



University of  
**Southern**  
**Queensland**

**INFORMATION AND COMMUNICATIONS  
TECHNOLOGY (ICT) PROJECT  
INVESTMENTS: A WORK-BASED RESEARCH  
STUDY INVESTIGATING ICT CORE  
COMPETENCE AND COMPETITIVE  
ADVANTAGE IN THE MALAYSIAN  
MANUFACTURING SECTOR**

A Thesis submitted by

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For the award of

DOCTOR OF PROFESSIONAL STUDIES

2023

## **ABSTRACT**

The use of ICT to automate data and information has long been utilised in Malaysian manufacturing organisations. Malaysian manufacturers use ICT to automate and integrate operations such as distribution, supply chain, financials and manufacturing and provide data for better decision making. While some research focuses on corporate strategy and technology in the Malaysian manufacturing industries, little research has been conducted connecting strategy, ICT core competence and/or corporate competitive advantage in the Malaysian manufacturing sector. This exploratory work-based research study sought to focus on investigating ICT as embedded in corporate strategy, ICT resource allocation and the development of core competence in achieving competitive advantage in the Malaysian manufacturing sector. The study adopted resource based theory (RBT) to frame the research. The RBT of the organisation looks at competitive advantage based on its resources and capabilities. This aligns with the study which looks at ICT resource allocation, ICT capabilities and the development of core competence. A sequential, exploratory mixed-methods research design was used in this study. Data were collected through face-to-face interviews followed by an online quantitative survey of manufacturing companies. The results show strong evidence that corporate strategy needs to integrate ICT strategy to a corporate level; understand the technologies and capabilities to leverage their value; and to develop its capabilities into a core-competence that translates into competitive advantage.

Keywords: ICT strategy, core competence, resource allocation, competitive advantage, Resource Based Theory

## **CERTIFICATION OF THESIS**

I, Loh Kok Hong declare that the PhD Thesis entitled *Information and communications technology (ICT) project investments: A work-based research study investigating developing ICT Core Competence and Competitive Advantage in the Malaysian Manufacturing Sector* is not more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Date: 31 January 2023

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## **ACKNOWLEDGEMENTS**

This journey would not have been possible if not for the following conversation with my father, for he said “Hong, do the best that you can, never allow anyone to look down on you, and show that you are more than capable.”. For that this thesis is dedicated to my father, Loh Kum Hing (羅錦興) who gave me the inspiration and encouragement to start off this journey. To my family, especially my late wife, Jessie and my children Weslee, Nicky and Keith Loh, I thank you all for playing a pivotal role in this journey and supporting me in pursuing my dreams.

I am eternally grateful to Dr. Luke van der Laan who has supported, encouraged and challenged me throughout this research and got the thesis to the point of completion. It would be too difficult for me to complete this journey without Dr. Luke’s drive and motivation and I sincerely believe that his knowledge and wisdom have given me the willpower and strength to see through this tough journey.

Last, but not the least, a huge thanks to my brothers, sisters-in-law and friends and everyone else who interacted with me in one way or another the last seven years to offer support and motivation. None of this would have been possible without all of you by my side.

Thank you, 謝謝 and “Terima Kasih”.

## **DEDICATION**

To my late wife Jessie Loh, the journey would not have been possible without your steadfast support throughout this road less travelled, fraught with turbulence, confusion and mayhem.

I will forever remember your words of encouragement, whispered in my ears, praying that I succeed, with you and our children besides me.

From the moment I penned the first word on this thesis, you have always been my emotional wall until you said good-bye.

I will always love you, and you forever be in my heart.

We shall meet again dear, holding hands and travel to our retreats.

(Jessie Loh 1966 – 2020)

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## **ABBREVIATIONS**

|            |   |
|------------|---|
| BI         | Business Intelligence                     |
| BPR        | Business Process Re-engineering           |
| CE         | Circular Economy                          |
| CEO        | Chief Executive Officer                   |
| CIO        | Chief Information Officer                 |
| COO        | Chief Operating Officer                   |
| CRM        | Customer Relationship Management          |
| CSF        | Critical Success Factor                   |
| DPRS       | Doctor of Professional Studies            |
| DSS        | Decision Support Systems                  |
| DSTIN      | Dasar Sains, Teknologi, Inovasi Negara    |
| EA         | Enterprise Architecture                   |
| e-Business | Electronic Business                       |
| ERP        | Enterprise Resource Planning              |
| FMCG       | Fast Moving Consumer Goods                |
| FMM        | Federation of Malaysian Manufacturers     |
| GMIT       | General Manager of Information Technology |
| HRMS       | Human Resource Management System          |
| H-T        | High Tech Manufacturing                   |
| IBM        | International Business Machine            |
| ICT        | Information and Communications Technology |
| IOS        | Inter-Organisational Systems              |
| IoT        | Internet of Things                        |
| IRM        | Information Risk Management               |
| IR4.0      | Industrial Revolution 4.0                 |
| IS         | Information System                        |
| IT         | Information Technology                    |

|      |  |
|------|--|
| KMO  | Kaiser-Meyer-Olkin                                     |
| KWS  | Knowledge Work Systems                                 |
| MDEC | Malaysia Digital Economy Corporation                   |
| MIS  | Management Information System                          |
| MITI | Ministry of International Trade and Industry           |
| MNC  | Multi-National Corporations                            |
| MRS  | Management Reporting Systems                           |
| OAS  | Office Automation Systems                              |
| OECD | Organisation for Economic Co-operation and Development |
| OEE  | Overall Equipment Effectiveness                        |
| PC   | Personal Computer                                      |
| PCA  | Principal Component Analysis                           |
| PMO  | Project Management Office                              |
| RBT  | Resource Based Theory                                  |
| SaaS | Software as a Service                                  |
| SCM  | Supply Chain Management                                |
| SEM  | Structural Equation Modelling                          |
| SPSS | Statistical Package for the Social Sciences            |
| TCO  | Total Cost of Ownership                                |
| T-M  | Traditional Manufacturing                              |
| TPS  | Transaction Processing Systems                         |
| UK   | United Kingdom   |
| USQ  | University of Southern Queensland                      |
| VRIN | Valuable, Rare, Inimitable, and Non-Substitutable      |
| WWW  | World Wide Web   |

# CHAPTER 1: INTRODUCTION AND OVERVIEW

## 1.1. Introduction

Due to business dynamics and complexities, aligning business management software to organisations' strategic goals has appeared to be a concern for researchers and practitioners. The challenge to achieve this alignment becomes more severe and demanding as the corporate world is dependent on the use of technology to achieve their business strategies thus ensuring that the strategies have the competitive advantage over their competitors.

In the Malaysian manufacturing industry, the development and execution of business strategies are an on-going event. Manufacturing companies continually review their strategic objectives as business environments change to local and global demands. Campbell, Edgar and Stonehouse (2011) state the objective of strategies are to:

- i. Drive the business to suit the environment; or
- ii. Use business resources to alter the rules of the game; or
- iii. Remodel the business environment.

In developing strategies, David (2011) highlighted that the formulation of strategies requires organisations to dedicate and invest in human capital resources especially specialised skills, ICT and non-ICT technologies, goods and markets over time to balance internal resources with prospects and risks to the business environment. In developing core competence in order to achieve competitive advantage, it is imperative that organisations develop business strategies, invest in a strategic of resources, review organisational structures and invest in technological systems.

In seeking to achieve competitive advantage, research into various strategic management literatures have highlighted a number of definitions and is inconclusive as mentioned by Ma (2000), Rumelt (2003), Arend

(2003) and O'Shannassy (2008). Based on Porter (1985), the definition of competitive advantage is that the business lead over its competitors by giving customers better value. Christensen and Fahey (1984), Kay (1995) and Porter (1980) highlighted competitive advantage as the strength attained through its qualities and resources to execute at a higher level over its competitors within the same industry and/or market.

Prahalad and Hamel (2009, pp.41-59) explain that organisations can easily face challenges to sustain their strategic position. They indicate that developing core competence is a way to achieve competitive advantage. Schilling (2013) simplified the definition of core competence as "a harmonised combination of multiple resources and skills that distinguish a firm in the marketplace". Scholars have acknowledged the importance of the core competence concept by suggesting core competence models to competitive advantage (Petts, 1997; Hafeez et al., 2002). Banerjee (2003) defines core competency as the knowledge of successes or failures in recommending knowledge resources.

Gupta et al. (2009) highlighted that resources alone are insufficient to develop competitiveness over other organisations. To develop a competitive advantage, organisations need the capability to utilise their resources and capabilities in managing change as well as having the ability to utilise the available resources to create new resources, especially in skilled areas through new technology or software application, or to create new opportunities in developing new products. Clulow et al., (2003) summarised: "Organisations are considered to have an advantage over its competitors when it is implementing a value creating strategy not implemented by competitors" (2003, p. 221).

In the field of technologies and software applications, the fundamental objective of Information and Communication Technologies (ICT) deployments is to ensure that ICT systems serve to achieve competitive advantage and are considered a necessary part of a corporate strategy.



ICT is located at the heart of managerial issues both on strategic and operational levels to compete in local and global markets in a context of market globalisation and internationalisation of organisations. However, in practice, ICT systems' role in the management of enterprises is built gradually, by successive pushes, without coherent strategy and at the whim of technical innovations and commercial successes. Their use is integrated in typically an ad-hoc way, incremental over time aimed at producing new tools to support management practices. However, this practice is inadequate to effectively create competitive advantage. Instead, it is apparent that corporate strategy should embed ICT strategy at the corporate strategy level to direct orientated ICT investment with the goal that the ICT capabilities develop into a core competence.

An area that has not been previously examined in the literature is the nature of which Malaysian manufacturing organisations link implementation and deployment of ICT projects with the objective of achieving competitive advantage. This area is worthy of investigation even though ICT technologies such as the use of websites and applications that enable users to create and share content or to participate in social networking (also known as social media sites) empower organisations to communicate an enormous amount of information to relevant stakeholders (i.e., customers, employees and investors), other interested parties (e.g., media, the common people) and other organisations. However, these future platforms and technologies do not represent a holistic and future orientated practice that qualify as "strategic".

Open Gov Asia, an internet content developer, initiates dialogues with public sectors across South East Asian countries, CIOs of various organisations and technology experts and report on innovative policies, technologies and programmes coming from different government agencies. Open Gov Asia (2020) reported that Malaysian manufacturing companies continue to be the industry with the highest revenue contribution, and anticipated that throughout the 2018–2023 period, its

revenue contribution to total ICT spending would slightly grow from 18.4% to 18.5%. GlobalData Plc, a London based data analytics and consulting firm, forecasted that the Malaysian manufacturing firms represents the most significant sector from a ICT spending perspective, and is expected to contribute 18.5% of total technology revenue by 2023 which translates to about USD4.66B out of a total of USD25.2B spendings in the Malaysian technology market (GlobalData, 2022).

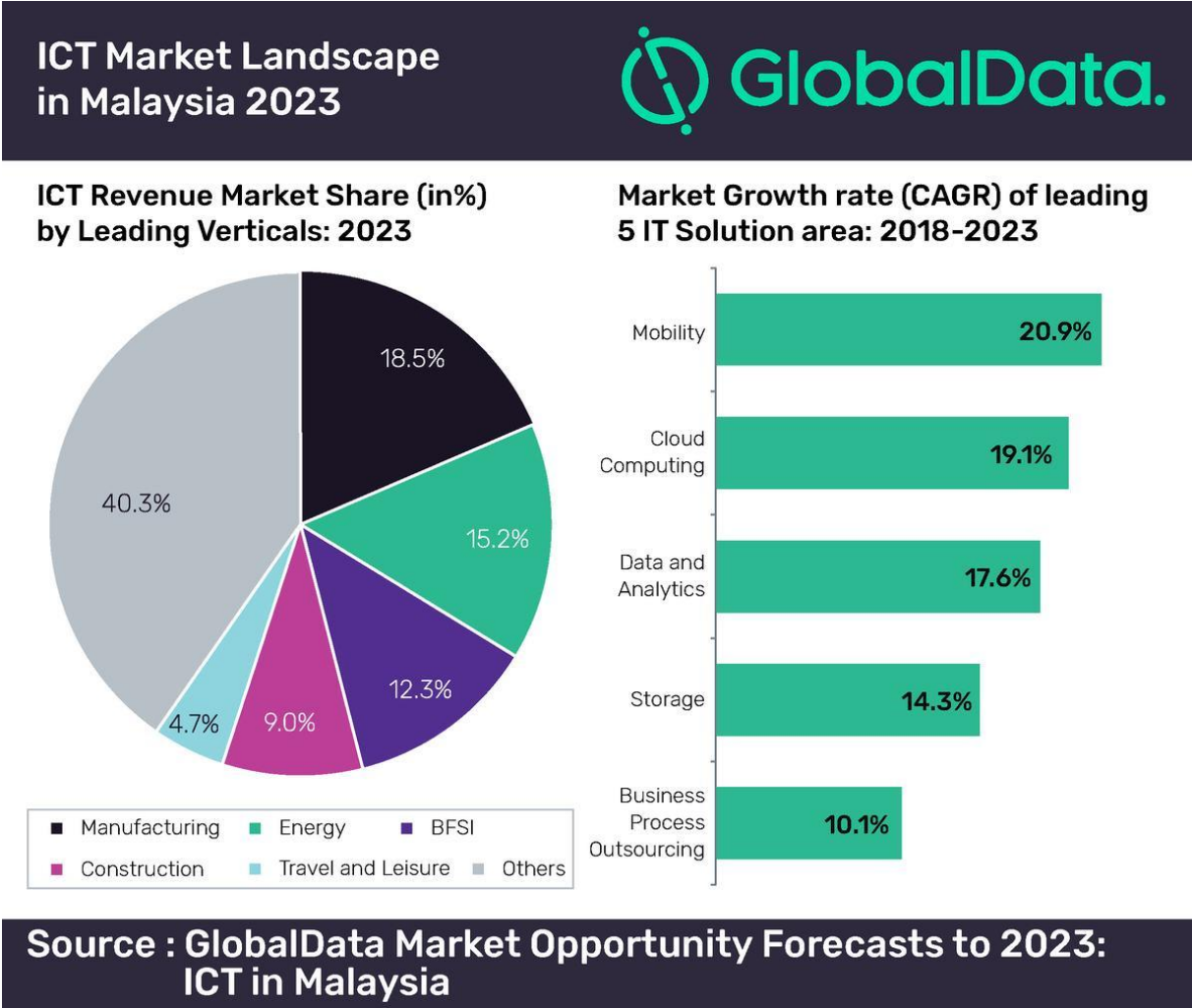


Figure 1: ICT Market Landscape in Malaysia 2023

Most stakeholders recognise that the use of ICT solutions is to improve internal operations through automating certain processes such as management and operation of procurement processes, managing inventories through the use of inventory systems and increasing operational efficiencies of the warehouse via the use of warehouse

management systems. However, they have yet to understand the triangulation between ICT investments, ICT core competence and competitive advantage.

Based on a 2016 FMM-MDEC-Monash University study on the adoption of ICT among the Federation of Malaysian Manufacturers (FMM) members, 74% of 148 manufacturers surveyed indicated that the top determining factor to adopt new technologies is their internal organisation's need, followed by set-up cost and security (69% of respondents), and compatibility with the existing system (58% of respondents). Other factors that affect the lack of adoption of ICT technologies are the lack of knowledge (53%), the lack of skills (51%) and the lack of external technical support (52%) (Low et al., 2016).

The thesis acknowledges specifically that the study is dated but as a preliminary indication of ICT adoption in the Malaysian manufacturing industry, it was a useful benchmark to build on and provides an initial understanding which the study can use as a point of reference.

This study therefore seeks to investigate the development of ICT strategy, ICT core competence development and achieving competitive advantage in the Malaysian manufacturing industry. This study is a work-based research study that primarily seeks to understand these relationships and contribute to professional practice.

### ***1.1.1. Background of the study***

Strategic management emphasises the strategic choices faced by multi-sectoral corporates in relation to creating competitive advantage and strengthening corporate performance. Many of the strategies include the use of ICT technologies in the organisations.

On the one hand, traditional implementation and deployment of ICT projects are often static and reactive; only coming into play post-adverse event and not before. In today's fast paced and highly disruptive business environment, corporates' demand for ICT solutions are more strategic in order to give them the ability to proactively pre-empt changes in their business environment as early as possible in order to remain competitive. ICT is one of the fastest evolving technologies and innovations worldwide, offering new approaches, products and services, impacting on organisational change and innovation in ICT and is an ongoing topic in research (Huang et al, 2004; Cameron & Green, 2012). Much less is known as to how and to what extent corporates can achieve effective competitive advantage as it relates to pro-active ICT investment.

While ICT plays a major role in industries such as manufacturing, professional services, providing information management, communicating across the globe, etc., it has also advanced towards sensing and predicting human requirements. By assessing the impact of technology's application in businesses, it is important to understand that ICT enabled solutions implementation is complex and dependent on both internal and external factors. ICT implementation does not only represent buying hardware and software but at the same time, affects processes of the organisation and at times may require a change in corporate policies and staff capabilities. As a result, organisations need to understand and be able to manage and adapt to changes, as ICT implementation requires material transformations within the organisation (Adelaar, 2000).

As such, an effective corporate strategy should include a holistic understanding of the technology itself as well as the capabilities needed to leverage them into competitive advantage.

The background to this study is an attempt to understand the complex interaction between ICT strategic investment, the development of core competence and competitive advantage in the Malaysian manufacturing

sector. It's focus is on gaining a practice-based insight using a work-based learning approach.

### **1.1.2. ICT and the Resource Based Theory (RBT)**

The RBT's principal development occurred between 1984 and the mid-1990s. After Wernerfelt's (1984) initial article, contributions were made by many scholars, and since then, RBT has been applied to a wide range of phenomena, including information systems (Wade & Hulland, 2004). It seeks to clarify the internal sources of an organisation's competitive advantage suggesting that if an organisation is to achieve a state of competitive advantage, it must obtain and control of valuable, rare, inimitable and non-substitutable (VRIN) resources and capabilities, and that the organisation apply them in their operations (Barney, 1991, 2001).

By adopting a perspective based on the RBT, researchers in ICT studies have identified various ICT related resources that serves as potential source of competitive advantage (Mihalič & Buhalis, 2013). However, based on Information Systems literature on RBT, and the use of ICT as a source of competitive advantage, the consensus view that emerges, is that it is not ICT resources, per se, that provide competitive advantage, but rather, it is the way that they are used or integrated in combination with other resources in the organisation that provides such advantage (Nevo & Wade, 2011).

As such, an effective corporate strategy is to:

- i. Elevate its ICT strategy to a corporate level;
- ii. Understand the technologies and capabilities to leverage their value;  
and
- iii. Develop its capabilities into a core competence that translates into competitive advantage.

## **1.2. Problem Statement**

In a number of industries, ensuring the success of corporate strategies is considered a vital part of industry success; whether in private or public sectors, non-profit organisations, multinationals or small and medium enterprises. Bart et al. (2001) illustrated, that achieving corporate's competitive advantage based on corporate strategy had consistently shown to be the top-rated management tool deployed by senior managers during each of the twenty years prior to his study.

Literature reviews on effective corporate strategy show it is well-defined and are clear-cut about the most frequent attributes used universally. However, an area that has not been previously examined is the nature and extent to which Malaysian manufacturing organisations associate ICT project investments with corporate strategies. As such this study seeks to gain an in-depth understanding on corporate strategy, the development of ICT core competence and competitive advantage in the Malaysian manufacturing sector.

Most manufacturing industry stakeholders understand the use of ICT systems to improve their internal operations through the automation of certain processes such as the management and operations of procurement processes, managing inventories through the use of inventory systems and increasing operational efficiency of the warehouse with the assistance of warehouse management systems. Manufacturers also depended on business-to-business (B2B) and business-to-customers (B2C) ICT systems to manage their businesses resulting in strong dependency of the use of internet based business applications to reach out to their suppliers and the market (Lebeaux & Pratt, 2020; Bharadwaj, El Sawy, Pavlou & Venkatraman, 2013). However, they have very little idea or understanding of the importance of ICT projects and how it can achieve competitive advantage over their competitors.

In Malaysia, besides manufacturing industries, there is sufficient evidence that organisations that fail to include ICT as a key priority in its corporate strategy will likely fail to have a competitive advantage (Luftman & Brier, 1999). An example would be local taxi companies that lost significant business to private car owners providing taxi rides using mobile applications such as UBER or GRAB. Taxi operators that do not invest in online platforms are likely to have lost market share and collapse.

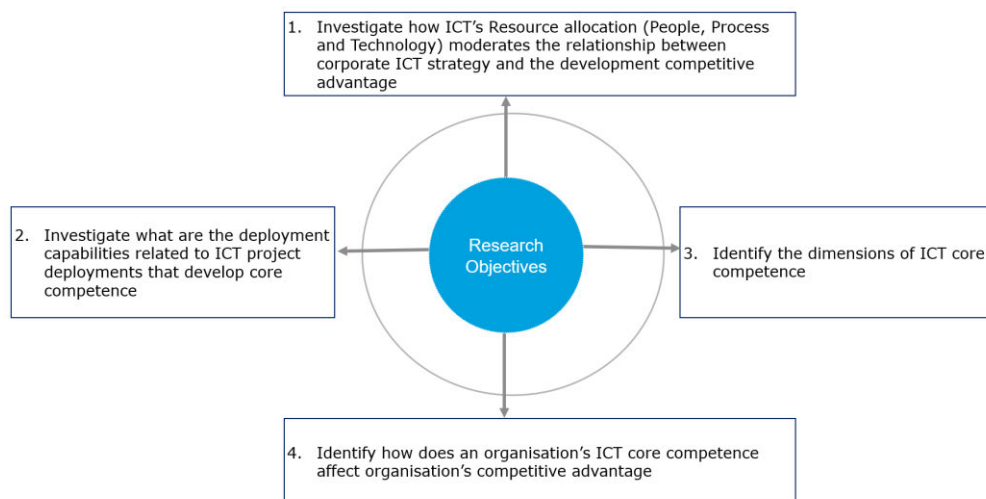
In the 2016 Ministry of International Trade and Industries (MITI) Annual report, MITI undertook several major initiatives to boost Malaysia's economy and for industries to move up the global value chain. With this roadmap in mind, MITI has begun collaborating with relevant Ministries and Agencies as well as the captains of industries to craft a National Industry 4.0 Transformation policy and action plan to overcome major challenges in the area of the development of essential ICT infrastructure, talent and human capital, targeted incentives as well as standards and technology.

