6	There exists competent human skills and knowledge to ensure effective delivery & support of IS services					
Integration						
REC7	IT capabilities promote easy management, utilization and retirement of resources in response to business needs					
REC8	IT capabilities enhance human output plus ensure easy tracking and management of personnel performance metrics					

**SECTION E: DETERMING THE INFLUENCE OF IT-ENABLED DYNAMIC
CAPABILITIES ON ORGANIZATIONAL AGILITY**

Organizational Agility represents the aggregate capability of a company to rapidly change or adapt in response to a dynamic business environment. In this study, its discussed from an **innovation capability & operational adjustment agility** (i.e., technological fitness, streamlined business processes, dynamic culture and effective management) perspective.

Please rank from strongly agree to strongly disagree

Item No	Statement	1	2	3	4	5
ORG1	Innovation Capability					
	Relative to our competitors, we are much faster in developing new product/ service offerings for our customers					
	Re-orchestrating business-process changes in order to align the business strategy to new requirements is now much faster					
	Operational Adjustment Agility					
	Technological Fitness – Information technology capabilities are highly effective and a primary source of our competitive edge					
	Structure & Streamlined Business Processes – work flow within and across teams is more streamlined devoid of duplication or role ambiguity					
	Dynamic Culture – The firm leans more to agile/ iterative strategies co-created with staff as opposed to top-management long term linear planning					
	Effective Management – Due to greater availability of data driven information, leadership has greater confidence in making strategic decisions					

Appendix III: List of Manufacturing Firms in Nairobi City County

(Source: Kenya Association of Manufacturers (2020). Members of Kenya Association of Manufacturers. Retrieved from <https://kam.co.ke>)

1	Abu Engineering Ltd Acme Container Ltd	61	East African Portland Cement	121	Petmix Feed Petroleum Institute of East Africa
2	Addison Industries Ltd	62	East African Tanners	122	Pharm Access Africa Limited
3	Adhesive Solutions Africa Ltd	63	Eastern Chemical Industries Ltd	123	Pharmaceutical Manufacturing Co (K) Limited
4	Adix Shoes Ltd	64	Eco Consult LTD	124	Pharmaceutical Products Limited
5	Africa Kaluworks (Aluware) Division K	65	Ecolab East Africa (K) Ltd	125	Phillips Pharmaceuticals Limited
6	Africa Oil Kenya B.V	66	Ecotech Ltd Energy Pak (K) Ltd	126	Platinum Packaging Limited Polythene Industries Ltd
7	African Cotton Industries Limited	67	Eli Lilly (Suisse) SA	127	Print Fast Kenya Ltd.
8	Agni Enterprises Ltd Ali Glaziers Ltd	68	Elys Chemical Industries Limited	128	Pwani Oil products Limited
9	Alpha Dairy Products Ltd	69	Equatorial Tea Ltd	129	PZ Cussons East Africa Ltd.
10	Alpha Fine Foods Ltd	70	Eveready East Africa Limited	130	Raghad Enterprises
11	Alpha Medical Manufacturers Limited	71	Excel Chemical Ltd.	131	Ramco Printing Works Limited
12	Alpharama Ltd	72	Fairdeal Upvc, Aluminium and Glass Ltd	132	Redmacc Leather / Zingo Leather
13	Apex Steel Ltd AquaSanTec	73	Famiar Generating Systems Ltd	133	Reflex Footwear Limited
14	Aquva Agencies Ltd -Nairobi	74	Farmers Choice Ltd	134	Regal Pharmaceutical Limited
15	Arrow Rubber Stamp Company Ltd.	75	Flexoworld Ltd Foam Mattress Ltd.	135	Reliable Concrete Works Ltd
16		76	Forbes Media Electronic Advertising Solutions	136	Renscope Scientific Kenya
17	Ashut Quality Products ASL Ltd – HFD	77	Furmart furnishers	137	Revital Healthcare (EPZ) K
18	Athi River Mining Ltd	78	Gahir Engineering Works Ltd	138	Rhino Special Products Ltd
19	Atlas Copco Eastern Africa Ltd	79	Gesto Pharmaceuticals Limited	139	Rock Plant Kenya Ltd.
20	Aventis Pasteur SA East Africa	80	GlaxoSmithKline Kenya Limited	140	ROM East Africa Limited
21	Azu's Leather Limited	81	Goldrock International enterprises	141	Rosewood Office Systems Limited
22	Bamburi Special Products Ltd	82	Goods Chemistry Practise & Allied Cert. Corp Ltd	142	Rotam Sub-Saharan Africa
23	Bata Shoe Co (K) Ltd	83	Guan Candle Making Machine Co.,Ltd.	143	Rupa Cotton Mills EPZ Ltd
24	Bayer East Africa Limited	84	Heluk International Limited	144	Sameer Group
25	BIDCO Oil Refineries Limited	85	High Chem East Africa Limited	145	Sandstorm Africa Limited
26	Beta Healthcare International Limited	86	Hydraulic Hose & Pipe Manufacturers Ltd	146	Sanpac Africa Ltd
27	Bilco Engineering	87	Imani Workshops JET Chemicals (Kenya) Ltd	147	Service Shoes Africa Ltd
28	Biodeal Laboratories Limited	88	Ivee Aqua EPZ Limited Athi River	148	Shade Systems(E.A)Ltd
29	Blowplast Limited	89	Jeilo Collections	149	Shadetents And Exquisite Designs
30	Blue Ring Products Ltd	90	KAM Pharmacy Limited	150	Shankan Enterprises Ltd