With the above background, research problems and the challenges that MITI's report reveals the following research objectives will frame the study and be addressed throughout the various stages of the study.

### **1.3. Research Objectives**

The study seeks to achieve the following research objectives:

1. Investigate how ICT's Resource allocation (People, Process and Technology) moderates the relationship between corporate ICT strategy and the development of ICT core competence;
2. Investigate and identify deployment capabilities related to ICT core competence in deployments;
3. What are the dimensions of ICT Core Competence following ICT deployment in the Malaysian manufacturing firms; and
4. How does an organisation's ICT core competence affect organisation's competitive advantage.

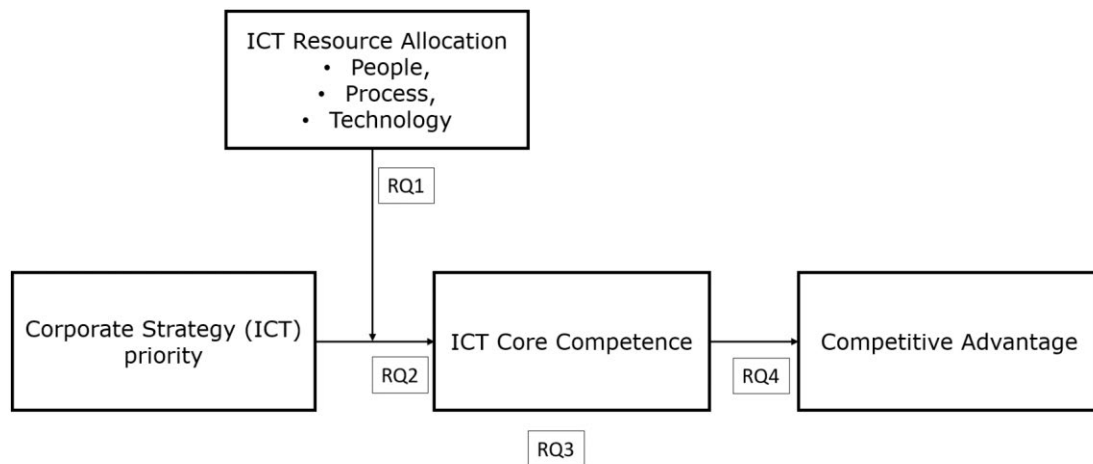


*Figure 2 Research Objectives*



## 1.4. Conceptual Model

In order to respond to the research problem, it is proposed that a conceptual model based on the underlying concepts of strategy, ICT deployment (resource allocation) and ICT core competence is required. The study's conceptual model is presented in Figure 3.



*Figure 3 Conceptual model of the study*

## 1.5. Research Questions

Based on the conceptual model and aligning with the research objectives, the following research questions guide the study:

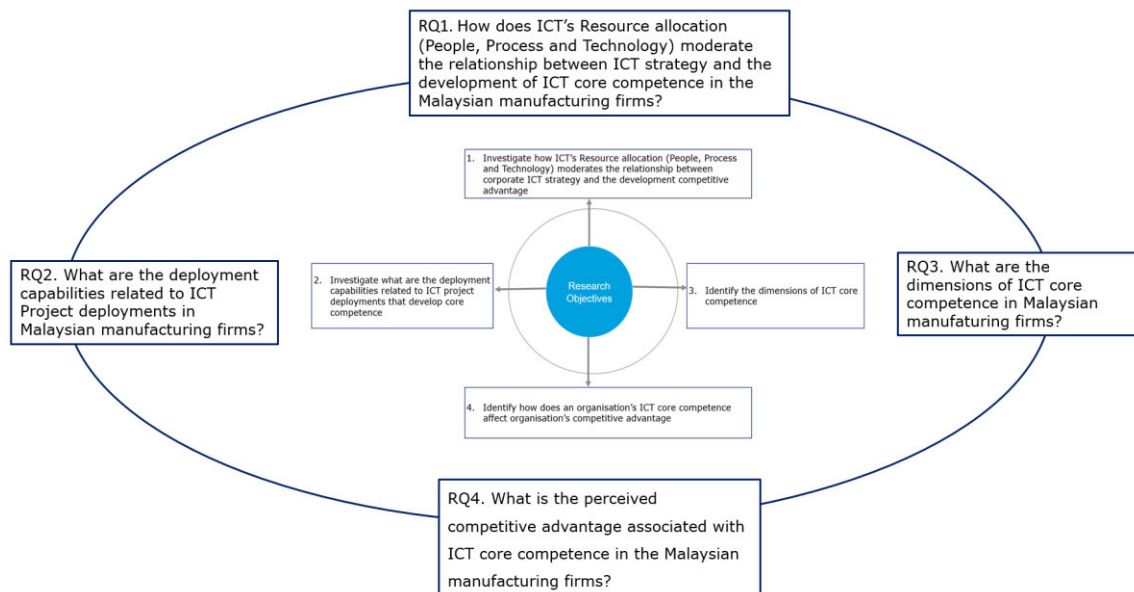


Figure 4 Research Questions of the study

- 
- RQ1 How does ICT's Resource allocation (People, Process and Technology) moderate the relationship between ICT strategy and the development of ICT core competence in the Malaysian manufacturing firms?;
- RQ2 What are the deployment capabilities related to ICT Project deployments in Malaysian manufacturing firms?;
- RQ3 What are the dimensions of ICT core competence in Malaysian manufacturing firms?; and
- RQ4 What is the perceived competitive advantage associated with ICT core competence in Malaysian manufacturing firms?
-

## **1.6. Significance Of The Study**

It is a common understanding that there is a gap between researchers and practitioners, usually in practice-based occupations, such as service related professions (Booth, Booth & Falzon, 2003), where practitioners are known to depend on shared practice-wisdom rather than drawing from theory in extant literature. This is similar in the professional services industry such as ICT consulting and ICT technology implementation.

Bearing this gap between theory and practice in mind, this work-based research project is intended to make the following contributions:

1. To the researcher, through updating of knowledge with regard to theory and practices on the understanding of corporate strategies in relation to the corporates' ICT investments. The researcher will benefit by achieving stated learning objectives including intellectual, methodological, personal and professional competencies;
2. Contribution to the field of ICT deployments where professional firms benefit through developing a deeper understanding on evidence-based ICT implementation and not overcoming clients' immediate challenges. The study will make an evidenced based knowledge contribution that links ICT as part of corporate strategy to achieve competitive advantage;
3. Contribution to stakeholders of organisations who understand and leverage the benefits of strategy, development of ICT core competence to achieve competitive advantage; and

4. Contribution to the body of knowledge on strategy, ICT investments, the Malaysian context and to better understanding the development of ICT as a core competence to attain competitive advantage.

| Anticipated Contributions                            |   |
|--|---|
| Body of Knowledge                                    | Knowledge contribution regarding the association between strategy, ICT core competence and competitive advantage with ICT resource allocation on people, process and technology in the Malaysian manufacturing firms. |
| Learning Objective                                   | Benefit by achieving stated learning objectives including intellectual, methodological, personal and professional competencies.   |
| Contribution to the field of ICT Project Deployments | Contribution to the field of business solution deployment from a deeper understanding and evidence-based perspective in the Malaysian context.  |
| Contribution to Corporate Executives                 | Contribution to the executives of companies by providing an evidence-based on how can leverage the benefits of ICT deployment within corporate strategy to achieve competitive advantage.                             |

Table 1 Anticipated Contributions

## 1.7. Conclusion and Thesis Structure

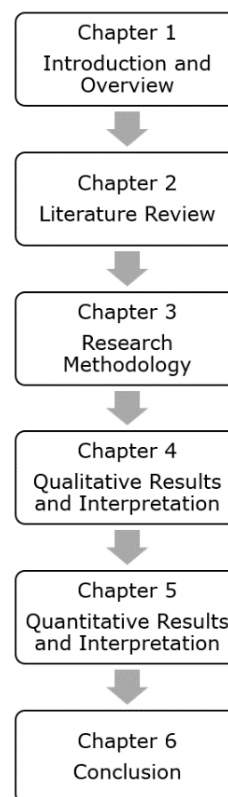
This chapter outlines the context of the problem, key concepts and research questions regarding the study. It notes that corporate strategy needs to integrate ICT strategy to a corporate level with an understanding of ICT resource allocation and developing its capabilities into a core competence that translates into competitive advantage.

Chapter 2 presents a systematic literature review of the relevant topics and concepts related to the study;

Chapter 3 outlines the research methodology deployed to answer the research questions;

Chapter 4 presents the qualitative findings from interviews and the interpretation of the findings;

Chapter 5 presents the quantitative findings from the survey and the interpretation of the findings;



*Figure 5 Structure of the Thesis*

Chapter 6 summarises the conclusions from this study on underlying concepts of strategy, ICT deployment (resource allocation) and ICT core competence to achieve competitive advantage.

# **CHAPTER 2: LITERATURE REVIEW**

## **2.1. Introduction**

This chapter offers an outline of the literature informing the development of the thesis and its associated key concepts. It is divided into two main sections.

The first section provides a background to strategy, reviewing its definition and theory, and the perspective of Resource Based Theory (RBT). More specific information about RBT addressing ICT resource allocation and developing ICT core competence and the notion of competitive advantage is addressed in the sub-sections of Section One.

Section Two contains a detailed description of the core competence associated with ICT resource allocation, its definition, scope, ICT investments and competitive advantage. It will also touch on the relationship between ICT projects and manufacturing companies' critical success factors (CSF).

## **2.2. Strategy**

Liddell & Jones (1940) define strategy as a high level plan in order to attain one or more goals under conditions of uncertainty. According to Freedman (2015, p.193) the word "strategy" means "a comprehensive way to try to pursue political ends, including the threat or actual use of force, in a dialectic of wills" in military conflicts, during which both opponents interact.

Strategy is considered as significant due to the fact that resources available to achieve a set of goals are limited. Strategic initiatives include setting goals, formulating actions to achieve set goals, and managing

resources to execute the actions. A strategy describes how the ends (goals) are to be achieved by allocation of the resources. Mintzberg et al. (2003) highlighted that strategy can be intended or can emerge as a pattern of activity as the organisation adapts to its environment or competes and involves activities such as strategic planning and strategic thinking.

### **2.2.1. Defining Strategy**

There are many definitions for "Strategy", but normally it refers to a set of guidelines that forms a set of decisions for the longer term. Chandler (1962, p.13) wrote "Strategy can be defined as the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals". In gaming strategies, it is the set of rules that governs the moves of the players. In military strategies, it is "the art of distributing and applying military means to fulfill the ends of policy" Liddell (1967, p.321).

In management theory, Chandler (1962) defines management strategy as "The long-term goals and objectives of an organisation, taking actionable paths and allocating resources required to carry out these goals".

Therefore, strategy is:

- a) Clearly articulated;
- b) developed knowingly and decisively longer term goals;
- c) developed ahead of time based on the reasons to which it applies;
- and
- d) the allocation of resources to action the goals.

Khalifa’s (2020, pp. 128-143) definition of strategy and the five attributes of strategy are listed in Table 2:

| Strategy Definitions   | The 5 Attributes of Strategy |  |   |  |                                   |
|--|------------------------------|--|---|--|-----------------------------------|
|  | Aspirational                 | Power Creating                                     | Directional                                 | Systemic   | Intentional                       |
| Strategy, rendered as a cohesive core of guiding decisions, is an entity’s evolving theory of winning high stake challenges through power creating use of resources and opportunities in uncertain environments. | Winning is the aim           | Use of resources and opportunities to create power | A core of guiding decisions gives direction | A theory of winning gives cohesion to core decisions | An evolving theory is intentional |

Table 2 Khalifa's definition of strategy and the 5 attributes of strategy

The concept of strategy can be seen to be comprised of the following directives:

- Strategy is aspirational – it should not be easy or straightforward to implement and achieve a strategy across an organisation, and it should be a sign of significant success when a strategy is viewed as complete;
- Strategy is power creating – the implementation of a strategy should cause a shift in power both within and without an organisation. Internally, it should cause focus and the spending of resources to be shifted to the areas which are related to the successful implementation of the strategy. Externally, it should cause the organisation the gain a competitive advantage over its competitors, giving them greater power within the marketplace;
- Strategy is directional – the overarching concept of an organisation’s strategy should be guiding in principle, aiding the understanding across all levels of an organisation of where decisions should ultimately result in the organisation getting to greater profitability and success;



- Strategy is systemic – a strategy should not be considered as its individual parts, rather the whole system, and, particularly, the term strategy should not be associated with the level of activity or even sub-activity, as doing so confuses the overall concept; and
- Strategy is intentional – a strategy cannot just form organically or be assumed to exist.

Rather, strategies come out of the theory of winning, i.e., out of reflection and concerted effort and planning in order to achieve competitive superiority.

The differing perspectives of strategy are broad and provide greater insights than the adherence to a single perspective could. While strategy concepts and discourse have always been recognised as interdisciplinary, its breath across discipline and multitude approaches are not in the scope of this study.

### **2.2.2. Role Of Strategy**

Strategy is about the direction of organisations, mainly corporate organisations. It includes those subjects which are of primary concern to the organisation's senior management. Rumelt, Schendel and Teece (1991) state that companies have choices if they are to survive which includes strategic choices such as selection of goals, choice of products or services to manufacture and the development of policies in determining how the company positions itself to compete in a product based market. The integration of these choices ultimately make up strategy. This understanding remains relevant in the contemporary literature e.g., Johnson, Whittington, Regnér, Angwin and Scholes (2020).

Defining strategy requires attention on two sides of the formation;

- i. the intended strategies which is a guideline on the “how or on what basis” and evolving strategies where strategists develop techniques through a conscious process before making specific decisions; or
- ii. a gradually formed unintended technique, while making decisions and in which the definition of strategy equips the concept of strategy for the researcher (Mintzberg, 1979, p. 67-86).

In this work-based research, the focus of the study will be on corporate strategy.

### **2.3. Theory Of Strategy**

Strategic management looks at the construction and realisation of key goals and initiatives by an organisation's senior management on behalf of their stakeholders, based on their resources and evaluation of environments (internal and external) in which the organisation competes (Nag et al., 2007). Porter (1991) highlighted that there is a need for a theory of strategy which associates environmental conditions and corporate performance to market outcomes. The basic unit of study in a theory of strategy must ultimately be a strategically distinct business and in this case, the manufacturing industry in Malaysia. Porter suggests a chain of causality for doing so as listed in below.

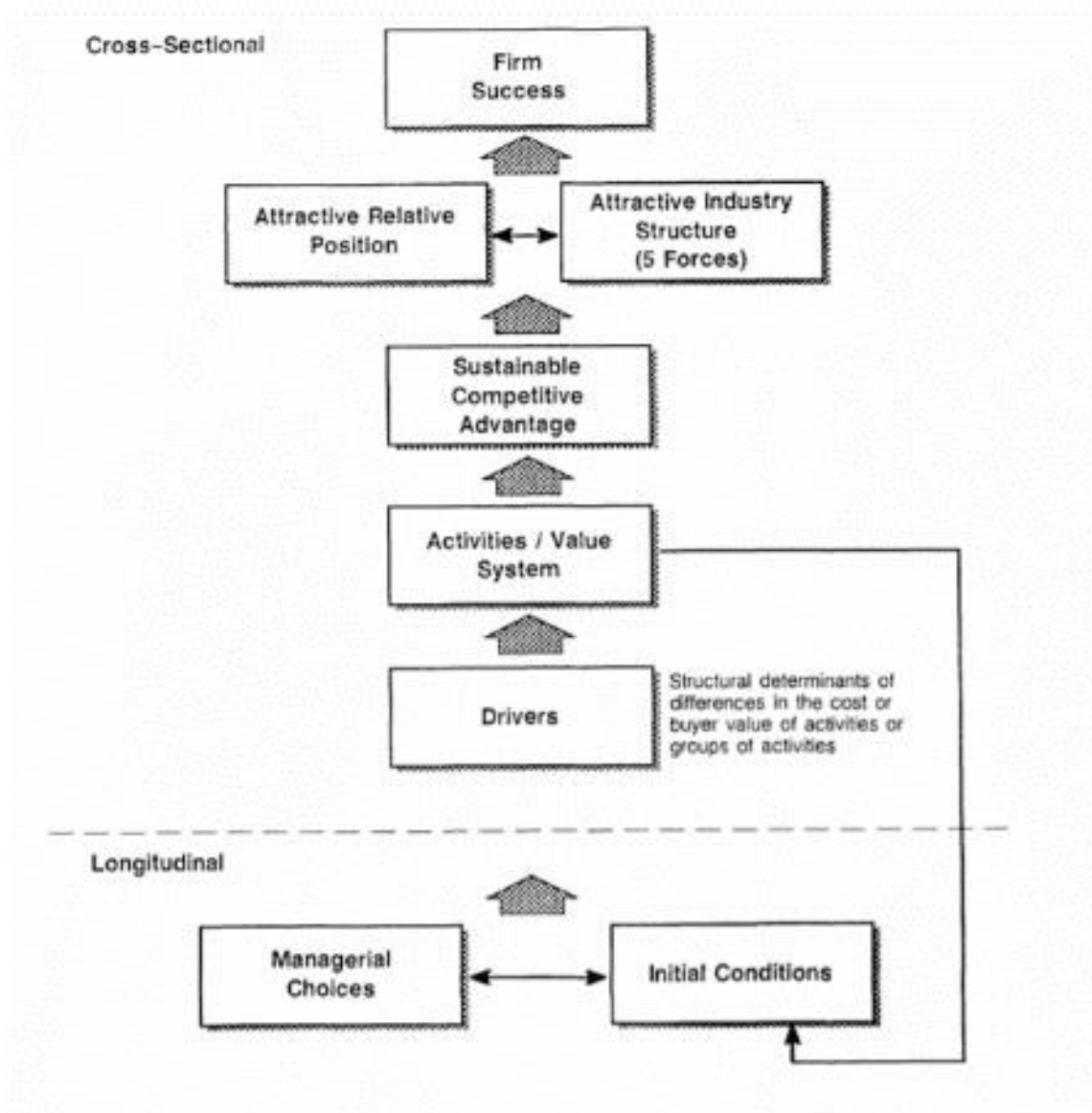


Figure 6 The Determinants of Success in Distinct Business – Porter (1991)

In deriving an underlying definitional consensus of the field, Nag, Hambrick and Chen (2007, p. 950) decided that the definition is “held together by agreement on basic definition and purpose, but is also engaged in a wide and ever-shifting range of theoretical and practical explorations”. The implicit definition resulting from their analysis was that “the field of strategic management deals with the major intended and emergent initiatives taken by general managers on behalf of its owners, involving utilisation of resources, to enhance the performance of firms in their external environments” Nag, Hambrick and Chen (2007, p. 944).

However, it does not take into consideration the concerns of system theorists who maintain that diversity in the understanding of what strategy means is vastly different. The number of concepts and frameworks do continue to increase but as Nag et al. note “the same forces that generate dissensus in a field also paradoxically provide grounds for consensus and commonality” (Nag, Hambrick & Chen, 2007, p. 950).

Many of those perspectives overlap and while seemingly at odds, the various perspectives provide greater insights than the adherence to a single perspective could. Strategy concepts and discourse have always been recognised as interdisciplinary. To ensure that there is a consistency in the theory and definition, van der Laan and Yap (2016) define strategy as “the direction and differentiation of organisations, including those subjects of primary concern to senior leadership, and the match an organisation makes between its capabilities and the opportunities and risks created by its external environmental, determining its capacity to be resilient to change and ability to exploit emerging, and explore future, opportunities.”

Johnson et al. (2020) confirms that this definition is acceptable because it acknowledges that the sector is grounded in practice and exists due to its importance especially in terms of the strategic decision making of organisational leaders. It also challenges firmly entrenched mechanistic views of strategy which hold that organisations are subject to industry forces rather than the organisation’s characteristics, a view that is increasingly questioned. That said, it is important to illustrate the evolution of approaches to making strategy. These are covered mainly by the traditional school, planning school, the positioning school and resourced based school.

## 2.4. Resource Based Theory (RBT) of Strategy

The RBT offers a framework to identify and foresee the core elements of business performance in terms of attaining competitive advantage. Instead of relying on externally driven techniques to comprehending the success or failure of leveraging organisational operations, RBT offers an internally-driven strategy by emphasising internal organisational resources (Kozlenkova, Samaha & Palmatier, 2014). It seeks to elaborate on corporate resources that are imperfectly replicable but might perhaps generate long-term competitive advantage (Barney, 1991).

The RBT aspires to elucidate the interior sources of an organisation's competitive advantage. Its central proposition is that if an organisation is to attain a state of competitive advantage, it must obtain and control valuable, rare, inimitable, and non-substitutable (VRIN) resources and capabilities, plus have the organisation *in-situ* which will absorb and apply them (Barney, 1991, 1994, 2002). This proposition is shared by several related analyses: core competences (Prahalad & Hamel, 2006), dynamic capabilities (Helfat & Peteraf, 2003; Teece, Pisano & Shuen, 1997), and the knowledge-based view (Grant, 1996; Wang & Noe, 2010).