31	Blue Triangle Cement	91	Kapa Oil Refineries Limited	151	Sigma Engineering Co. Ltd
32	Blue Waves Enterprises Limited	92	Kenbro Industries	152	Simco Auto Parts Ltd
33	Bobmil Industries Limited	93	Kenya Fluorspar Company Ltd (KFC)	153	Slumberland Kenya Ltd
34	Bogani Industries Ltd	94	Kenya Grange Vehicle Industries Ltd	154	Solarworks East Africa
35	Bosky Industries Ltd	95	Kenya Solar Kiesta Industrial Technical Services Ltd	155	Stainless Steel Products Ltd
36	British American Tobacco Kenya Ltd	96	Kenya Suitcase Manufacturers Limited	156	Stamet Products (K) Ltd
37	Budget Shoes Ltd	97	Kim-Fay E.A Limited	157	Statpack Industries Limited
38	Bulk Medicals Limited	98	KingSource Plastic Machinery Co.,Ltd.	158	Steel Structures Limited
39	C & P Shoes Industries Ltd	99	Laboratory & Allied Limited	159	Sudi Chemical Industries Limited
40	C. Dormans Ltd	100	Leather Industries of Kenya Limited	160	Sunrays Solar Ltd
41	Chandaria Industries Limited	101	Mac's Pharmaceutical Limited	161	Superfit Steelcon Ltd
42	Chemplus Holdings LTD	102	Macquin Shoes Ltd	162	Tamoil Africa Holdings Limited
43	Chevron Kenya Ltd	103	Makiga Engineering Service Limited	163	Tarpo Industries Limited
44	Chloride Exide Kenya Limited	104	Manhar Brothers (Kenya) Limited	164	Tenacity Locks Ltd
45	Climacento Green Tech Ltd	105	Manzil Glass & Hardware Ltd	165	The Kensta Group
46	Colgate-Palmolive (East Africa) Ltd	106	Maridadi Seasons Handcraft	166	Tianjin Haopu Chemical Co. Ltd
47	Collis F.B Commercial Motor Spares Ltd	107	Mather & Platt Kenya Ltd	167	Top Tank
48	Cosmos Limited	108	Maweni Limestone Ltd	168	Tripac Chemical Industries Ltd
49	Creative Fabric World Co Ltd	109	Medivet Products Limited	169	Umoja Rubber
50	Creative Innovations Ltd.	110	Mellech Engineering & Construction Ltd.	170	Unga Farm Care (EA) Ltd
51	Crown-Berger (K) Ltd.	111	Metal Crown Ltd Metsec Ltd.	171	Unga Group Ltd.
52	Cuma Refrigeration EA Limited	112	MGS International (K) Ltd	172	Unighir Ltd.
53	Dawa Pharmaceuticals Limited	113	Mjengo Limited	173	Unilever Kenya Limited
54	Denrit LTD	114	Mohajan Trade International	174	Universal Pharmaceutical Limited
55	Didy Pharmaceutical	115	New World Stainless Steel Ltd	175	Universal Ponds Kenya Limited
56	Diversey Lever	116	Novartis Rhone Poulenc Limited	176	Warren Concrete Ltd
57	Doshi Group of Companies	117	Novelty Manufacturing Limited	177	Wartsila Eastern Africa Ltd
58	East Africa Glassware Mart Ltd	118	Orbit Chemical Industries Ltd	178	Wazawazi company limited
59	East African Breweries Limited	119	Orpower 4, Inc Packaging Industries Ltd	179	Welfast Kenya Ltd
60	East African Cables Ltd.	120	Patco Industries Ltd Pelican Signs Ltd	180	Welrods Limited