The RBT of the organisation, looks at competitive advantage as gaining resources and capabilities (Penrose, 1959; Wernerfelt, 1984). There are assumptions of the RBT that organisations compete based on their resources and capabilities. However, this is inconclusive as there may be differences within the resources and capabilities of competing organisations which give them a competitive advantage over others (Peteraf, 1993). Barney (1991) stated that the RBT of the organisation and the advantage of a consistent competitive advantage result from the resources and capabilities an organisation considers as valuable, rare, inimitable, and non-substitutable (VRIN) and can be tangible or intangible

assets, including the organisation's management skills, policies and procedures, and the data and information it controls.

Grant (2002, p.103) highlighted three types of resources:

1. Tangible resources are identified as the organisation's physical assets. The assets, such as plants, equipment and financial resource focuses on the characteristics of a product or service that are relevant to customers' preferences and choice.
2. Intangible resources offer economies of scope from the ability to extend them to additional businesses at low cost such as corporate reputation, trade secrets, brand equity, policies, procedures and processes.
3. The third resource refers to the organisation's human resource. Human resource looks into the human capital aspects which includes corporate managers to employees. The third resource also includes the human capital's skill sets, knowledge, communication and collaborative skills and social capital.

The overarching question guiding the study is: why do companies in the same industry perform differently especially when there are so many manufacturing companies in Malaysia producing exactly the same products such as food-based manufacturing industries or even electrical components manufacturers? In this study, we will analyse the RBT of the companies (Zott, 2003) which is the main context to address this question.

Research from Rumelt (1984), Barney (1986), Dierickx and Cool (1989) and Grant (1991)'s determinations resulted in the RBT becoming the main reference in firm strategy developments. The perspective of core competence, developed by Prahalad and Hamel (1990), and competence-based competitive strategy (Sanchez & Heene, 1997) resembles the RBT from the conceptual point of view. More recent literature confirm these

perspectives as still relevant from a RBT perspective (see e.g., Sony, 2019; Hitt, Arregle & Holmes Jr, 2020; Adomako & Tran, 2022).

From the perspective of firms' internal organisation, RBT conceptualises firms as bundles of resources. Following decades of study, researchers have theorised that when firms possess VRIN resources, they will achieve sustainable competitive advantage by implementing fresh value-creating initiatives that competing firms will have difficulty in imitating (Wernerfelt, 1984; Barney, 1986; Dierickx & Cool, 1989; Grant, 1991; Ray, Barney & Muhanna, 2004; Acedo, Barroso & Galan, 2006; Armstrong & Shimizu, 2007; Thompson & Morgenstern, 2009).

The RBT of organisations acknowledge the importance of these VRIN resources as its aggregated capabilities, individual's competence, networks and other intangible assets. In terms of RBT gaining competitive advantage, it moves from an externally focused, rationally analysed strategy of market positioning to a more dynamic and emergent strategy which focuses on the enhancement of the organisation's unique internal resources and capabilities (Teece, 1998; Bharadwaj, 2000).

Tian, Wang, Chen & Johansson (2010) define ICT deployment capabilities as the organisational capabilities to configure and reconfigure an organisation's information system, by adding new ICT components or by adapting existing ones, to make the whole collection of information system available to support and shape businesses. Tian et al. (2010) further states that ICT deployment capabilities comprised of three components: strategic ICT flexibility, business-ICT partnership, and business-ICT alignment are key to attain competitive advantage.

The main contribution of this research is to contribute to practice knowledge on how Malaysian manufacturers realise the corporate strategies through the use of ICT core competence and in anticipation of

achieving competitive advantage. The RBT is used to support the critical factors in the following researcher's conceptual framework. The use of RBT is dependent on a number of factors such as the organisation's resources (internal and outsourced), efficiency-based and capabilities and substitutes.

Resource-based theory examines the organisations performance differences based on their resources (Peteraf & Barney, 2003). The theory consists of two main assumptions:

1. Organisations within the same industry may differ in their resources; and
2. These resources may not be perfectly mobile across organisations, so organisational differences in resources will continue for a long time (Barney, 1991).

The theory talks about how organisations maintain unique and sustainable positions in competitive environments (Hoopes, Madsen & Walker, 2003). It focuses on the differences in efficiencies rather than why it is different such as market power, collusion, or strategic behaviors (Peteraf & Barney, 2003). The idea in RBT is that organisations compete against others based on their resources and capabilities (Wernerfelt, 1984; Barney, 1991). An organisation's competitors can be identified through similar products, resources, capabilities, and substitutes (Peteraf & Bergen, 2003). The RBT assumes that organisational decisions to select and accumulate resources are based on economics of scale and are subjected to limited information, biases and prejudices, and causal ambiguity (Oliver, 1997). Causal ambiguity means that it is not known exactly how a resource leads to above-average performance for an organisation.

A resource is defined as anything that could be thought of as a strength for an organisation (Wernerfelt, 1984). Cave (1980) and Wang (2014)



referred to resources which include any tangible or intangible assets that are semi-permanently tied to the organisation. The researcher refers to those who are semi-permanently tied to organisations such as external consultants who are tasked to undertake ICT deployments. To Peteraf and Barney (2003), a key assumption in resource-based theory is that it focuses on an enterprise level, or business level, of analysis. The theory focuses on the resources and capabilities controlled by an organisation that underlie performance differences across organisations. The RBT did not initially focus on whether resources were static or changing. However, more recent research attention has focused on how resources change, adapt, and evolve over time. For example, research has examined how organisations integrate, build, and reconfigure their resources and capabilities in response to rapidly changing environments (Teece, Pisano, & Shuen, 1997; Teece, Peteraf & Leih, 2016).

| <b>Resources</b>   | <b>Core Competence</b>   | <b>Competitive Advantage</b>  |
|--|--|---|
| Technology   | Skill Sets   | Cost or Differentiation   |
| Design   | Knowledge  | Preemption  |
| Branding   | Talent   | Future Position   |
| Production   | Core Products  | Reputation  |
| Wernerfelt (1984);<br>Barney (1991, 1997, 2007);<br>Rumelt (1980, 1984, 1991,<br>1998);<br>Teece (1987, 1991, 1997);<br>Snell, Youndt & Wright (1996);<br>Chakraborty & Sharma (2007);<br>Hitt Xu & Carnes (2016);<br>Zhao & Fan (2018);<br>Gerhart & Feng (2021). | Petts (1997);<br>Prahalad & Hamel (1990,<br>1994, 2006);<br>Banerjee (2003);<br>Chen & Wu (2007);<br>Agha, Alrubaiee & Jamhour<br>(2012);<br>Azeem, Ahmed, Haider &<br>Sajjad (2021) | Porter (1980, 1985);<br>Lieberman & Montgomery<br>(1988);<br>Hamel & Prahalad (1994);<br>Davies, Chun, da Silva & Roper<br>(2003);<br>Greening & Turban (2000);<br>Hall (1993);<br>Hung (2006);<br>Barney(1991, 1994, 2002);<br>Saeidi, Sofian, Saeidi, Saeidi &<br>Saeidi (2015);<br>Davies (2016);<br>Sihite, Sule, Azis & Kaltum<br>(2016) |

Table 3 The RBT View of Resources

### **2.4.1. RBT on Resource Allocation**

Harrison, Hitt, Hoskisson & Ireland, (1991) and Barney, Ketchen, Wright, (2011, 2021) present evidence that suggests resource complementarity, not similarity, was associated with higher performance in acquisitions. The authors demonstrated that strategic alliances may be an attractive alternative for accessing complementary resources because the investment or long-term commitment is less than that required in acquisitions. Lockett and Thompson (2001) highlight from the economics literature support for this aspect of the RBT.

According to the RBT, strategy is the process of allocating an organisation's resources to fulfil the demands of the market while deterring competitors' capacity to successfully respond. As a result, the distribution of resources and competencies forms the fundamental foundation of corporate strategy (Collis & Montgomery, 2008).

### **2.4.2. RBT on Core Competence**

A core competence is a special set of technology, expertise and abilities that a business in a market possesses. Due to its intangible properties, it is difficult to understand and indistinguishable to outside observers. This benefits the possessing organisation as core competence cannot be copied easily by competitors (Petts, 1997; Galbreath, 2004).

Core competence is widely considered as an essential model for competitive strategy in competitive markets as this differentiates an organisation in its competitive position related to others. Competitive organisations always look for different approaches to competitive advantage and these organisations depend on their internal calibre and strengths to provide exceptional customer value, differentiating themselves from their competitors. What this means is that these

organisations hold a very high esteem on their “core competences” (Hamel & Prahalad, 2006). The core competence has to be a main factor for the formulation of strategies considered as a critical source of profitability. Scholars have acknowledged the importance of core competence by recommending core competence models to achieve competitive advantage (Petts, 1997; Hafeez et al., 2002; Agha, Alrubaiee & Jamhour, 2012; Sołoducho-Pelc & Sulich, 2020).

Core competence is developed by learning and experiencing on the success and failures of recombination of second-order competencies and the understanding of the successes or failures in suggesting knowledge resources (Banerjee, 2003). Some researchers define core competence as “the ability to operate efficiently within the business environment and to answer to challenges” (Chen et al., 2007, p.159) and associating core competence with organisational performance. Chen et al. (2007) highlight that the importance of core competence in the Traditional manufacturing (T-M) sector is much higher than in the High-Tech (H-T) manufacturing sector. Companies are different in terms of their own abilities to select, build, implement, and also to safeguard this core competence. The differences in these core competences may likely produce differences in corporate performances (Hamel & Prahalad, 1994) and has been developed to support and manage a more efficient identification and utilisation of the organisation's strength. There is also a presumption that core competencies are cumulative and change slower over time than products and markets (Gupta et al., 2009). Core competence is also derived from skills alignment and associating its objectives within the organisational systems and processes hence achieving optimum competences at the organisational level (Hamel & Prahalad, 1994, pp. 224-225; Peteraf, 1993; Teece, Pisano & Shuen, 1997; Teece, 2018; Hanelt, Bohnsack, Marz & Antunes Marante, 2021).

While the RBT suggests that strategic resources are indeed more complicated, in some areas, manufacturers that are skilled at product development and innovation, may not have the most creative people who are innovative and able to produce new ideas. As product development capabilities are entrenched in the manufacturers' systems and processes, ultimately the core competence resides with those who manage and implement these systems, but they are not independent from them. Core competencies, which are knowledge-based, are dependent on people and consist of human capital, social capital (i.e., internal/external relationships and exchanges), and organisational capital (i.e., processes, technologies, databases) (Snell, Youndt & Wright, 1996; Jiang & Messersmith, 2018; Hamadamin & Atan, 2019).

Core competence acts as a linkage between the organisation's resources and the current market needs. Though two organisations may have the same resources, employing these resources to meet market needs will make one organisation successful and the other not so.

This study seeks to gain an in-depth understanding on the development of ICT resources as a core competence and competitive advantage in the Malaysian manufacturing sector.

### **2.4.3. RBT on Competitive Advantage**

An organisation has a competitive advantage when it can create more economic value than its rivals (Barney & Hesterly, 2010). Porter's (1985) arguments reflect the strengths, weaknesses, opportunities, and threats (SWOT) of a framework for assessing competitive advantage. Competitive advantages are those factors that a firm needs to have in order to succeed in business (Analoui & Karami, 2003). There are three types of

competitive advantage; the cost of leadership; differentiation; and focus (Porter, 1985).

Fiol (2001), reevaluated the competitive advantage concept and concur that it is possible to achieve a competitive advantage based on any core competency, no matter how inimitable. In any competitive environment, the skills/resources of organisations and the way the organisation utilises them have to constantly change in order to produce continuously changing temporary advantages. As such, excellent results may be derived from the ability to terminate and reestablish specialised, inimitable resources or routines over time as mentioned in Eisenhardt and Martin (2000)'s work. However, the consequence of Eisenhardt and Martin's (2000) work is that there is a need to develop employees' adaptability with changing organisational identities and strategic focus.

Competitive strategy is an art of taking advantage of opportunities that are difficult to duplicate (Bertelè & Chiesa, 2001). Competitive strategy focuses on the differences between organisations rather than their common objectives and addresses not "how can this function be performed" but more on "how can we perform it better than, or at least instead of, our rivals?".

IBM's early success in the Personal Computer (PC) industry was considered generic and other firms soon copied their basic product concept. Once this happened, IBM had to try to either forge a strong competitive strategy in this area or seek a different type of competitive arena (Ma, 2000). IBM subsequently shifted to software solutions.

Competitive advantage can be classified under one of the following:

- Superior skills
- Superior resources
- Superior position

In answering the question of "what sustains this advantage, keeping competitors from imitating or replicating it?", organisations' skills can be a source of advantage if they are based on the organisation's history of learning-by-doing or learning-on-the-job and if they are entrenched in the coordinated behavior of a critical mass of their staff. However, skills that are based on trainings, and are able to be replicated by competitors are not considered as sources of sustained advantage (Rumelt, 1993, 1998).

In regards to the use of ICT as a source of competitive advantage, the consensus view that emerges is that it is not just ICT resources that translates to competitive advantage, but the way that they are used or integrated with other resources as highlighted by Nevo & Wade (2011) and Lumor et al. (2023).

#### **2.4.4. RBT on Manufacturing and Other Industries**

The use of RBT exploring the use of ICT in order to gain a competitive advantage was undertaken by a number of industries especially in manufacturing.

Okorie et. al (2023) highlighted that manufacturers are investigating the extent to which digital technology applications can aid their sustainability initiatives by assisting in the transformation of abstract sustainability goals, such as those of net-zero emissions and a circular economy (CE), into realistic and doable actions, accomplishments, and ultimately, a sustainable competitive edge. The manufacturers approached the study using RBT to evaluate the potential contribution of ICT to the development of a manufacturing firm's competitive advantage as well as the use of internal resources and core competencies to achieve net-zero manufacturing emissions and CE.

Ferreira et al (2023) applied the RBT with ICT as a component to assess the role on digital technology deployments has had in promoting social and environmental sustainability in European manufacturing multinational firms. The outcome of this study shows that digital technologies are crucial for manufacturing organisations to be competitive as well as environmentally and socially sustainable, contributing to sustainable development goals.

In another study correlating RBT, ICT resulting in superior business performance, Karim, Nahar and Demirbag (2022) stated that while the findings suggest a significant and beneficial relationship between the use of ICT and the organisation's business performance, decision-makers at the corporate level should focus not on how ICT is being invested alone, but how ICT investment can transform into performance improvements. Karim, Nahar and Demirbag (2022) defines business performance in the context of profitability, growth and other performance measures.

## **2.5. Information and Communication Technology**

### **2.5.1. Introduction**

The phrase ICT was coined in 1997's Stevenson Report to the United Kingdom government and promoted by the new National Curriculum documents for the UK in 2000 (Stevenson, 1997). The adoption of Information and Communications Technology (ICT) has transformed the ways in which production takes place especially in manufacturing, organising and scheduling activities, and processing data (Uhlenbruck et al., 2003).

ICT has changed business practices, particularly in how information is gathered and analysed and the development of decision making in finding

the most optimum approach for process reengineering (Akhavan et al., 2006; Attaran, 2004). Although ICT is considered as important in many organisations, several issues have yet to be addressed in the literature. Studies have either emphasised the theoretical discussion on factors of business process re-engineering (BPR) or utilise a case study approach that offers lessons on ICT implementation strategies based on a specific organisation's experience (Pan & Jang, 2008; Shin, 2006).

The annals of the ICT field are filled with technology and management innovations that impacted the functions of ICT in organisations and even resulted in the use of new acronyms and abbreviations that have become a part of everyday language. Technology waves such as CRM, SaaS, ERP, WWW, BI and now IoT were significant enough to create entirely new industries and companies that have changed the world (McNamee & Maples, 2011).

Other management innovations such as IRM (Information Risk Management), BPR (Business Process Reengineering), and EA (Enterprise Architecture) have demonstrated a new level of acceptance so much so that they have become part of the ICT tactics for information management and delivery. While new words and acronyms of technological words have seeped through to everyday language, the ICT field has also had its share of exciting system abbreviations and inflated expectations such as BI (Business Intelligence), KWS (Knowledge Work Systems), OAS (Office Automation Systems), IOS (Inter-Organisational Systems) and KMS (Knowledge Management Systems).

Most recent, IoT is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. In short, IoT is based on whatever that can be connected, will be connected (Georgios, Kerstin & Theofylaktos, 2019).



In the beginning, ICT was meant to refer to a system that provides management with the information needed for decision making and in turn, management is about organising, directing, planning and control to achieve key objectives (Murray, 2011). Therefore, the role of ICT serves to provide management support to all levels of managerial and in all functional areas of the organisation, with the information they need for organising, directing, planning and control. Whether an organisation's ICT operations are automated or manual it consists mainly of the following three subsystems presented in Table 4.

| No | Subsystems                           | Descriptions   |
|----|--------------------------------------|--|
| 1  | Transaction Processing Systems (TPS) | Systems to capture internal (as well as external) data about performance measures to be reported to corresponding managers   |
| 2  | Management Reporting Systems (MRS)   | Reporting systems to provide key performance indicators for each manager at all managerial levels and in all functional areas; and   |
| 3  | Decision Support Systems (DSS)       | Systems to help with root cause analysis, problem solving, planning, and decision making to effect changes to get back on course when a performance measure is not being met |
| 4  | Enterprise Resource Planning         | Enterprise Resource Planning (ERP) system is an enterprise information system designed to integrate and optimize the business processes and transactions in a corporation.   |

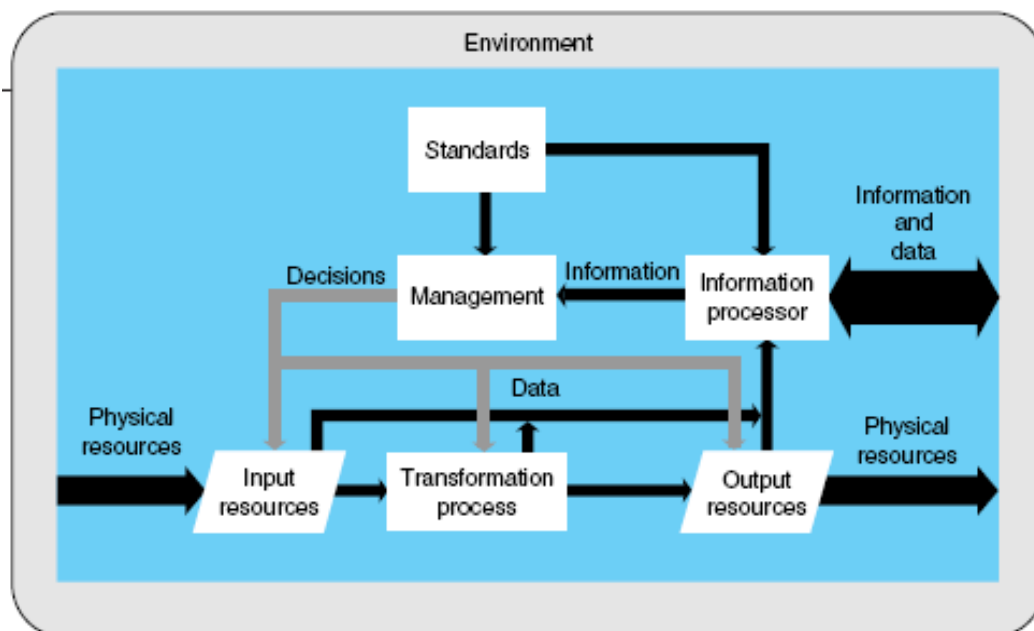
Table 4 ICT Subsystems

The interpretation of ICT has over time become somewhat fuzzy by the hype cycle (O'Leary, 2008) as it relates to new systems. It is only over time that system abbreviations and terminologies show their relevance and that the systems are either encompassed in one of the 3 subsystems above or span one or more of them. For example, Executive Information System (EIS) is now renamed as Business Intelligence (BI) and is a part of MRS, KMS is a sub-set of DSS, while ERP spans across all 3 types of subsystems.

Given that an organisation's ICT system is to support managers of the organisation and at all managerial levels and all functional areas, for their management needs, it is fitting to consider the place of ICT subsystem within a larger organisational system.

Figure 7 presents a general systems model of the organisation (McLeod & Schell, 2007) as a feedback-controlled system. Any organisation can be modeled as a chain consisting of input, process, and output subsystems whose main function is to transform raw materials into goods or services. ICT is regarded as a primary enabler of modern feedback – knowledge production and processing control systems.

This production chain, however, is controlled through a feedback chain consisting of the goal subsystem, the sensor subsystem whose role is to "sense" how the goal is being met, and the management subsystem whose role is to bring about change to ensure that goals are in fact met.



Source: Management Information Systems, 10/e, (McLeod & Schell, 2007)

Figure 7 The General System Model of the Organisation

Many studies investigate factors on the adoption of ICT and provide recommendations for organisations to take advantage of it and to successfully implement it (Al-Qirim, 2007; Kang et al., 2008; Pan & Jang, 2008, Srivastava et al. 2022). These studies have however, limitations when assessing the organisations underlying objectives specifically from a RBT point of view.

The current digital era is characterised by rapid progress, expansion, innovation, and digital disruption. Malaysia's manufacturing companies needs to adapt to the new digital world in order to be competitive. The process of digital transformation involves more than introducing new technology, making tool purchases, or modernizing legacy systems, it must adapt and anticipate to business changes and foster innovation (Albukhitan, 2020). The digital transformation strategy aids the manufacturing executives in addressing issues for the manufacturing organisations, including the present level of digitalisation, the ideal state for the future, and the strategy to achieve competitive advantage. The digital transformation strategy also focuses on the consideration of utilizing internal and external resources in the development and implementation of the digital transformation strategy.

In general practice, the implementing resources are from an internal ICT team and may be assisted by external consultants. Malaysia's manufacturing enterprises tend to operate with business units or departments being responsible for their own roles. The normal conclusion to implementation of technology falls under the duty of the internal ICT team. Other business units involved in the project normally play a lesser role focusing on the functionalities of the new system in-line with their departments' tasks. Any deviation on how the technology function operate versus how the department's processes operate raises a number of queries which may lead to putting the onus on the ICT team should any problems arise from the differences.

### **2.5.2. The impact of ICT on Business**

The adoption of ICT in organisations relating to improving customer value is considered as one of the most critical opportunities of the application of ICT. ICT has not only closely related to processes related to manufacturing, sales, inventory, etc., but is also becoming a recognised technology in the organisation's decision making, forecasting and budgeting process. Although there may be issues related to efficiencies of ICT in terms of manufacturing and services, the overall significance of ICT is recognised when new enterprises and activity spaces are being established (Bailey, 1998; Dinerstein, Einav, Levin & Sundaresan, 2018; Lee & Musolff, 2021).

However, the practice of the strategic allocation budget in advance for ICT enhancement is rare and undisclosed by businesses. This would point to Malaysian manufacturing businesses being predominantly reactive and finding rather than allocating fundings after it becomes apparent that ICT enhancement is needed.

The use of ICT will continue to evolve in work related matters, in how information is communicated and in the ways of the organisation's business activities. It is anticipated that ICT technology may; eliminate existing limits between economic relations and interaction, and create new ways of communications and new types of market relations; provide new opportunities to organise operations and continuously expand spaces of interaction. It is important to state that the implementation of ICT solutions are associated with internal and external factors while evaluating the impact of ICT on businesses. As Adelaar (2000) states, the implementation ICT does not necessarily refer to just the acquisition of

software but also to consider the impact on changing of policies and processes in the organisations and that these organisations need to prepare to embrace change since the implementation requires internal transformations.

### **2.5.3. ICT Strategy**

An effective corporate strategy with an embedded ICT strategy is a strategy that seeks to recognise the technologies and capabilities to leverage their value. This is achieved by developing its ICT capabilities into a core-competence that translates into competitive advantage. It covers facets of technology management, including cost management, human capital management, hardware and software management, vendor management and risk management (Lebeaux, 2017).

ICT strategic goals mirror business projects or business alignment and take into consideration the needs of key stakeholders including employees, customers and business partners.

Most corporate strategy with embedded IT strategy contains key elements such as:

- A high-level overview of the IT department that covers its mission, core values, objectives and approaches to accomplishing its goals;
- Current budgets and spending forecasts for a multiyear timeline usually between 3 to 5 years;
- An outline of current and future IT projects and initiatives with timelines and milestones;
- A catalogue of existing enterprise architecture; IT department capabilities and capacities; and future resources with details on infrastructure, staff skill sets and other necessary resources;

- An analysis of the current IT's strengths and weaknesses including IT staff's technical skill sets and non IT-staff's knowledge on the application of IT;
- A list of the internal and external forces (such as market and industry trends) that shape current technology requirements and innovations as well as the future forces expected to shape IT; and
- A forecast of the potential opportunities and vulnerabilities that will necessitate technology responses to best position the organisation to support its business plans and strategies.

#### **2.5.4. ICT and Competitive Advantage**

Pavlou and Sawy (2006) and Kountios, Konstantinidis and Antoniadis (2023) observed that the impact of ICT on competitive advantage was facilitated by explicit organisational dynamic capabilities such as

- i. coordination of competence;
- ii. collective mindsets;
- iii. ability to recognise the value of new information, assimilate it, and applying it commercially; and
- iv. approach to business that prioritises the identification of customers' needs and desires, developing products and services that satisfy customers.

These four dimensions are further improved through the use of digitalisation (Pavlou, 2004).

ICT and competitive advantage captures the ability to utilise ICT to enable organisations to adapt faster to external changes than their competitors, hence, providing them with a sustained competitive advantage (Jared et al., 2015). Therefore, ICT core competence directly associated with achieving or maintaining the organisation's competitive advantage

(Nguyen, 2010; Teece & Leih, 2016). Organisations' capabilities are defined as the ability to carry out tasks and activities in order to achieve corporate objectives (Chibelushi & Trigg, 2012; Escandón-Barbosa et al., 2016; Shafei & Zohdi, 2014) which together form a core competence.

The utilisation of digital systems in organisations discusses highly digitised work environments with processes and knowledge systems that enable the entire infrastructure and changes an organisation's ability to unveil new and often competitive initiatives (Sambamurthy et al., 2003; Vial, 2021). A deep knowledge in digitisation supports changes in external activities, whereas a deep knowledge in digitalised processes supports the basis for response actions (Overby et al., 2006). The (Sambamurthy et al., 2003; Vial, 2021) model offers different views into ICT's value adding role where facilitating business related strategy has the capacity to launch new and competitive initiatives. The model contributes to the understanding of the tri-partite of the three capabilities: the use of digital options, flexibility and entrepreneurial awareness. The concept also provides a benchmark to evaluate the value of ICT in three ways:

1. Organisations can assess the returns of ICT investments by the value of the digital options (ICT's support in organisation's processes and knowledge-based systems).
2. A view of a flexible infrastructure set-up that proposes a measurement of the degree of IT-enabled response in organisational changes.
3. The measurement in competitive actions changes (Sambamurthy et al., 2003).

Past literature states that digitalisation enhances organisations' capability and capacity to manage business to adapt to the market. This shows the importance of strategic related processes but what it does not look into is how ICT core competence compliments the changes in the business to adapt to the market. As organisations equip with different technologies,

the technologies needs to be innovative to complement the business changes.

Research on how ICT supports organisational needs to react to market changes was hypothesised by (Fink & Neumann, 2007; Tallon et al., 2019) in terms of an agile IT-enabled organisation which consist of three parts:

- i. agile IT-dependent information;
- ii. agile IT dependent strategies; and
- iii. agile IT-dependent systems.

They conclude that agility is the ability to respond efficiently and effectively to emerging market opportunities.

Fink and Neumann (2007) and Masa'deh (2013) were able to assess several alternative models in parallel, and validated their findings by using Structural Equation Modelling (SEM) techniques. They confirm the positive effects of ICT personnel capabilities on IT infrastructure capabilities as well as positive impacts of IT infrastructure capabilities on three parts.

While an agile ICT-dependent systems has positive effects on ICT-dependent information agility, it seems to put a strain on the quality of information as it tries to adjust ICT swiftly and efficiently. While both an agile ICT-dependent system and agile ICT-dependent information has positive effects on agile ICT-dependent strategies, whenever there are changes in the business environment, organisations needs to adapt the information systems and information resources according to new information needs (Fink & Neumann, 2007; Masa'deh, 2013).

Fink and Neumann (2007) and Paschke and Molla's (2011) study evidences that technical and behavioral capabilities of IT core competence are positively associated with broader corporate capabilities. In turn, infrastructure capabilities affect strategic agility directly and



indirectly via an IT-dependent system and information agility (Tallon, Queiroz, Coltman & Sharma, 2019).

As ICT is part of an organisation's strategic resource, it is considered as a means for functional integration and an opportunity to improve it as a core competence and therefore the organisation's competitiveness.

Porter's generic strategies illustrate how organisations can use ICT to achieve cost leadership, or support a differentiation strategy, or support a niche strategy (Boddy et al., 2005; Fiore et al., 2018).

### **2.5.5. The purpose of ICT Projects**

The benefits of ICT applied to businesses are not always apparent (Kling, 1996, p. 709; Smith, Dinev & Xu, 2011). Attewell (1996) and Lee, Chu and Tseng (2011) highlighted that the productivity gains initiated by ICT do not necessarily materialise. Lee, Chu and Tseng (2011) further indicate that even if there are gains, high expenditure levels and the efforts taken to implement ICT offset the overall benefits for business.

ICT performance studies can be categorised from two perspectives:

- **Industrial Economics.**

Numerous economists have tried looking into the logic of ICT productivity from an industrial economics perspective. Researchers such as Hempell et al. (2004); Premkumar and Roberts (1999); Sarkar and Singh (2006); Shin (2006) utilise the structure-conduct-performance framework to emphasise the economic impacts of structure, organisation size, year of establishment, years of ICT implementation, etc. with the assumption that ICT has direct impact on productivity. Areas such as staff motivation and decision-making within ICT, and organisational reform processes are not considered in this economic rationality perspective.

- **Organisation Management.**

In terms of the relationship between ICT and the organisation's management, Nah et al. (2003) find that top management support, project champions, Enterprise Resource Planning (ERP) teams, project management and change management programs as well as organisational culture are critical to the success of an ERP implementation. Kang et al. (2008) discovered that normalisation and centralisation-based integration, characterised by clear objectives, coordination and control of activities of different departments, is essential for successful ERP implementation. ERP as an ICT function is critical from a strategy operationalisation perspective. Ramadhan, Handaru and Pahala (2023) finds that ERP and other software such as Supply Chain Management (SCM) contribute to the organisation's competitive advantage.

In the adoption of e-commerce, Wymer and Regan's (2005) investigations show that the elements of innovativeness, need, competitive pressure, value of e-commerce, pressure from the government, reliability of e-commerce, and prior experience of management has positive impact. Al-Qirim (2007) research has also shown positive correlation between organisational readiness and variables such as cost/financial and technical resources, industry competition, and government pressure on e-commerce adoption in small-to medium-sized enterprises. Henderson and Venkatraman (1991, 1993) developed models and frameworks to narrow the gap between business and ICT (e.g., the strategic alignment model by (Henderson & Venkatraman, 1991, 1993; Buckby et al., 2008) the strategic alignment framework by (Luftman et al., 1993; Avison, Jones, Powell & Wilson, 2004), and the four-layer model of process, information, services, and technology integration (Strandl, 2006; Lemańska-Majdzik & Okręglicka, 2015).

While researchers from the perspective of industrial economics investigate the impact of ICT in terms of revenue, costs, and return on investment

(ROI), researchers from the view of organisation management evaluate the impact of ICT from its values and benefits.

#### **2.5.6. ICT ERP Deployment**

In the current era of globalisation, where information is available across different channels, the more complicated the logistics of information, the greater the requirement for tools for organisations to manage and organise the information taken from their activities effectively.

Information Systems are considered important for a competitive organisation where one of the highly utilised ICT systems in research and business support is the Enterprise Resource Planning System (ERP).

ERP systems was extended from the original material requirements planning (MRP) and manufacturing resource planning (MRP-II) concept, developed in the 1960-1970s in which technology is used to coordinate the activities between the production control, inventory and finance departments (Markus et al., 2000). The scope of the system was further enlarged to include human resource, sales, distribution and supply network chain. ERP then evolved to become an enterprise-wide information system that utilises database technology to control and integrate all the information related to an organisation's business including customer, supplier, product, employees, and financial information. To other organisations such as government agencies that adopted ERP systems, almost of all the business transactions such as inventory management, customer order management, production planning, distribution, accounting, human resource management are keyed-in, processed, monitored and reported (Davenport, 1998; Umble & Umble, 2002; Gefen & Ragowsky, 2005; Raymond et al., 2006).

While ERP systems have evolved and implemented globally since the 1970s, there are still many published reports on the complications in

implementing ERP (Tsai et al., 2005); Lui & Chan, 2008; Fernandez et al., 2018) and usually the problems relate to issues of over budgeting and delays in the implementation timeline. Organisations also reported that ERP implementations failed to grasp the organisation’s goals and expectations. According to (Chakraborty & Sharma, 2007; Saade et al., 2017), 90 percent of all initiated ERP projects failed from the perspective of project management and in the worst scenarios, many organisations abandoned their implementation.

Previous research (Barker & Frolick, 2003) illustrates that complexity in ERP implementation does occur regardless of the ICT investment in the ERP system and this means that no matter how much was spent on investing in ERP system, organisations will be bound to face difficulties during the implementation phase. Compared to other information systems, the major problems of ERP implementation are not technologically related issues such as technological complexity, compatibility or standardisation but mainly on organisation and human related issues such as staff’s resistance to change, organisational culture, incompatible business processes, project mismanagement, and lack of support from top management (Khaparde, 2012).

A lot of research has been done about the outcome of ERP implementation (Gulledge, 2006; Kiran & Reddy, 2019). Huang et al. (2004) assessed risks in ERP projects by interviewing members of the Chinese Enterprise Resource Planning Society and prioritised the top ten risk factors based on factor analysis (Table 5). Based on the results, factors such as senior management commitment to the project, communication with users, training and user support present the key risks.

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| <b>Priority</b> | <b>Description</b> |
|-----------------|--------------------|
|-----------------|--------------------|

---

|           |  |
|-----------|--|
| <b>1</b>  | Lack of senior manager commitment                  |
| <b>2</b>  | Ineffective communications with users              |
| <b>3</b>  | Insufficient training of end-users                 |
| <b>4</b>  | Failure to get users buy-in and support            |
| <b>5</b>  | Lack of effective project management methodology   |
| <b>6</b>  | Attempting to build bridges to legacy applications |
| <b>7</b>  | Conflicts between user departments                 |
| <b>8</b>  | The composition of project team members            |
| <b>9</b>  | Failure to redesign business process               |
| <b>10</b> | Unclear/misunderstanding change requirements       |

Source: Huang et al. (2004)

Table 5 Top ten risk factors of ERP risk

Planning actions for each risk factor require the management of change. Aladwani (2001); Denuwara (2014) suggested a three-step process-oriented change management approach; knowledge formulation; strategy implementation; and status evaluation.

From the technical point of view, the key choice in ERP implementation is to find an optimal strategy to balance between customisation of the ERP system versus changing the organisational procedures within the company (Huang et al., 2008; Lui & Chan, 2008). According to Xie, Allen and Ali (2022), the critical success factor when implementing ERP and focusing on resources leads to a higher successful implementation rate.

Based on Table 5, in order to support any organisation's competitive advantage, the listed risks will potentially damage the reputation of the organisation. From the organisational point of view, it is to manage change and develop the business processes to overcome risks and convert the investment into advantage. These two views are merged in many deployment projects. Despite extensive use of software vendors and business process consultants, the impact of their role has not been studied

widely. This study will tentatively respond to this gap.

**2.5.7. Conceptual Framework**

The previous sections defined and described the key concepts of the study as they relate to the research problem. These are derived from the main problem of the study that corporate strategy focuses on investments in core competences that result in competitive advantage but little is known on this relationship in the Malaysian manufacturing sector. Figure 8 illustrate the conceptual model adopted to guide the study.

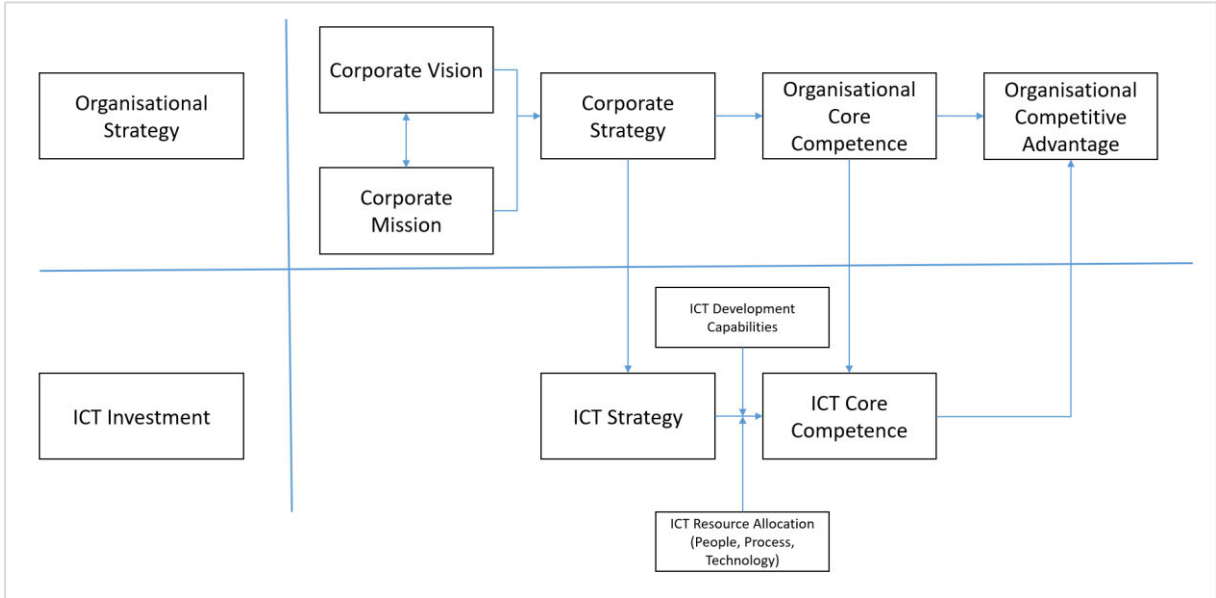


Figure 8 The Conceptual Framework

The conceptual framework illustrates the conceptual, disciplinary and dimensional interactions related to the relation between ICT strategic investments originating from corporate strategy with the intent of developing core competence. It has been developed by the researcher to help understand the interactions associated with the research problem, available literature on corporate strategy related to the deployment of ICT capabilities. Based on the literature reviewed, the conceptual framework

further specifies the variables and their interaction as related between ICT investments and achieving competitive advantage.

As mentioned in Section 1.5, given the stated research problems and purpose of the study, the following research questions will inform the research methodology:

- RQ1. How does ICT's Resource allocation (People, Process and Technology) moderate the relationship between ICT strategy and the development of ICT core competence in the Malaysian manufacturing firms?;
- RQ2. What are the deployment capabilities related to ICT Project deployments in Malaysian manufacturing firms?;
- RQ3. What are the dimensions of ICT core competence?; and
- RQ4. What is the perceived competitive advantage associated with ICT core competence in the Malaysian manufacturing firms?

The next section, Chapter 3 on Research Methodology outlines the approach taken for this work-based research i.e.:

- i. the research questions;
- ii. data gathering techniques;
- iii. analysis methodology; and
- iv. ethical considerations.

# CHAPTER 3: RESEARCH METHODOLOGY

## 3.1. Introduction

The term "Research" is defined as "a creative and systematic work undertaken to increase the stock of knowledge" (OECD, 2015, n.p.). Research involves the collection, organisation, and analysis of information to increase understanding of a topic, in this case the work-based research study. The objective of the research is to produce new knowledge or deepen understanding of a topic or issue. The principle aim of this study is to conduct applied research in order to make a knowledge contribution to practice.

This chapter is divided into three sections that detail the methodological approach adopted by the study.

- The first section provides re-iteration of the research questions, followed by the paradigm adopted to meet the aim of the study, explanation and justification of the research design and strategy of inquiry;
- The second section presents the research design and phases of the research; and
- The third section presents ethical considerations.

The objectives of this chapter are to:

- Outline the methodological basis for this research in investigating the relationship between ICT strategic investments originating from corporate strategy with the intent of developing core competence;
- Delineate and provide an outline of each phase applied to this research; and



- Outline ethical considerations relating to the research process, participants of the survey and interviews, and UniSQ throughout the research process.

### **3.2. Research Paradigm**

In determining an appropriate research paradigm, the pragmatic knowledge claim was considered as most appropriate in responding to the research questions. The research questions were presented at the conclusion of the previous chapter. The perspective to view the questions in light of the anticipated contributions of the study is a critical starting point in considering the study methodology. This is referred to as the research paradigm.

Pragmatism explores the relationship between thought and action. The purpose of thought is to predict, take action and solve problems in line with a body of knowledge, experiences and exploration. With pragmatism, researchers strongly relate pragmatism with mixed methodology (Cersosimo, 2022). Pragmatism looks into handling everyday life problems and its inquiry reorients the focus of research to working with a particular industry. The approach in pragmatism is about working with publics around their problems through community-based inquiry and, in the process, further building the collective capacity to act (Lake & Wills, 2020).

The application of pragmatism to mixed-method designs connects the questions and the issues of the work-based research study. The debate on mixed methods suggests a process of integration between qualitative and quantitative data.

Mixed-methods (quantitative and qualitative) investigations have significant subjective implications. This subjectivity is inherent in the

research design, the tools for data collection, and the management of research interpretation. In other words, there are no data which do not present a distinct subjectivity. This confirms that the use of a variety of methods to ensure cross-verification and validity is an effective validation procedure for this work-based research study (Cersosimo, 2022).

Due to the paucity of the research connecting strategy, ICT core competence and competitive advantage in the Malaysian manufacturing context, this study is exploratory. Exploratory research, explores the research questions and is not intended to provide final and definite explanations to existing problems. In this case, to gain deeper and original practice insights as to the research problems.

Conducted in order to determine descriptions of the problems, exploratory research helps us to have a better understanding of the problem.

Saunders et al. (2007) highlighted that when conducting exploratory research, the researcher ought to be willing to change his direction as a result of revelation of new data and new insights.

Exploratory research design is not aimed at providing final and conclusive answers to the research questions, but explores the research topic with varying levels of depth. Moreover, it has to be noted that “exploratory research is the initial research, which forms the basis of more conclusive research.

Creswell (2009) states that researchers start a project with certain assumptions or knowledge claims. These assumptions guide how researchers explore their research questions and how they learn while undertaking the research. According to Mackenzie and Knipe (2006, p.2), “It is the choice of paradigm that sets down the intent, motivation, and expectations for the research”. Before a method is chosen, the basic belief system or worldview that guides the researcher needs to be identified (Guba & Lincoln, 1994).

Though the philosophical discussion regarding research paradigms and knowledge claims is of much depth and breadth, Creswell (2009) has narrowed the discussion to four dominant worldviews: post positivism, constructivism, advocacy/participatory, and pragmatism.

While some researchers are bound to adopting post positivism, constructivism, or advocacy/participatory paradigms for their studies, the pragmatist researcher takes an action-oriented approach that suggests the research problem is the central focus of paradigm adoption (Mackenzie & Knipe, 2006). Pragmatists seek to understand the problem and pose possible solutions or enhancements based on a deep understanding of the problem or situation (Creswell, 2009).

According to Johnson and Onwuegbuzie (2004), the philosophical implications of pragmatism attempt to find a middle ground and a workable solution between subjectivism and objectivism, focusing on the more moderate and common-sense versions of these concepts based on how well they work in solving problems. According to Creswell (2009), pragmatism opens the doors to solving real-world problems using multiple methods, different worldviews, and different assumptions.

The aim of the study is to develop a deeper understanding of the relationship between corporate strategy in deploying ICT capabilities and resources and determine the extent to which may result in competitive advantage in the Malaysian manufacturing scene. As such a pragmatism paradigm is justified and suggests a mixed-method approach which is complementarity (Creswell & Plano Clark, 2011; Greene, Caracelli & Graham, 1989).

### 3.3. Research Design

The research design requires a pre-defined approach to answer the research questions in order to achieve the aims of this work-based research study. The following sections in this chapter outline the research design and the methodology adopted for this investigation on ICT deployment (resource allocation) and ICT core competence.

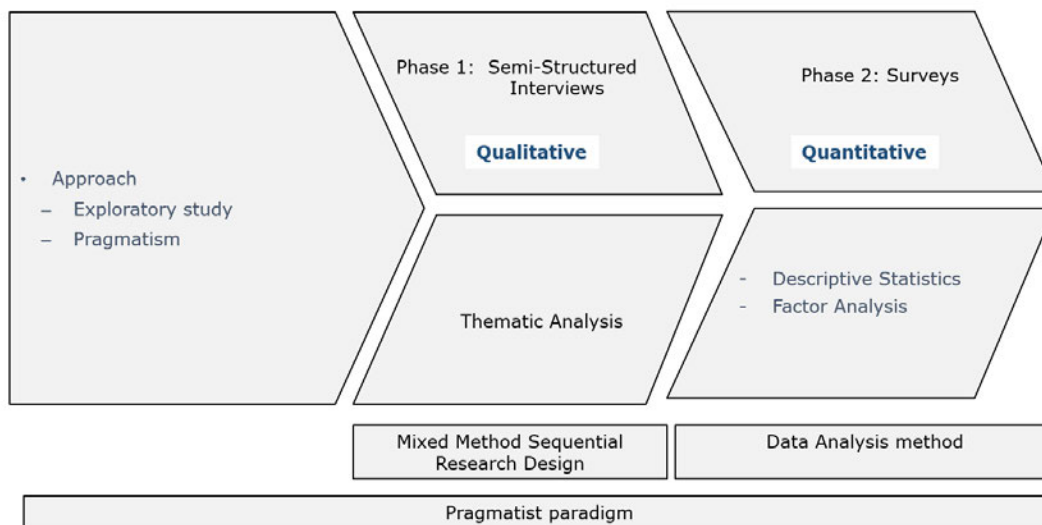


Figure 9 Research Design and Methodology

#### 3.3.1. Phases of Research

The approach for this investigation into strategy, ICT core competence and gaining competitive advantage is a sequential, exploratory mixed-method (quantitative and qualitative) study. The research methodology used for this study consisted of two phases following the literature review to achieve the objectives of this research.

A mixed methods approach was chosen to offset of weaknesses in each method (quantitative and qualitative) standing alone. This is of

importance in pragmatism. The phase 1 data collection is based on open ended interviews to identify variables, terminology and perspectives across different manufacturing industries. These perspectives are then applied to the development of the quantitative instrument for the second phase of data collection. The phase 1 data collection (qualitative methods) do not allow for as large a sample size as quantitative methods, limiting its generalisability. The deeper insights gathered through qualitative measures combined with the broader data gathered from the quantitative data collection measures provides a fuller analysis of the problem and increases generalisability.

The instrument in phase 2 data collection is augmented from phase 1 data collection.

### **3.3.2. Qualitative Primary: Semi-structured interview**

The objective of the phase 1 of the research design was to collect data from semi-structured interviews in order to develop a deeper understanding of the phenomenon. With a qualitative first phase, the interview method was deemed suitable. This was due to the reason of its ability to explore complex issues.

Interviews are particularly useful when:

- i. the research objectives centre on understanding experiences, opinions, attitudes, values and processes;
- ii. there is insufficient known about the subject to be able to draft a questionnaire; and
- iii. the potential participants might be more receptive to an interview than other data gathering approaches (Rowley, 2012, p. 262).

For phase 1, semi-structured interviews were deemed suitable to be answered by subject matter experts on RQ1 as the subject matter experts

were able to understand and make sense on the research topic and their ability to garner subjective situational insights.

The design and conduct of interviews and ensuring the validity of data and utility of findings are critical to the success of research. Potential biases that may impact the data collection process were sought, particularly in respect to the design of the data collecting questions and how responses from participants were solicited given their closeness to the researcher. In order to counteract this, academic supervisors were consulted before the interviews to make sure the semi-structured interview protocol was appropriate for the desired research.

Both interviewer and participant's bias were taken into consideration when conducting the interview by paying close attention to how each question was worded and presented, keeping an eye on body language, and clarifying replies to ensure proper interpretation. The interviews were allowed to evolve and notes kept by the researcher of key points

### **3.3.3. *Selecting the Participants.***

The selection of suitable participants is crucial for the research to be compelling. Being a mixed-method study, the design of the sampling strategy is an important consideration.

A purposive sample approach was employed as the research study hoped to provide fresh insights, on the assumption that the chosen subject experts would be knowledgeable about the research topic and would offer rich and deep information on the research subject.

Participants identified and the engagement of participants for the interview process was around four key criteria:

- i. variety of viewpoints;

- ii. expertise;
- iii. availability; and
- iv. industry specific knowledge

The degree to which the sample group is representative of the population of interest depends on these criteria.

The organisations which this study is focused on are manufacturing companies located in Malaysia. The companies are managed by business entrepreneurs, Chief Executive Officers (CEOs), Managing Directors and Senior Management in the upper echelon of its structure. During the qualitative stage of the research, participants from the upper echelon were invited to engage in the informal, qualitative part of the study where the research questions were raised. Following questions were also raised, if required, to further understand the background related to the research questions.

The participants met the following key criteria to ensure expert knowledge is obtained:

1. Knowledge and experience with on ICT projects and core competence;
2. Capacity and willingness to participate;
3. Sufficient time to participate; and
4. Effective communication skills based on a combination of local dialects, languages and idioms used mainly in daily business expressions in Malaysia.

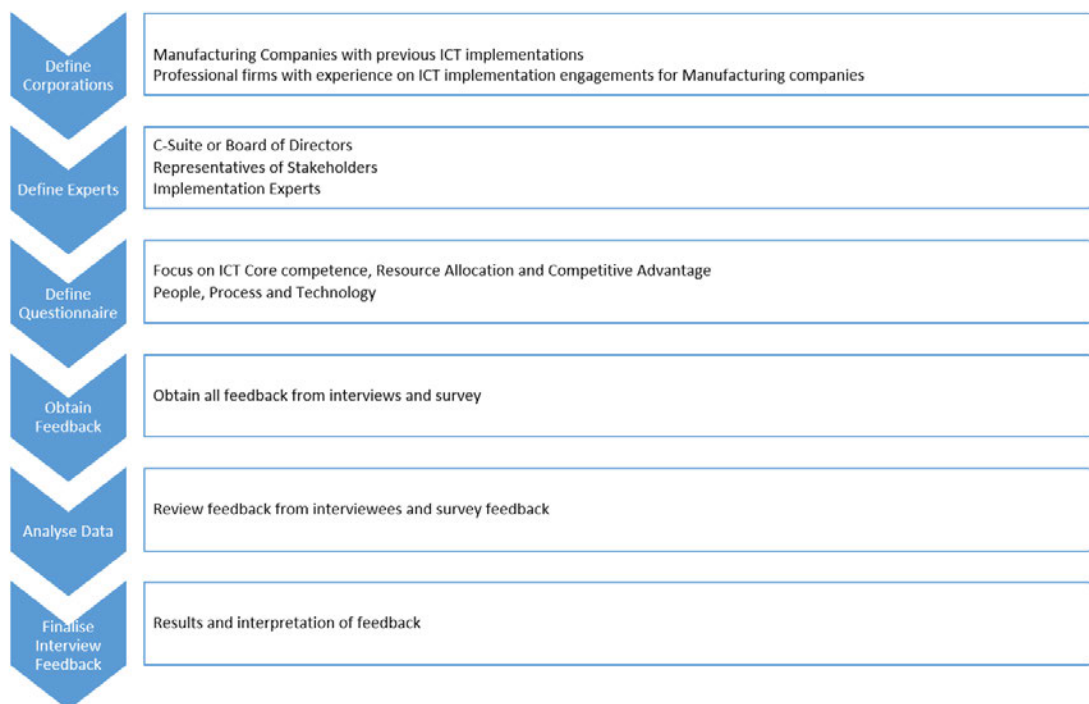
Over and on top of the criteria stated, the participants selected are based on demonstrated expertise in the field of ICT management, deployments and executions in the manufacturing organisations. The participants met at least one of the following recruitment criteria:

1. Top executives of an organisation with participation in formulating corporate strategies;
2. Top executives who understand their businesses sufficiently well;

3. Involved in ICT project management and deployments related to corporate strategies; and
4. Involved in assessing the outcome of the ICT deployment.

As such, the experts may be employees or employers or subject matter experts with relevant commentary on ICT strategy, although with limited knowledge in their respective organisations. Given the narrow field of expertise, the group will be a homogenous sample.

Figure 10 shows the structure of how data will be sourced and the steps in ensuring transparency and accuracy.



*Figure 10 Data Sources and Structure of Data Capturing*

These factors were addressed by clearly defining the inclusion criteria, recruiting seven male participants from manufacturing sector with electronics (1), food-based industry (2), oleochemical (1), garment manufacturing (1), tobacco (1) and tiles (1). The purposive sampling approach was used because it has been established as an acceptable method when identifying cases for interview research. The interviews aimed to yield insight and information until a level of “theoretical



saturation" has been achieved where further interviewing no longer provided any new information (Collins, 2015).

The criteria used to select appropriate cases and delimit the sample group was based on participants experience at a senior management level (C-suite, Entrepreneurs or General Managers) responsible for corporate strategy and ICT strategy working in private sector organisations.

A personal invitation through telephone calls was communicated to the seven prospective participants with an explanation of the research topic. The purpose of the call was to explain the aim of the study and outline what was required for participation in the study (anonymity, commitment, expected risks and benefits, outcomes, etc.). To enhance the likelihood of participation, subject matter experts had the discretion of nominating the time and location for the interview given these have been identified as potential barriers in conducting such research. The semi-structured interview process was administered by the researcher through a face-to-face as it has the ability to yield a higher participation rate. The interviews were conducted between 17<sup>th</sup> April and 30<sup>th</sup> June 2018 at a location nominated by each interviewee for a time ranging between 30 and 45 minutes.

Consistent with the guidance provided by Rowley (2012), four key questions/themes were used to guide each interview (refer to Appendix A). At the start of each interview, the context was reviewed to ensure each subject matter expert was clear on the focus of the study, any questions were clarified before asking the questions.

Starting with a broad questioning approach, RQ1 explored the area of ICT strategy where ICT resource allocation moderates core competence between corporate ICT strategy and the development of competitive advantage ; RQ2 explored the ICT capabilities related to the ICT deployments; RQ3 looks at what are participants view on the dimension of ICT core competence contributing to competitive advantage; RQ4 looks at

the participants view on what their insights are on how core competence can contribute to competitive advantage. All seven (100%) subject matter experts invited to participate in the study completed the interview phase thus providing enough "rich information" for analysis and theory building.

#### **3.3.4. Data analysis.**

A substantial amount of information was generated upon completion of the interview phase. As a pragmatic mixed method study the qualitative data analysis phase aimed to draw out meaning from the narrative by interpretation of the individual accounts and insights, perspective and themes.

Following the interview phase, the next step was to organise and analyse the data. Key area of this analysis included: organising and getting to understand the data; classifying and coding; interpreting and presenting the findings from the data.

In the manual content analysis phase, each audio interview's meticulous verbatim transcription was stored in an Excel™ database and verified for correctness against the original recording. Kuckartz (2014b, p. 37) states that "content analysis stands or falls by its categories [...] since the categories contain the substance of the investigation, content analysis can be no better than its system of categories". The Excel™ database used for guiding the analysis was structured following the profile matrix outlined by Kuckartz (2014a) with the vertical columns representing each participant (1-7) and the horizontal categories representing each of the key constructs covered in the interview. It is essential to properly define and delineate each construct that the text should be placed in, and therefore is a significant phase in the analysis. This made it possible to analyse each of the relevant constructs in a specific situation and allow themes to emerge (Kuckartz, 2014b). The constructs for classifying data against were corporate strategy, ICT strategy, ICT resource allocation, ICT core

competence and competitive advantage. In order to understand the insights, a block of text containing the transcribed data was first examined and then analysed. A de-identified summary report of emerging themes was generated when the analysis was complete, in accordance with the steps suggested by Braun and Clarke (2006). The analysis was sent to each participant in October 2018 in accordance with ethical approval standards.

In summary, the overall aim of the qualitative interview phase was to explore and gain a deeper understanding of the variables, attributes and definitions outlined in the conceptual framework in the Malaysian manufacturing context. In addition to informing the design of the quantitative survey to be used in the second phase of the research design.

### ***3.3.5. Quantitative Secondary: Middle, lower management and executive engagement survey***

The first phase's semi-structured interview results allowed for gaining a deeper understanding of the relationship between business strategy and integrated ICT strategy. It also informed the creation of a survey instrument used in the second phase. The second phase's objective was to validate the conceptual framework presented in section 2.5.7 and refined as a result of the first phase. Surveys are a commonly used method in research to collect quantitative data from a representative sample. This data is then analysed through statistical means to draw inferences from the data. The length of the survey, the time allotted for completion, the costs related to administering the survey, the accessibility of the respondents, data entry, and analysis are just a few of the many factors that influence how surveys are conducted in practice and the number of responses that may be returned (Saunders, Thornhill & Lewis, 2007).

### **3.3.6. Survey design**

The second phase included a survey to validate ICT strategy, core competence and competitive advantage construct and examine the associations between the conceptual framework variables. Additional considerations supporting the reasoning for this strategy included the work-based study's short duration, descriptive character, size and scope of the study and surveys' ability to be administered once, which circumvented some of the limitations of doing longitudinal studies in business research (Saunders, Lewis & Thornhill, 2007). As such, the study was cross-sectional and used to evaluate potential links between variables by "systematically assessing the same set of variables for all elements (or subset of elements) in a population" when control over the variables is neither necessary or feasible (Bethlehem, 1999, p. 110).

Online or web-based surveying has various benefits for the researcher, including cost and time effectiveness, reaching geographically scattered participants, enabling access to specialised groups and simple data processing. It was required to create a survey instrument for evaluating each of the factors and determining whether the framework was appropriate by putting it in front of a representative sample group because the quantitative phase of this work-based research (Creswell, 2014). The design of a survey is extremely significant as its validity and reliability affect final research findings (O'Gorman & MacIntosh, 2015).

This work-based research study was designed specifically for this study as the variables of interest had not been examined as a conceptual framework in the Malaysian manufacturing sector.

### **3.3.7. Survey sampling**

For this survey, it was decided that a non-probability technique for sampling was the best choice. As a judgment-based alternative that "will provide findings that can be transferred to other research", non-

probabilistic sampling has been proven to be a viable option (Andres, 2012, p. 15). However, the major limitation of this method is the inability to determine sampling error and biases in the study. The convenience sampling technique used to choose participants for the survey fits well with the non-probability approach.

To ensure a sample representative of the population (Malaysian manufacturing middle managers and executive), criteria were established to select appropriate participants and delimit the sample group based on them having experience at a management level (middle managers or executive) responsible for ICT strategy, ICT resource allocation and ICT core competence.

Furthermore, recognising the difficulty in accessing a representative sample, participants for the survey were recruited through snowball sampling which has been established as an appropriate method and is particularly useful when it is not possible to identify all individuals in a sampling frame (Andres, 2012). Respondents were recruited by the participants from the survey who provided the survey link in email form to contacts that met the criteria. Although probability sampling was not utilised, it was still deemed important to consider the effect of non-response bias. A larger sample group was obtained by the researcher by e-mailing the survey link to participants network provided by the main participant.

### **3.3.8. Survey sample numbers**

In research, the required number of samples affects rigor and the ability to conduct statistical analysis on the data (Williams, Onsmann & Brown, 2010). Limiting constraints for this work-based research study were time, money, and participant accessibility.

### **3.3.9. Quantitative Online Survey**

The survey was administered online through University of Southern Queensland's (USQ) survey platform (Figure 11). Participants for the survey were recruited through purposive snowball sampling. This approach resulted in 130 responses (90 full, 40 partial) being completed.

In summary, between 4<sup>th</sup> June 2021 and 27<sup>th</sup> July 2021, the survey was active on the USQ survey platform with a total of 90 surveys being fully completed and 40 partially completed, for a total of 130 surveys' information received. Once the survey was closed, the data was extracted from the USQ survey platform and imported into Statistical Package for the Social Sciences (SPSS™) software for analysis. Due to the response rate, a limitation of the current study was the sample size and requires further studies of larger samples and statistical methods such as confirmatory factor analysis.

The study considered sampling power calculations to determine a minimal sample size. This amounted to 218 responses. The study was unable to achieve this sample size and as such it was a limitation in the generalisability of the findings. The study was exploratory and as such only sought to make preliminary findings that could inform future research.



Figure 11 Initial page of the quantitative survey

### **3.3.10. Survey data analysis**

As a pragmatic mixed-method study, the purpose of the quantitative data analysis phase was to validate the conceptual framework and examine associations between the variables in the context of the Malaysian manufacturing sector. Data analysis for the secondary phase was completed using SPSS™ which has been well established as a suitable tool. An advantage of using the USQ survey platform is that the data collected through the survey is easily converted and imported to SPSS™ for data analysis.

As a starting point, the data from the USQ survey platform was checked for missing or incomplete data, normal distribution of the data, inconsistencies and obvious errors to ensure the integrity and

completeness of the dataset before attempting data analysis (Hair et al., 2009). Once confirmed suitable, descriptive statistical analysis was undertaken in SPSS™ and a summary of the dataset was extracted. This included the participant's demographic characteristics, designation and industry. The benefit of this data was that it enabled the investigator to determine whether each case was suitable for inclusion in the studies dataset based on the criteria outlined in 3.3.7 and the use of multivariate analysis was possible for this study.

Consequently, the descriptive data analysis confirmed that further analysis was appropriate and the next analysis requirements were considered. It was judged that in addition to a frequency analysis, an exploratory factor analysis would reveal the factorial structure of the variables of interest and its internal validity.

### **3.3.11. Ethical Considerations**

This research presents a range of ethical issues given the interaction with people, organisations, and the research community. Creswell (2014) notes that it is important for researchers to be aware of ethical issues at all stages of a study and to take precautions to protect participants. According to Saunders, Lewis and Thornhill (2007), ethical issues are related to:

- i. privacy of possible and actual participants;
- ii. voluntary nature of participation and the right to withdraw partially or completely from the process;
- iii. consent and possible deception of participants;
- iv. maintenance of the confidentiality of data provided by individuals or identifiable participants and their anonymity; and



- v. reactions of participants to the way in which you seek to collect data, including embarrassment, stress, discomfort, pain, and harm (Saunders, Thornhill & Lewis, 2007, p.185).

The research was completed in line with the approval of the University of Southern Queensland's Human Research Ethics Committee approval. Participation in interviews were voluntary, anonymous and data non-identifiable. The research involved examining stakeholders, employers, employees and the stories and meanings around those, the organisational functioning, relationships between individuals and projects, and roles in the project.

The researcher understands that conducting interviews requires strong facilitation skills and professionalism and as such, the researcher's broad professional experience in similar contexts will be invaluable to perform this task with professionalism and confidence.

Participants of the online survey in the second phase were all anonymous, as they are participating remotely online.

Possible ethical dilemmas for the current research were addressed as per the table below:

|                             |   |
|-----------------------------|---|
| Informed consent            | Participants in the study will be required to acknowledge consent. Participation is voluntary and there will be no pressure, coercion, payment, or inducements as part of gaining consent. Participants are all adults.   |
| Confidentiality             | Privacy and confidentiality will be observed by ensuring anonymity of participants through re-identifiable data, replacing identifiers by a code or pseudonym. Although original identifiers will be kept to a minimum, (for example only using initials and industry). |
| Recruitment of participants | Participation in the study will be voluntary. Current contacts of the researcher will be asked to participate. Suggestions for further participants will be generated from these initial participants (snowball).   |
| Intellectual property       | Before commencing the research, the development of a clear understanding between the researcher, academic supervisor, and co-supervisor/s will be established.  |
| Technology – Cyber security | To protect research data/information from improper access, IT measures such as appropriate firewalls and software controls will be in place (Desai & von der Embse, 2008)   |
| Disclosure                  | Data will be kept for the university minimum time of five years.  |

Table 6 Ethical Approach and Considerations

### **3.3.12. Conclusion**

In conclusion, this chapter described the methodological approach and ethical considerations for creating, investigating and validating the variables, attributes, and operational definitions of ICT strategy, core competence and resource allocation conceptual framework through semi-structured interviews and online survey.

Further, it has highlighted the limitations of each phase which are discussed further in Chapter 6 – Conclusion

Chapter 4 presents and interprets the results from the qualitative phase of the study.

# **CHAPTER 4: QUALITATIVE RESULTS & INTERPRETATION**

## **4.1. INTRODUCTION**

This chapter describes the results of the qualitative phase of the research design that was conducted across different manufacturing industries in Malaysia. The researcher commences with a description of different manufacturers and the participants. The collection of qualitative data was based on an interview protocol containing semi-structured questions. The interview was undertaken between the researcher and the stakeholders with face-to-face discussions. A number of themes emerged from the thematic analysis of this data. Rallis & Rossman (2012); van den Beemt & Diepstraten (2016) describes qualitative interviews as a means to explore narratives of richer expression and (Creswell, 2014, p. 190) highlighted that qualitative interviews allow for “views and opinions from participants” that provided for greater depth of understanding the phenomenon.

Interviewed participants includes very senior representatives of the organisation and/or management representatives involved in managing the business and manufacturing facilities. Results of the qualitative interviews from the four questions are included. The interview participants were considered by the researcher as “constructors of knowledge in collaboration” (Gubrium & Holstein, 1995) with the researcher as befits a work-based study with the researcher as an “insider”. The chapter concludes with a summary of the themes that emerged from the interviews.

## **4.2. Description of participants**

The participant manufacturers consist of manufacturers in the food, tobacco, tile manufacturing, bedding accessories and oleo-chemical

industries. The pool of participants interviewed consists of Chief Executive Officers (CEOs), Chief Operating Officers (COOs) and Finance and Manufacturing General Managers. The participants were contacted by the researcher to set appointments based on their availability. Once the date and time was agreed and confirmed, the interviews were conducted in their respective office as preferred.

Prior to the interviews, the participants were informed of the title of the research and the objective of conducting the interviews. They were also asked to sign an informed consent to participate. The interview protocol informed the questions asked.

### **4.3. Managing and Recording Data**

Measures were implemented to maintain security and reliability. Interviews were recorded using a voice recording device in addition to handwritten interview notes. Pseudonyms were assigned to participants and used in the transcription process and in the researcher's notebook. The exact line of questioning that was used with each individual in an open-ended interview varied depending on the flow of conversation. Follow-up questions were asked in various instances to encourage the participant to fully elaborate their experiences to allow the researcher to capture much richer descriptions. Replies from the participants depended on their desire to express their thoughts and throughout all the interviews, the conversation and language used were a mix of English, Malay, "Manglish" and different Chinese dialects. Throughout the interview, notes were also written down (besides those interviews that were recorded) to capture some key thoughts and points that came to mind along with observational comments.

#### **4.4. Qualitative Data Preparation and Analysis**

As suggested by Creswell (2014), an interactive and iterative analytic approach with multiple interrelated stages should be followed in an order that makes the most sense to researchers. Organisation of the collected data is the first step that the researcher took to prepare the data to be analysed. This consisted of transcribing the interview recorded orally to written English or spoken with mix of other languages and colloquial language to written English depending on the form of communication that was used with the participant. Upon transcription, the data were coded in order to remove all identifiable descriptors. Orally recorded interviews were sent to an Australian company that specialises in transcription, transcribing recorded video calls and typing of academic interviews.

After completing all of the interviews, thematic analysis (Braun & Clarke, 2006) was used to uncover key themes from the conversations with the participants. Using the thematic analysis procedures proposed by Braun and Clarke (2006), initial codes were first generated by reading through the interview transcripts. The codes were then grouped together into potential themes, as areas of relevance emerged from the transcripts.

Further analysis was then required to refine the parameters for each theme, ensuring that each theme clearly presented something definitive from the data. Following this analysis, the results were then collated and structured into a table for subsequent discussion.

|          | <b>Phase</b>               | <b>Examples of Procedure for Each Step</b>  |
|----------|----------------------------|---|
| <b>1</b> | Familiarisation            | Transcribing data; reading and re-reading; noting down initial codes  |
| <b>2</b> | Generating initial codes   | Coding interesting features in the data in a systematic fashion across the data set; collating data to each code  |
| <b>3</b> | Searching for themes       | Collating codes into potential themes; gathering all data relevant to each theme  |
| <b>4</b> | Involve reviewing themes   | Checking if the themes work in relation to the coded extracts and the entire data set; generate a thematic map  |
| <b>5</b> | Defining and naming themes | Ongoing analysis to refine the specifics for each theme; generation of clear names for each theme   |
| <b>6</b> | Producing the report       | Final opportunity for Analysis selecting appropriate extracts; discussion of analysis; relate back to the research question or literature; produce report |

*Table 7 Thematic analysis followed by the study*

Rallis and Rossman (2012) define coding as the process of organising data through writing brackets to create chunks of text and writing words in the margins to categories them. These categories that are created will allow the researcher to identify themes that contain topics that were anticipated based on literature, themes containing topics that were not anticipated, and even comprising unusual topics. Creswell (2014) anticipated that there may be between five to seven themes and categories produced from the coding process.

#### **4.5. Description and Analysis of Identified Themes**

This section refers to describing the themes that were discovered from the one-on-one semi-structured interviews following Braun and Clarke's (2006) steps for analysis that captured the essence of the thoughts from the senior management. Each theme is discussed with excerpts from the interviews.

##### **4.5.1. Theme 1: Competitive Advantage**

The first theme that was established from the data analysis from the interviews was competitive advantage. Participants agreed that corporate strategy should include ICT technology in expanding their business. The participants also generally acknowledge that the internal ICT teams are incapable of developing an ICT Strategy Blueprint aligned with corporate strategy. The participants have previously requested their internal ICT team to develop an ICT Strategy Blueprint. The observation and conclusion from the participants noted that the ICT Strategy Blueprint does not answer how ICT strategies are able to assist and compliment the corporate strategy in creating competitive advantage. The participants noted that the internally developed ICT strategies consists of a number of network diagrams, various software applications and the ICT infrastructure consisting of hardware and software to be implemented by vendors. There was no mention in the ICT Strategy Blueprint on how the



recommended software applications address corporate strategy and that the ICT solutions (hardware and software) may overcome operational issues (reactive). There was also no mention of upskilling the current ICT and non-ICT staff in developing ICT core competence. Participants mostly recommended the different hardware and software with technical information on the assumption of having “an enhanced ICT capability over their competitors”.

The participants concluded that the ICT team do not possess skills in developing ICT strategy and only suggested an ICT digital transformation plans for incrementally improving ICT effectiveness and efficiencies.

Digital transformation is defined by Schmarzo (2017), as the application of digital capabilities to processes, products, and assets to improve efficiency, enhance customer value, manage risk, and uncover new monetisation opportunities.

The general conclusion was that participants agree that there is a need for external consultants to develop the ICT strategy and the integration into the corporate strategy, the mechanisms of how technology can assist in leading to competitive advantage and the development of core competence.

Participant 5 reiterated that the new corporate strategy is to retail tiles (online and in retail shops) while maintaining their project-based manufacturing business. Participant 5 believes strongly that by using technology to connect with their customers, it allows the organisation to develop a competitive advantage over their competitors.

*“We try to use latest technologies such as facial recognition and tile design software to identify them and bring up their previous purchases. Our tile design software allows the customer the freedom to choose and design the tiles based on their preference” –*

Participant 5 - Managing Director

Participant 7's need for a thrust in their business across different countries have led them to review the need for a new ICT system. Participant 7's production facilities face challenges in getting the right production outputs in line with the forecasted sales from different countries. Participant 7's strategy in ensuring the right mix of products for different holiday seasons, design sensitivity, preference and cost have led them to review their current technology and how market data can be fed into the production system. Due to misinformation and data inaccuracy, unsold products have been increasingly stock-piled in the warehouses with no information of where the products are stored and the availability in the warehouses. This has led to decreasing competitiveness and reduction in market share. The corporate strategy actively seeks to increase competitiveness by having ICT priority.

*"We have engaged consultants to formulate the IT strategy and this strategy will be in line with our visions and missions, one of which is to develop closer to our customers and capture bigger market share especially in our overseas offices."* – Participant 7 - CEO

In summary the key points on competitive advantage were:

- i. It appears corporate strategy do not integrate ICT as part of the overall strategy but merely a subset of corporate strategy;
- ii. Participants have never considered ICT strategy as part of corporate strategy;
- iii. ICT strategies can assist and compliment the organisation's objective in achieving competitive advantage;
- iv. The lack of placing importance on ICT led to misinformation and data inaccuracy which reduce competitiveness in the market.

#### **4.5.2. Theme 2: Core Competence**

Most of the participants acknowledged that core competence and technology is critical in achieving competitive advantage. While they have

undertaken a number of ICT projects over the years, the participants felt that maintaining staff core competence is challenging as ICT staff's attrition rate is high and tend to be recruited by other organisations with better benefits. Further follow-up questions on how participants define core competence in their organisation resulted in a number of common feedback that core competence refers to the ICT staff understanding the ICT infrastructure and the number of years of working experience. Follow-up question to the participants was asked if core competence includes ICT advisory to the management and is considered a core competence to sustain business competitiveness. Some participants' responses noted there is a lesser priority to have ICT advisory skills compared to managing the ICT infrastructure in order to minimise downtime or disruption to the business and that ICT core competence is narrowed to providing technical assistance to the organisation.

Participants agreed that ongoing ICT skills development is essential to develop ICT core competence. Core competence, in general has been defined as the resources generated or recombined inside an organisation that creates competitive advantage (Banerjee, 2003).

The majority of the participants acknowledged that engaging external consultants in different fields of technology is crucial as the organisations acknowledged that their internal ICT team lack the advisory and ICT management skills. Knowledge transfer from the external consultants is also intended to enhance ICT capabilities, although limited. The participants acknowledged that the internal ICT department's role is reactive where projects are only deployed upon requests from different departments, hence core competence is limited to the knowledge in understanding and maintaining the current ICT infrastructure.

The ICT team, while accomplished in understanding how features and functions of the software applications works, lacks the ability to translate ICT solutions into further value adding features which in turn can create

competitive advantage. Due to the limited skills in ICT advisory to the board, participants prefer to engage external experts who are proficient in understanding and developing ICT strategy but do so knowing that their ICT core competence is limited through that dependence of external expertise.

Participant 3 recognises that as their local organisation is within a larger international organisation, the local ICT team deploy projects based on the instructions given by the international organisation. Hence core competence is limited to understanding of the related projects initiated by the larger organisation. However, the core competence of larger organisation acts as proxy for the affiliate's capabilities.

*"We have visited our internal ICT department's strength and weaknesses. We conclude that the current ICT team does not possess the knowledge nor the understanding of new technologies to help our organisation move to a higher level but is highly dependent on the instructions from our corporate headquarter. Our organisation wants to be the best in our business, and with a well-developed ICT strategy that is in line with our international corporate strategy, we hope to achieve that. Hence we have engaged external parties to assist in the development of an ICT strategy which includes our current people, process and technologies." - Participant 3 – General Manager of Finance*

Within any software implementation, the participants admitted that there is a lack of confidence in the data that is output from the new software application. In these cases, the departments resorted to entering data into the old system and new system and compared the output to ensure that there are consistencies in data accuracy. Additionally, the participants believe that the development of core competence of the ICT staff on the new software application requires more time and essentially revert to the

older system as a backup to ensure that there is consistency in data accuracy.

The participants recognised that despite the ICT team's requirement on skills upgrading, they acknowledge that there are limited projects within the organisation that can develop the ICT team and infrastructure as core competence. This is partly due to a lack of corporate strategy integrating future orientated ICT capabilities. As such, new projects are preferred to be outsourced to external consultants and expect core competence to increase within the ICT team with cooperation from the consultants. The participants also expect the ICT team to "learn on the go" and self-skill themselves.

Due to various software developments over the years, Participant 4 admitted that the General Manager of IT (GMIT) was against the use of external consultants and the reason was that external consultants do not possess the knowledge of their business and the internal ICT systems compared to the knowledge of their internal ICT team. The GMIT expressed that engaging external consultants is costly and the fees can be used to employ new ICT staff and grow core competence organically. As the organisation has new corporate strategies, the chairman has persisted to outsource ICT advisory services to a reputable management consulting firm. The initial conclusion was that the skill sets of the internal ICT staff remains limited to the maintenance of the legacy systems and due to the lack of ICT spending, the ICT team's alternative is to utilise 'freeware' downloaded from the internet for the organisation.

*"We were unaware that some of the departments were using freeware downloaded from the internet. This is against our risk management policies and despite the General Manager of IT (GMIT) has insisted that our organisation is prudent, the freeware is 'safe' to be use and at no cost to the organisation. As a member of our board, we have advised the GMIT to provide evidence that the*

*freeware is safe and is in-line with the organisation's corporate strategy. Despite his long service in the organisation and having a good understanding of our business, he has officially retired and his advice and suggestions will no longer be considered in view of the risk policies advocated in our organisation "* – Participant 4 – COO.

Participant 6's reply on core competence was much more direct and he acknowledged that there was no ICT core competence in their organisation. As such, they have engaged external experts to develop an ICT strategy which includes digital transformation initiatives to thrust the organisation to be competitive.

*"We want to be the best in our line of business and we will use these new systems in line with our Mission statements which is Customer focused, efficient and effective, and a results-oriented workforce"* – Participant 6 - CEO.

The participants acknowledged that while ICT technology has improved tremendously in their daily business operations through minimal duplication of work. This was achieved by automating repetitive work and reducing data discrepancies. The participants also highlighted that it is also equally important that non-ICT staff members get to understand the use the software applications and utilise technology as part of the job responsibilities. Comments from the participants stated that non-ICT staff have to at least know and understand the use of the software applications in line with their job. On top of that, participants expects that the non-ICT staff are able to apply features in improving the internal operating procedures which also develop core competence.

*"In our industry we are considered the smallest, so we have to continuously improve on our technology. All our systems are implemented in-house and do not depend on outside help. This way we keep our knowledge to ourselves because we know our operations better and it is easier to implement with people who*

*already know our business”* – Participant 3 – General Manager of Finance

Participant 1’s organisation’s use of technology was underutilised with little emphasis on embracing new software applications. The company’s ICT staff role is to reduce doing cabling and backups. The company underwent a radical 3-year digital transformation and replaced the entire network infrastructure and software solutions. Participant 1’s company’s challenge was instilling new processes, familiarising the organisation with the use of new software applications and successfully retain a team of ICT staff who manages daily ICT operations and systems availability to the organisation.

*“Company needs to ensure core competence amongst its staff to manage processes efficiently with end users and ICT team being able to understand the current processes and improve on it using technology”* – Participant 1 - COO

In summary, the key points on core competence emerging from the interviews were:

- i. ICT integration in corporate strategy is needed to develop core competence;
- ii. ICT core competence is outsourced to external experts as there is a lack of confidence and takes a lot of time in building the internal ICT team;
- iii. External consultants can be used to develop core competence but is limited;
- iv. Non-ICT employees are needed to build core competence;
- v. Lesser priority was given to building ICT core competence compared to maintaining the ICT infrastructure;

### **4.5.3. Theme 3: Integrated ICT Infrastructure**

The term ICT Infrastructure is termed as “All of the hardware, software, networks, facilities, etc., that are required to develop, test, deliver, monitor, control or support IT services. ICT infrastructure includes all of the Information Technology but not the associated People, Processes and documentation (ITIL, 2011).

Participants agree that an integrated network that allows data input flows through applications or different sets of software applications without the need for humans to rekey in from one system to another. Participants believed in the “single source of truth” where information from a source is keyed in and the data goes through the relevant modules and gets updated into different databases. This avoid duplication of data through rekeying of data and exposes the activity to transcribing and transposition errors.

Participant 6 describes how using an integrated ICT system prevented the manufacturing facilities from over or under producing the products due to a proper production scheduling information input into the Manufacturing Production Schedule module. Moreover, the key objective in having a new integrated system is to eliminate fraud where the organisation’s security found a series of frauds committed by the warehouse manager, purchasing manager and external suppliers.

*“With a new integrated production software, we are able to overcome the problems of over and under producing products. Previously we print out data from one system and then rekeying the same information into another system. A lot of time was wasted, errors in data entry and exposes us to product discrepancies which some of our staff took advantage of” - Participant 6, CEO.*

The effective use of an integrated technology provides the opportunity to increase the amount of automation within the organisation, as mentioned



by one of the participants. The rationale from the participant on the staff, is that, while the current integrated system is able to undertake the process and minimises manual and repetitive workload, it is imperative that they demonstrate efficiency and effectiveness in their work using an integrated technology. The participant is convinced on the success of ICT capabilities and have invested additional automation tools such as mobile data collection devices to capture data. The tools, such as mobiles phones, tablets and barcode readers assist in capturing not only text data, but diagrams, photos, videos and transmit the data to the organisation's back-end system to be processed and at the same time, taking advantage of technology to market the organisation's products using similar tools. This speed up the processing of data, meetings and over exceeding customer expectations and reducing inefficient process.

*"Using new Warehouse Management systems and barcoding helps in ensuring we manage our warehouse operations better and able to get the correct inventory level and the stocking areas. We can then have faster identification and picking of stocks and able to arrange transportation more efficiently"* – Participant 7 - CEO

Participant 4's view on integrated ICT infrastructure is that the organisation has raised concerns on the use of old technology from the 1980s. The technology used is unable to integrate with new and current systems such as Windows based applications and users have to rekey in the data developed on Excel™ spreadsheets into the old system. The ICT staff, who is familiar with the old system finds it challenging as the person-in-charge was unwilling to migrate to any new technology as most of the applications used are developed in the old system and migrating to a new system incurs costs, time and training needed.

In view of their expanding business from manufacturing to plantation and property development, the board felt there is an urgent need to transform

the current infrastructure to a new ICT infrastructure but not without a detailed study and the development of a 6-year ICT strategy.

*"There is a need to upgrade the current technology and the software as the IT staff skillsets are not on par with the latest technology due to them managing the old system full time. Moreover, our ICT staff did not demonstrate excitement with the announcement of new ICT initiatives and prefer to stick to what they know."* - Participant 4 – COO

In summary, the key points on integrated ICT infrastructure were:

- i. Dated ICT infrastructure reduces core competence;
- ii. Advanced ICT infrastructure increases core competence;
- iii. ICT infrastructure contribution to core competence is dependent on organisation's people and processes
- iv. Without an ICT corporate strategy, it is difficult to justify ICT investments

#### **4.5.4. Theme 4: Resource Allocation**

The PMO and Project Management Dictionary (2016) defines resource allocation as "scheduling of activities and the resources required by those activities, so that predetermined constraints of resource availability and/or project time are not exceeded". Internal ICT resources from all participants recognised the following:

- i) Core competence is difficult to maintain as ICT staff retention is a challenge.

*"Usually, the deployments are instructed from HQ and our local ICT in-house team implements it. After sometime, the ICT staff finds the job boring and leaves to advance to more*

*challenging role in other companies” – Participant 2 - General Manager of Finance.*

- ii) ICT staff require consistent upskilling and organisations may not allocate any spending as the skills are not needed in their daily management of the current systems.

*“There is no reason to outsource to external experts as the internal ICT staff's skills are sufficient to maintain the current in-house solution” – As informed by the General manager IT (GMIT) to Participant 4 - COO*

*“The IT staff needs to be equipped with the latest technologies and require an IT strategy to review and overhaul the use of technology to gain competitive advantage. As it is, the core competence are limited to maintaining a decentralised old system” – Participant 4 – COO*

The differing views between participant 4’s GMIT and COO reflects the lack in corporate strategy integrating with ICT strategy and hence reduce their market competitiveness.

- iii) There is a tendency to employ unskilled part timers to assist in the data entry of transactions

*“We employ school leavers for a few months during school holidays to help key in back-dated transactions under the supervision of the IT staff, but we do not discount the number of errors encountered and it is up to the IT team to correct it” – Participant 1 – COO*

- iv) ICT staff is stuck with managing the current system and are not inspired to gain knowledge of new technologies or operational procedures of the organisations.

*"The IT staff is quite well verse with running the current system but they also have to do data patching from the current system which has 'bugs'. Efficiency is limited to 'fire-fight', patching data and getting new projects up. They is no planning and IT staff accepts new requests on an ad-hoc basis. These new requests are mostly requesting for new transactional reports."* – Participant 5 – Managing Director

The above issues are common across all the manufacturing organisation's internal ICT department. Participants agree that there is a tendency to use external experts to manage and realise new ICT projects without any increase in capital expenditure. The participants agree that without a corporate ICT strategy, it will be difficult to justify ICT spendings. With the scarcity of ICT resources, one participant agreed to "rent a CIO" as advised by external experts as a temporary measure to develop an ICT strategy and integrate future orientated ICT initiatives into corporate strategy.

Participant 2 indicated that there is a need for resources from their subsidiary to assist in implementing a new ERP system as there were no capable ICT staff who were able to lead and manage the project. Resources were allocated from their Australian office for the implementation and also to improve ICT staff capabilities. Participant 2 also indicated that computer literacy among the staff had improved tremendously and the staff expressed interest in understanding more and were willing to take up additional responsibilities in managing the system post implementation.

*"Deployment capabilities is referred to our external consultants which was from Australia. The staff here has no idea on using computers so we have to start from scratch"* – Participant 2 - General Manager of Finance

In summary, the key points on resource allocation were:

- i. Staff from non-ICT department were used to assist in new ICT deployments;
- ii. Resources are limited to mainly maintaining the current ICT system and engage outside experts on new ICT initiatives;
- iii. ICT literacy increases by engaging external experts to assist in ICT deployments;
- iv. Unskilled workers are hired to help in ICT deployments especially in data entry works on a temporary basis;
- v. Allocation of resources normally refers to getting external experts on a contractual basis on the hope that the experts can create ICT core competence.

#### **4.5.5. Theme 5: Staff Capabilities**

Any new ICT projects require the cooperation and collaboration between outsourced consultants, internal ICT staff and non-ICT staff. In order for the organisation to progress, participants understand that ICT deployments involve ICT and non-ICT staff. The core reason is that in any ICT deployments, specifically software related implementations must have selected non-ICT staff to be involved throughout the duration of the implementation as the non-ICT staff ultimately become the end users, take ownership of the implemented software application and thus, responsible for the information input into the software.

Participant 4 (COO) was informed by the internal General Manager of IT (GMIT), that since the current software applications are internally

developed, there is no necessity to engage external experts. Participant 4 (COO) and the Board of Directors recognised that there is a lack of skill in ICT advisory. This has led to the Board to review their corporate strategy and concluded that while the current system may be able to sustain the current business, there were concerns in the following areas:

- i. The current infrastructure is obsolete and this has been communicated by their vendor to replace the entire infrastructure with the latest technology;
- ii. There is already a lack of replacement parts for the server and this has led to the vendor needing to source hardware components globally which resulted in high procurement cost and serious server downtime and the staff resorting to process transactions manually;
- iii. Current ICT staff are used to managing and maintaining the current system. Retraining and reskilling on new systems incur additional hours and the GMIT is unwilling to allow his staff to take time to attend training. During the interview with a senior IT staff, there was a concern by the GMIT that reskilled staff may potentially leave for another company after spending time and cost on upskilling the staff;
- iv. ICT staff who are unable to advise departments heads on the benefit of an integrated system and resulted in staff developing stand-alone modules using different development tools based on the individual's skill sets;
- v. Two senior ICT staff had expressed unwillingness to consider upgrading the system despite the lack of components for their server. This was due to their plan to retire and preference to focus on their post-retirement activities;
- vi. The central ICT system is based outside Klang Valley and is extremely challenging to employ highly skilled ICT staff. This has

led to them employing semi-skilled ICT candidates or candidates with different ICT skilled sets;

- vii. Through observation, there are also lackadaisical ICT staff who demonstrated that their role is strictly within their roles and were unwilling to skilled up internally to take over the role of staff who had left.

Participant 5 indicated that it is crucial that department heads from different manufacturing facilities across Malaysia, Indonesia and China are able to understand the new ERP system while taking into consideration, the current processes and how the new system is able to reduce operating steps in their current processes. This has led to an operational process improvement and a number of supply chain processing steps and time were reduced tremendously. While the implementation timeline was extended due to the Managing Director's directive that there must be an improvement in their internal processes, subsequent new processes resulted in better understanding of the corporate's information supply chain, better capitalisation of the new system's features and functions and allowing technology related ideas and designs documented and executed in future.

*"Nominated staff must to be on the project and understand the implementation and equip themselves with the new systems. External consultants are there to execute the implementation and training. We are looking into a much faster operations while ensuring we give our customers our best service."* – Participant 5  
- Managing Director on insisting that department heads understand the new system and independent from ICT's assistance.

In summary, the key points on staff capabilities were:

- i. Staff skills are limited due to the lack of attention in building ICT core competence;
- ii. The dependencies on external consultants to enhance staff capabilities is limited as the consultants are engaged for specific initiatives in the organisation;
- iii. There is a misconception that new ICT systems can eliminate most of the operational issues, expects staff to familiarise with the new system as quickly as possible, improve the internal process and meeting customers' demands all at the same time.

#### **4.5.6. Summary**

This study addressed the perceptions of the participants whom are leaders and senior management of their manufacturing facilities. The following insights were identified from the analysis of interview data and themes:

1. There is very little understanding by the participants on what ICT strategy constitutes and the importance of it being integrated into the corporate strategy. Even if there is availability of an ICT strategy, the prominence of it is considerably less compared to a corporate strategy which places importance on obtaining profitability and market share. Moreover, the understanding of ICT strategy may be distorted due to the scarcity of business related information in the "ICT Strategy" developed internally which in most cases are confused with an ICT Digital Transformation plan.
2. Participants' view is that ICT is perceived more of a productivity tool rather than a 'business enabler' or integral to corporate strategy. This may be due to previous ICT initiatives being implemented and executed on an incremental basis with no concerted effort made to ensure ICT initiatives are in line with the corporate strategy and business requirements.



3. There appears to be no focus on integrating skilled ICT resources in areas of strategic advisory, planning and management. The utilisation of ICT resources is dependent on the requests of other departments or on ad-hoc basis. ICT resourcing is mostly incremental depending on existing operational budgets rather than strategic investments.
4. There is a lack of alignment between the participants' business requirements and ICT initiatives resulting in ad-hoc and piecemeal ICT investments. ICT considerations do not appear to be factored into the development of corporate strategy with minimal or no representations at the senior corporate management level.
5. There is limited or no focus on viewing ICT capabilities (people, process, technology) as a core competence. As a result, most manufacturers exclude ICT as a potential source on competitive advantage.
6. There is a lack of faith on any newly implemented systems as non-ICT staff prefer to enter data in the legacy system, rekey the same data into the new system and compare the outcome between both systems. This is due to a lack of ICT project activities such as the users' acceptance test on new systems and a system integration test if the new system is integrated to existing software application.

These insights informed the development of question items included in an online survey instrument for responses from a broader sample. This sought to determine the extent to which the insights can be generalised (with obvious limitations) across the sector. Chapter 5 reports on the results of the quantitative survey.

# **CHAPTER 5: QUANTITATIVE RESULTS AND INTERPRETATION**

## **5.1. Introduction**

Phase 2 of the research involves participants undertaking a quantitative online survey. The survey's purpose was to triangulate the qualitative findings and determine the extent to which the phase 1's findings represented a broader sample of the population. Due to the exploratory and applied nature of the research, the need to include quantitative research strategies was imperative. In this study, the quantitative data is not intended to test a hypothesis as surveys are often intended to do (Creswell & Clark, 2011) but serves to extend the reach of information collection to those who were not interviewed directly by the interviewer, and to obtain more generalisable results.

The following sections provide the results of descriptive data analysis and descriptive statistics of quantitative data collected in the second phase of this study (anonymous online survey). The justification for this approach is outlined in Section 0 and serves to a) offset the weaknesses of qualitative method; b) triangulate qualitative findings as appropriate, and c) expand the information collected in the interviews to see how it applies to others' experiences of working in similar industries.

## **5.2. Data Preparation**

The online survey was scheduled to be open for a period of two months in 2021. The minimum number of survey responses targeted was 60, in an effort to surpass a minimum number of 50 required for valid correlation based on the number of items. This target was set to ensure that the

minimum needed for inferential statistics was met (Hair, Black, Babin, & Anderson, 2010). The current study's data required processing to convert the data collected into a format suitable for answering the study's research questions (Zikmund et al. 2013). The phase 2 data was confirmed suitable for further analysis by following the data cleaning and screening recommendations of Creswell (2014) and Hair et al. (2010).

### **5.2.1. Missing data and handling of incomplete cases**

While missing data "are a fact of life in multivariate analysis" (Hair et al., 2006, p. 49), it is critical that the researcher address the issues affecting the interpretation and extrapolation of the results (Hair et al., 2006). Hair et al. (2006) recommend a four-step process for identifying and managing missing data before statistical analysis, reducing the risk of sample size reduction and minimising the risk of biased results. These steps include; defining the type of missing data; establishing the extent of missing data; assessing the randomness of missing data; and choosing the method of imputing the missing data.

Following the four-step process outlined by Hair et al. (2006) the survey set included missing data that was not ignorable. These missing data were not random, and were easily identifiable by the researcher, and associated with the respondents failing to complete the survey. The most efficient remedy method was to delete these non-random individual cases with missing data (Hair et al., 2006). Therefore, it was unnecessary to continue to steps three and four of Hair et al. (2006) i.e. assessing the randomness of missing data and choosing the method of inputting the missing data.

### **5.2.2. Normal distribution of data**

Of the 130 responses, a total of 90 (70%) surveyed responses were considered as complete while the remaining 40 incomplete responses were removed. The total 90 responses were then checked for further missing values, duplicate cases and normal distribution of data using Skewness

and Kurtosis statistics and observations of normal P-P plots. No further cases were deleted and the data was normally distributed.

**5.3. Descriptive Statistics (Frequency Analysis)**

The survey was administered according to the methodology outlined in 3.5.7. The sampling strategy included purposive, convenience, and nonprobability techniques, with the invitation to participate in the survey extended to all executives, middle management and employees of the participating organisations. The overall participation resulted in 130 responses.

| Survey Distribution | Total Responses (Response Rate) |
|---------------------|---------------------------------|
| 130                 | 90 (70%)                        |

*Table 8 Survey Distribution and Responses*

The sample size of 90 complete responses is considered adequate and sufficient for the exploratory nature of the study. The sample resulted in a cross of respondents across different gender, designations and manufacturing industries providing quality factor solutions with small sample sizes (MacCallum et al. 1999). Using Exploratory factor analysis (EFA), a technique for large sample sizes (N), with N = 90 is considered as a reasonable absolute minimum (de Winter et al., 2009).

**5.3.1. Sample Demographics**

Completed responses from the survey were extracted across different demographic characteristics of respondents. Descriptive statistics of the respondent profiles assist the researcher with identifying suitability or

further multivariate analysis (Hair et al., 2010) and provide the researcher with a deeper understanding of the responses.

A total of 90 cases were included in the analysis. The demographic information in the online survey covered: gender, age group, industry and designation.

*Gender:* The total respondents consist of 37.8% female and 62.2% male respondents. This may support the observation that the manufacturing industries in Malaysia leans towards male dominated industry.

*Age Group:* The respondents' age group was normally distributed, with the average respondents (35.6%) between 40-49 years old. Those aged between 50-60 years old accounted for a further 25.6% and those between 30-39 accounting for an additional 23.3%. The majority of participants (66.7%) are 40 years and above of age and in between the middle to advanced stages of their careers.

*Industry:* The researcher did not intentionally target certain manufacturing industries. A total of 90 respondents were spread across 35 different manufacturing industries in Malaysia. Manufacturers in the machinery and equipment and automation had 15.6% responses with respondents from the building and construction manufacturing industry at 11.1% followed by prepared food industry at 8.9% and Consumer and Industrial Electrical and Electronic Products at 5.6%.

*Employment Designation:* 40.4% of the respondents fall under the senior management category. Based on the observations of the respondents, senior management constitutes respondents who are classified as part of the C-suite, directors and general managers and senior managers. The

middle management consist of 30% comprising of managers where most likely are head of departments and/or are technical experts in their fields.

Table 9 below provides an overview of the respondent profiles.

|                         |  | Frequency | Valid Percent | Cumulative Percent |
|-------------------------|--|-----------|---------------|--------------------|
| Gender                  | Female   | 34        | 37.8          | 37.8               |
|                         | Male   | 56        | 62.2          | 100.0              |
|                         | <b>Total</b>   | <b>90</b> | <b>100.0</b>  |                    |
| Age Group               | 18 - 29  | 9         | 10.0          | 10.0               |
|                         | 30 - 39  | 21        | 23.3          | 33.3               |
|                         | 40-49  | 32        | 35.6          | 68.9               |
|                         | 50-60  | 23        | 25.6          | 94.4               |
|                         | >60  | 5         | 5.6           | 100.0              |
|                         | <b>Total</b>   | <b>90</b> | <b>100.0</b>  |                    |
| Industry                | Agricultural Produce                                       | 3         | 3.3           | 3.3                |
|                         | Electrical and Electronic Parts and Components             | 6         | 6.7           | 10.0               |
|                         | Fashion Accessories and Textiles                           | 2         | 2.2           | 12.2               |
|                         | Gift, Souvenir and Jewellery                               | 1         | 1.1           | 13.3               |
|                         | Gloves   | 2         | 2.2           | 15.6               |
|                         | Household Products   | 2         | 2.2           | 17.8               |
|                         | Machinery and Equipment and Automation                     | 14        | 15.6          | 33.3               |
|                         | Apparel, Garment and Accessories                           | 1         | 1.1           | 34.4               |
|                         | Oil and Gas Products                                       | 3         | 3.3           | 37.8               |
|                         | Packaging and Containers                                   | 4         | 4.4           | 42.2               |
|                         | Pharmaceutical, Toiletries and Cosmetics                   | 1         | 1.1           | 43.3               |
|                         | Plastic Products   | 3         | 3.3           | 46.7               |
|                         | Prepared Food  | 8         | 8.9           | 55.6               |
|                         | Rubber Products  | 1         | 1.1           | 56.7               |
|                         | Telecommunication  | 2         | 2.2           | 58.9               |
|                         | Textiles, Yarn and Other Related Materials                 | 2         | 2.2           | 61.1               |
|                         | Automotive, Part and Components                            | 3         | 3.3           | 64.4               |
|                         | Building and Construction Materials                        | 10        | 11.1          | 75.6               |
|                         | Computer Hardware  | 1         | 1.1           | 76.7               |
|                         | Consumer and Industrial Electrical and Electronic Products | 5         | 5.6           | 82.2               |
| Aquaculture             | 1  | 1.1       | 83.3          |                    |
| Construction - Coatings | 1  | 1.1       | 84.4          |                    |
| Dairies Manufacturing   | 1  | 1.1       | 85.6          |                    |

|                        |  | Frequency | Valid Percent | Cumulative Percent |
|------------------------|--|-----------|---------------|--------------------|
|                        | Dairy products                         | 1         | 1.1           | 86.7               |
|                        | Education                              | 1         | 1.1           | 87.8               |
|                        | Electronic Manufacturing               | 1         | 1.1           | 88.9               |
|                        | Electronics Manufacturing Services     | 1         | 1.1           | 90.0               |
|                        | Food manufacturing                     | 1         | 1.1           | 91.1               |
|                        | Home textile supplier and manufacturer | 1         | 1.1           | 92.2               |
|                        | Investment Holding                     | 1         | 1.1           | 93.3               |
|                        | Labels and Stickers                    | 1         | 1.1           | 94.4               |
|                        | Manufacturing back office              | 1         | 1.1           | 95.6               |
|                        | Packaging Tapes                        | 1         | 1.1           | 96.7               |
|                        | Stock broking                          | 1         | 1.1           | 97.8               |
|                        | Stockbroking                           | 1         | 1.1           | 98.9               |
|                        | Trading                                | 1         | 1.1           | 100.0              |
|                        | <b>Total</b>                           | <b>90</b> | <b>100</b>    |                    |
| Employment Designation | Senior Management                      | 40        | 44.4          | 44.4               |
|                        | Middle Management                      | 27        | 30.0          | 74.4               |
|                        | Executive                              | 20        | 22.2          | 96.7               |
|                        | Non-Executive                          | 3         | 3.3           | 100.0              |
|                        | <b>Total</b>                           | <b>90</b> | <b>100</b>    |                    |

Table 9 Frequency of Respondent Profiles

### 5.3.2. Corporate strategy and ICT

While 80.5% of the respondents agree that their organisation has a business strategy, 90.3% believe that the organisation has developed an “ICT strategy blueprint”. The understanding of ICT strategy blueprint is somewhat fuzzy as 85.4% of the responses assume that while ICT investments focus on leveraging ICT technology to support corporate strategies, however ICT strategy is not part of the corporate strategy.

While 73.2% agree that ICT capabilities is used to drive corporate profitability, 85.4% respondents agree that the organisation's ICT is a strategic asset in driving corporate growth and achieving corporate strategies.

78.1% of respondents said that the organisation takes steps to make sure that technology investment is in line with the expansion of the corporate business.

Respondents (73.2%) say that their organisation is focused on striking a balance between ICT investment and the business success.

### **5.3.3. ICT resource allocation**

Nearly two thirds of the respondents (65.8%) agree that the organisation should allocate an annual budget for professional development and up-skilling of ICT resources.

68.3% of respondents, or two thirds, agree that the organisation allocates ICT resources on ICT deployments to external business partners including vendors, suppliers, government departments, etc. The majority of respondents (90.2%) do, however, believe that the internal ICT technology should be used to automate routine, rule-based, and repetitive human tasks.

### **5.3.4. ICT, organisational capabilities and role**

ICT is regarded as being essential to the operation of the business by 83% of the respondents. While 80.5% of respondents agree that ICT investment focus on providing effective, high-quality service to both internal and external stakeholders, 87.8% believes that ICT has improved operational productivity and effectiveness.

However, just 58.6% of respondents thought the organisation's ICT resources were knowledgeable in ICT administration, planning, and ICT strategic advice. This is evident as 75.6% of the response says that there are 'large gaps' in the current ICT resources supporting the corporate's



corporate strategy. 70.7% respondents perceived ICT as a productivity tool instead of a 'business enabler'. While ICT is critical of organisations competing in their individual markets, the internal ICT resources lack the expertise and understanding to achieve competitive advantage.

**5.3.5. ICT project implementation**

Of the total 90 respondents, 45.6% acknowledged that their organisations have undertaken ICT deployments. 80.5% perceive that the organisation's ICT is focused on effective implementation of technology.

39% of the respondents who had undertaken ICT deployments acknowledged that ICT implementations were realised in the past 12 months; 22% of the implementations realised between 1 to 2 years ago; 22% between 3 to 4 years; and 17.1% respondents replied that the last implementation more than 5 years ago.

Table 10 and Table 11 provides an overview of the respondents who have undertaken ICT project implementation.

|   |                 | Frequency | Valid % | Cumulative % |
|---|-----------------|-----------|---------|--------------|
| <b>Have your organisation undertaken any ICT projects?</b>                      | Yes             | 41        | 45.6    | 45.6         |
|   | No              | 29        | 32.2    | 77.8         |
|   | Unsure          | 20        | 22.2    | 100.0        |
|   | Total           | 90        | 100     |              |
| <b>When was the last time your organisation has implemented an ICT project?</b> | Last 12 months  | 16        | 39.0    | 39.0         |
|   | 1 - 2 years ago | 9         | 22.0    | 61.0         |
|   | 3 - 4 years ago | 9         | 22.0    | 82.9         |
|   | 5 years+        | 7         | 17.1    | 100.0        |
|   | Total           | 41        | 100.0   |              |

Table 10 Organisations undertaking ICT Projects

|        |    |                      |    |
|--------|----|----------------------|----|
|        |    | Last 12 months       | 16 |
| Yes    | 41 | 1 - 2 years ago      | 9  |
| No     | 29 | 3 - 4 years ago      | 9  |
| Unsure | 20 | 5 years+             | 7  |
|        |    | 1 - 2 projects       | 27 |
|        |    | 3 - 4 projects       | 8  |
|        |    | More than 4 projects | 6  |

Table 11 List of respondents that has undertaken ICT projects

### **5.3.6. Competitive advantage & core competence**

Ninety two point seven percent (92.7%) of respondents believe that ICT projects, when implemented, attained competitive advantage in their respective markets. This shows strong evidence that ICT is a critical component to organisations competing in their respective market and achieving competitive advantage.

According to 97.6% of respondents, ICT core competence is critical to successful ICT deployments. This shows that organisations achieving competitive advantage depends on effective ICT deployment accomplished by the organisation's ICT core competence.

83% of the respondents agree that ICT solutions should be expanded across the entire organisation and having an ICT core competence is a key component of corporate strategy. 78.1% of the respondents agree that the organisations consider ICT a strategic asset and is essential to being a competitive differentiator focusing on competitive positioning and performance in the marketplace.

### **5.4. Principal Component Analysis (PCA)**

The PCA procedure was used to initially extract factors from the online survey instrument. Hair et al. (2006) and Watkins (2018) stress the importance of factor rotation in interpreting factors. The Varimax orthogonal rotation was chosen to achieve a meaningful and straightforward factor structure outcome for the current study, as the factors were not expected to correlate (Hooper, 2012).

According to Watkins (2018) and Hooper (2012), the factor loadings and communalities were initially investigated. Item loadings over 0.30 and factors with at least three items are regarded by Osborne, Costello, and Kellow (2008) as the best fit.

### **5.4.1. Sampling adequacy (KMO)**

To statistically evaluate the correlation matrix's overall significance, Bartlett's test of sphericity was used (Watkins, 2018). With a 0.726 sampling adequacy, Bartlett's test of sphericity was significant for the online survey instrument (Table 12).

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy measures the ratio of correlations among variables. KMO values  $>0.70$  are desirable (Watkins, 2018); As shown in

Table 12, the KMO measure of sampling adequacy is well above the recommended 0.70.

|  |                    |         |
|--|--------------------|---------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. |                    | 0.743   |
| Bartlett's Test of Sphericity                    | Approx. Chi-Square | 962.334 |
|  | df                 | 351     |
|  | Sig.               | 0.000   |

Table 12 KMO and Bartlett's Test

### **5.4.2. Variance Explained**

A scree plot was produced to determine the optimum number of factors to be extracted from the instrument. The scree plot is presented in Figure 12. According to Hair et al. (2006), solutions are considered adequate if they account for at least 60% of the total variation. The PCA extraction converged on five components explaining 22.07%, 12.72%, 8.80%, 6.21% and 5.99% respectively. An initial Maximum Likelihood (ML)

extraction attempt converged on a single factor, explaining 60.62% of the variance across the instrument.

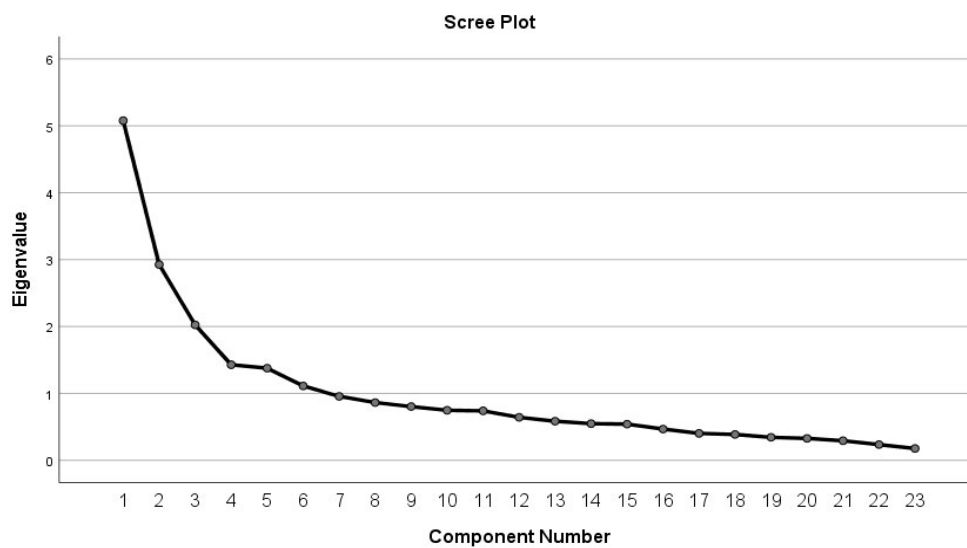


Figure 12 Scree Plot

Communalities were reviewed to determine factor items that may be candidates for deletion. Consideration of the communalities was undertaken in conjunction with item loadings.

#### **5.4.3. Rotated component matrix**

Factor loadings and communalities were investigated following the guidelines of Watkins (2018) and Hooper (2012). According to Osborne, Costello and Kellow (2008), factors with at least three items and item loadings over 0.30 are sufficient in exploratory investigations. Hair et al. (2006) advocate loadings over 0.30 as the minimum amount of loading necessary, with loadings 0.50 considered meaningful and well-defined structures surpassing loadings of 0.7. According to Hooper (2012), loadings below 0.40 may be unreliable and should be considered for possible deletion. As a result, the final factor solution only took into account loadings greater than 0.5.

The Varimax with Kaiser Normalisation rotation was undertaken. Table 13 shows the final rotated factor matrix using a significant factor criterion of 0.50. Items 6, 15, 16 and 20 fell below the minimum and was deleted.

|    |   | <b>Component</b> |          |          |          |          |          |
|----|---|------------------|----------|----------|----------|----------|----------|
|    |   | <b>1</b>         | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> |
| 1  | ICT planning should be part of the business strategy  | 0.787            |          |          |          |          |          |
| 2  | The organisation expects staff to improve the current operational processes with the use of the new system  | 0.682            |          |          |          |          |          |
| 3  | Selected internal staff needs to be involved in the understanding and implementation of a new software solution   | 0.679            |          |          |          |          |          |
| 4  | The development of an ICT Strategy plan must be in line with the organisation's vision and mission statements   | 0.637            |          |          |          |          |          |
| 5  | ICT Core competence is important to a successful project, be it internal or external  | 0.608            |          |          |          |          |          |
| 7  | Ongoing IT skills development are essential to developing a core competence team  | 0.763            |          |          |          |          |          |
| 8  | ICT core competence is an important component in competitive advantage  | 0.719            |          |          |          |          |          |
| 9  | Developing an ICT Strategy plan in order to implement and strengthen the organisation's technology platform is needed to support the organisation in expanding its business markets | 0.715            |          |          |          |          |          |
| 10 | ICT technology is an important component in sustaining competitive advantage  | 0.699            |          |          |          |          |          |
| 11 | Non-ICT employees need to understand the broader operations of the business in relation to its IT capabilities  | 0.577            |          |          |          |          |          |
| 12 | In your organisation, ICT core competence is limited to the maintenance of the current system   | 0.752            |          |          |          |          |          |

|    |   |       |
|----|---|-------|
| 13 | The ICT team is limited to being a support department and executes small projects only upon request   | 0.734 |
| 14 | ICT Implementation and deployment of new solutions are mostly outsourced to external consultants  | 0.645 |
| 17 | The use of ICT technology is to eliminate fraudulent reporting  | 0.740 |
| 18 | Newly implemented systems ensure integrity of information and avoids depending on incorrect data  | 0.717 |
| 19 | A globally developed ICT strategy that is implemented locally ensures the use of ICT in production is up to date  | 0.527 |
| 21 | There is a lack of trust from employees when an organisation introduces a new system with employees duplicating work by using the old system while rekeying into the new system                   | 0.738 |
| 22 | The organisation does not have ICT Strategy plans   | 0.735 |
| 23 | There is a lack of priority given to automation, consolidations and integrations of data and information  | 0.652 |
| 24 | Large projects requires external consultants to assist in ICT implementation and deployments while small projects only require internal ICT staff to implement and deploy within the organisation | 0.521 |

|    |  |       |
|----|--|-------|
| 25 | There is no necessity for external consultants to assist in the ICT deployments as the systems are developed in-house because ICT team understands the business processes better than external consultants | 0.806 |
| 26 | There is no reason to outsource external experts as the internal ICT staff's skills are sufficient to maintain the current in-house solution   | 0.804 |
| 27 | There is no reason to upgrade an organisation's current technology (as it is working well) due to ICT staff's familiarity on current available technology  | 0.540 |

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalisation.  
 a. Rotation converged in 8 iterations.

Table 13 Rotated Component Matrix

#### **5.4.4. Reliability analysis**

Reliability analysis on the online survey instrument and its six dimensions were completed. Using Cronbach's alpha, the instrument was determined to be internally consistent and reliable ( $\alpha = 0.840$ ) as listed in Table 14.

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 0.840            | 27         |

Table 14 Cronbach's Reliability

#### **5.4.5. Interpretation of PCA results**

The analysis on items 1 to 5 indicates that ICT is significant as a strategic tool in attaining competitive advantage.

The replies provided by the respondents to item 7 through item 11 highlighted the need of developing skill sets and retaining an ICT core competence team.



Item 12 through item 14 highlighted the criticality in the ICT staff to be able to maintain and support the existing systems. However, the organisation's senior management preferred that new ICT deployments to be headed by outside experts as they perceive that the existing internal ICT team's capabilities and skillsets are limited to maintaining the current systems.

Item 17 to item 19 show significance and importance of accurate data and information for management to make decisions on corporate transformation operations matters.

While organisations consider ICT to be one of the key factors in achieving competitive advantage, respondents highlighted that there is an absence of strategic planning and development of an ICT Strategic Blueprint to support corporate strategies as evident in items 21 to item 24.

The development of ICT staff and technology is commonly addressed by manufacturing organisations by bringing in outside experts, as seen in item 25 to item 27. While the senior management of the manufacturing organisations are aware that the internal ICT team's responsibility is to maintain the current systems, they are also cognisant of the fact that the internal ICT resource do not fully grasp the idea of how ICT strategies and development of ICT core competence can achieve competitive advantage.

The rotated component analysis and discussion suggest the following factors can be named following the description above (see Table 15):

|   | ICT Strategic Priority | Strategy Considerations   |
|---|------------------------|---|
| 1 | Importance of ICT      | Strategic priority in gaining competitive advantage             |
| 2 | ICT Staff              | Capabilities, infrastructure maintenance and technical support  |
| 3 | Data Accuracy          | Management and decision making                                  |
| 4 | Corporate Strategy     | Strategic planning and development of ICT Strategy Blueprint    |
| 5 | External Consultants   | Use of outside experts in developing ICT staff and ICT strategy |

*Table 15 ICT Priority and Strategic Considerations*

## **5.5. Discussion And Conclusion**

This chapter covered a thorough discussion of the results from the quantitative online survey.

Phase 2's quantitative online survey reveal that Malaysian manufacturing companies recognised the importance and criticality for ICT strategy to be a component of corporate strategy. Results from the quantitative online survey have confirmed that ICT has made considerable strides in automating internal procedures, easing users' workload by minimising the number of steps required to complete tasks.

The quantitative online survey revealed that Malaysia's manufacturing organisations view in deploying successful ICT projects significantly helps in achieving business goals and having a competitive advantage over their competitors. These, however, are only feasible if the organisations create and preserve an ICT core competence. These insights stand in stark contrast to the present internal ICT resources' skill sets and competencies, which are mostly reactive to new ICT requests across different departments and generally focus on supporting and maintaining current systems. Internal ICT resources, with exposures limited to managing the existing ICT infrastructure, lack the skill sets and exposure in providing advisory services to stakeholders.

Senior management, middle management and executives are convinced that ICT strategy is a critical component to advancing corporate strategic goals. The management of Malaysian manufacturing companies, on the other hand, appears to believe that "ICT strategy" consists of technical diagrams and drawings illustrating connectivity with servers, firewalls, clouds, etc. without recognising that ICT strategic goals mirror business projects, align business requirements, and take into consideration the needs of key stakeholders.

In multinational companies, global corporate strategies are taken into consideration when developing ICT strategies. The local subsidiary ICT teams are tasked with implementing ICT initiatives directed from the global office, with external consultants serving in the principal role.

To maintain an overall sustainability of ICT investments and the development of ICT core competence, it is critical that internal ICT resources undergo professional development and an annual budget set aside for ICT investments.

The study validated two separate instruments; a qualitative face-to-face interview and a quantitative online survey in the Malaysian manufacturing sector. The background to this study is an attempt to understand the

complex interaction between ICT strategic investment, the development of core competence and competitive advantage.

Based on the results and discussion presented, this chapter has developed the overarching conclusion of this study. This has been a final analysis of the results in light of the research questions and existing literature. This study is a work-based research study that primarily seeks to understand these relationships and contribute to professional practice.

Six essential themes were distilled from the rich and descriptive data that was obtained from phase 1 and phase 2. These identified themes were: corporate strategy; competitive advantage; ICT core competence; ICT organisational capabilities; ICT project deployments; and ICT resource allocation.

Based on the interview feedbacks and online survey, the Malaysian manufacturing sector recognises the importance of ICT in attaining competitive advantage. Results from the interview instrument and survey instrument shows that ICT strategy is a key component of corporate strategy but participating as a supporting role in realising their corporate strategy. To address these critical factors in achieving competitive advantage, improve operational processes, increase profitability, and turning into a competitive differentiator, ICT strategy should be elevated to a corporate level and included as a component a corporate strategy.

# CHAPTER 6: CONCLUSION

## 6.1. Introduction

This chapter outlines the conclusions and suggestions for future research arising from this work-based mixed methods study. The study focused on corporate strategy with an ICT priority, ICT resource allocation, ICT core competence, and competitive advantage in the Malaysian manufacturing sector. The objective of the study was to gain evidence-based insight in assessing the impact of corporate strategy that prioritises ICT core competence in order to gain competitive advantage in the manufacturing sector.

More specifically the aim of this chapter is to:

- Outline the contribution of the research to professional practice.
- Report on the limitations of this study, including the research methodology.
- Outline recommendations for future research.

Chapter 1 outlines the context problem, key concepts and research questions regarding the study. It notes that corporate strategy needs to integrate ICT strategy to a corporate level with an understanding of ICT investments and developing its capabilities into a core competence that translates into competitive advantage.

Chapter 2 presented a systematic literature review of the relevant topics and concepts related to the study;

Chapter 3 outlined the research methodology deployed to answer the research questions;

Chapter 4 presented the qualitative findings from interviews and the interpretation of the findings;

Chapter 5 presented the quantitative findings from the survey and the interpretation of the findings; and

Chapter 6 summarises the conclusion from this study on underlying concepts of strategy, ICT deployment (resource allocation) and ICT core competence to achieve competitive advantage.

## **6.2. Summary Of Contributions**

The Doctor of Professional Studies (DPRS) is a work-based professional doctorate that seeks to reflect on a real-life, real-time practice issue with the intent of, principally making an original contribution to practice. The DPRS study is intended to make two further contributions; a) to the body of knowledge, and b) to the researcher's professional and personal development. The latter is based on the rationale that by engaging in scholarship in a professional context, the study makes a contribution to building capacity of the individual and therefore also professional practice as a scholarly professional.

### **6.2.1. *Contribution to the body of knowledge***

The overarching purpose of the study was gain a deeper understanding how an ICT priority of corporate strategy is implemented, and how this relates to resource allocated, developing core-competence and gaining competitive advantage in the Malaysian manufacturing sector. Specifically, the study sought to:

1. Investigate how ICT's Resource allocation (People, Process and Technology) moderates the relationship between corporate ICT strategy and the development of ICT core competence;

2. Investigate and identify deployment capabilities related to ICT core competence in deployments;
3. Identify the dimensions of ICT Core Competence following ICT deployment in the Malaysian manufacturing firms; and
4. Gain a deeper understanding of how an organisation's ICT core competence affects organisation's competitive advantage.

To achieve this, the following research questions were posed:

- RQ1. How does ICT's Resource allocation (People, Process and Technology) moderate the relationship between ICT strategy and the development of ICT core competence in the Malaysian manufacturing firms?;
- RQ2. What are the deployment capabilities related to ICT Project deployments in Malaysian manufacturing firms?;
- RQ3. What are the dimensions of ICT core competence?; and
- RQ4. What is the perceived competitive advantage associated with ICT core competence in the Malaysian manufacturing firms?

Based on the results of both the semi-structured interviews (qualitative data collection) and the survey (quantitative data collection instrument), the two sources of data were compared. In combining the two strands, the outcome answers the research questions:

6.2.1.1 Manufacturing businesses recognise the value of ICT as a competitive differentiator in response to research question 1. ICT strategy was never thought of as a part of the corporate strategy, despite the fact that both qualitative and quantitative data have proved that it is a critical element in ensuring that corporate strategy is realisable.

6.2.1.2 In response to study question 2, in order to complete ICT projects, manufacturing organisations look internally for ICT and non-ICT employees as it is anticipated that internal staff members—both IT and non-IT—understand company operations

more thoroughly compared to external consultants. Evidence, however, indicates that there is a dearth of knowledge regarding ICT strategy and how it might be leveraged to the manufacturing organisation's benefit. Due to this, top management now requires that outside consultants take the initiative in ICT project deployments.

6.2.1.3 In response to research question 3, the dimensions of ICT core competence consists of the ability of ICT employees to manage the existing systems and infrastructure, be knowledgeable about company operations and processes, and be able to use ICT as a competitive advantage over their rivals. Another way that manufacturing organisations might employ outside expertise to assist implement ICT efforts is through the engagement of external consultants.

6.2.1.4 In answering to research question 4, analysis has revealed that manufacturing organisations prioritise the development of internal ICT core competence since doing so creates competitive advantage. Core competence also cover the limited engagement of outside specialists to provide knowledge transfer to the internal ICT team.

Further, the quantitative results provided tentative empirical evidence of an underlying factorial structure underpinning the phenomenon.

The development of ICT staff and technology is commonly addressed by manufacturing organisations by bringing in outside experts, as seen in item 25 to item 27. While the senior management of the manufacturing organisations are aware that the internal ICT team's responsibility is to maintain the current systems, they are also cognisant of the fact that the internal ICT resource do not fully grasp the idea of how ICT strategies and development of ICT core competence can achieve competitive advantage.



### **6.2.2. Contribution to the Malaysian manufacturing industry**

The Malaysian manufacturing industries focus mainly in manufacturing, producing and assembling products to meet customers' demands and ensuring sufficient raw materials and strict quality controls are adhered to. The manufacturers place ICT infrastructure as part of the operational requirement to automate and manage core business processes is to enhance operational performance.

In the context of professional studies, this research makes a significant contribution to the practice area by providing empirical evidences on connecting strategy, ICT core competence and/or corporate competitive advantage. Senior management and executives need to have a deeper and more thorough grasp of what ICT strategy is and why it has to be integrated into corporate strategy in order to gain an competitive edge. New ICT initiatives that combine ICT strategy with corporate strategy are therefore important to bring about the necessary paradigm change. Therefore, this research contributes to professional practice in the following ways:

- A corporate strategic approach in acknowledging that ICT strategy is critical towards having an advantage over competitors. This provides a valuable framework for manufacturing organisations because it establishes the attributes of a holistic strategy and the linkages to achieve strategic outcomes through ICT strategy at the corporate level. In practice, most of the manufacturing organisations have not placed ICT strategy and ICT core competence at the corporate level. This is perhaps due to the understanding and common practice that ICT is purely to support administrative and operations. It is also clear that many internal ICT teams are restricted to managing their present ICT infrastructure, notwithstanding the fact that part of their duties include maintaining and ensuring the system is operating at peak efficiency.

- ICT strategy formulation process - Surveys and semi-structured interviews indicate that despite the importance of developing an ICT strategy and the need for it to be incorporated into the corporate strategy, there is a lack of understanding of what it comprises. Based on the analysed data, the current understanding of ICT strategy is related to ICT infrastructure, ICT personnel, and the impression that the ICT team's role is to meet operational demands of the manufacturing organisations. This has led to senior management seeking external experts to obtain knowledge and gain an understanding and appreciation on the objectives of ICT strategy. Another key factor which led to the senior management of the manufacturing companies to seek external consultants to develop the ICT strategy is to eliminate any biasness on the strategy requirements. Favoritism of specific ICT infrastructure or outside parties is one example of this prejudice.
- ICT strategy budgeting and resource allocation - ICT strategy covers ICT resources (people, process and technology). The development of ICT strategy is similar to the formulation of corporate strategy as part of the strategy covers ICT financial investments in technology, knowledge attainment and services. The development of an ICT strategy as a component of company strategy enables budgeting of future ICT investments essential to balance between investments and business success.
- Development of ICT core competence - Responses from the surveys and interviews noted the importance of ICT core competence in achieving competitive advantage. It is evident that internal ICT core competence plays a major role in gaining competitive advantage. Despite the importance of internal ICT core competence,

manufacturing companies engage external consultants to project manage ICT project initiatives not only due to high ICT staff turnover but new software applications necessitate consultation with software vendors to enable the manufacturing companies to adapt to the new solutions. Moreover, the use of external consultants enables knowledge transfer and the adoption of best ICT practices.

- ICT strategy on business growth – The significance of ICT as a strategic factor for organisational growth is demonstrated by the extent to which participants from phase one’s decisions to invest in ICT were linked to goals for business expansion. Based on the empirical data from phase one, businesses are inclined to associate ICT investments with corporate growth. Participants interviewed in phase one of the study consists of the upper echelon of their structure.

The study's findings have provided insight into the significance, gaps, and challenges in building ICT's core competences as well as the expectations placed on senior management on the importance of ICT strategy and realising it to be a major competitive differentiator in their individual markets.

### **6.2.3.      *Contribution to personal learning***

This thesis presents the intersect between the research and practice domains of the practitioner-researcher, as they engage in a practice-based pedagogy of work-based research and learning. Undertaking the current study has contributed to the researcher’s lifelong learning and continual professional development as an ICT Strategy consultant.

Through each phase of the doctoral journey, there has been a significant contribution to the self: in doing; knowing; being and becoming (Higgs & Trede, 2016).

Doing – Undertaking the current study has presented the opportunity for developing better judgment, analytical skills, and research techniques.

Knowing – The researcher has enhanced knowledge and understanding of ICT strategy, core competence and competitive advantage. Furthermore, high-level mixed-method research skills have been established through semi-structured interviews, survey questionnaires, multivariate statistics and thematic analysis.

Being – The culmination of six years of effort has resulted in the researcher's ability to demonstrate expertise in ICT strategy as an advanced practice professional and has seen the development and establishment of their practice as a reflective practitioner.

Becoming – The importance of evidence-based practice has been reinforced through completing this thesis. Furthermore, completing the doctoral journey is not the end of the researcher's learning but has sparked a curiosity for enhancing ICT strategy and elevating it as part of corporate strategy, and a passion for lifelong learning.

Undertaking the DPRS program has provided the researcher with opportunities to develop their reflective practice as a work-based learning method. Formal, informal and non-formal learning (Benozzo & Colley, 2012) make up the researcher's own professional learning and development journey. In completing the DPRS program, the researcher reflected on the learning objectives set at the commencement of this professional doctorate, aligned to a taxonomy of learning areas, adapted from Bloom's Taxonomy (Bloom, 1956). The Learning Objectives for this doctoral journey included:

LO1 – Intellectual Capabilities: Critically evaluate research studies associated with the integration of ICT strategy as part of corporate

strategy, ICT core competence leading to competitive advantage and reporting the evidence in a doctoral dissertation.

Reflection: My learning journey emphasises the importance on corporate strategy integration with ICT strategy is documented in this thesis. The results of the study demonstrate that having an ICT core competence improves an organisation's ability to compete, and it is anticipated that manufacturing firms and other industries would therefore review the doctoral dissertation to gain a deeper understanding and consider integrating an ICT strategy in their corporate strategies.

LO2 – Communication Capabilities: demonstrate subject matter expertise through practical communication skills, including internal and external presentations and articles for publication.

Reflection: My knowledge on the importance on the Malaysian manufacturing organisations for an ICT strategy has grown significantly as a result of the interviews conducted with phase one's participants. Using a mix of languages and dialects to communicate with the participants was a challenge for me. This demonstrates that communicating a concept well is more crucial than using a common language especially in manufacturing organisations in Malaysia. Additionally, it has shown that there is a lot more to understand what ICT strategy is, and the interview sessions have enabled them understand the objectives and advantages of incorporating ICT strategy into their corporate plan.

LO3 – Methodological Capabilities: develop a research methodology to evaluate the relationship between corporate strategy and ICT strategy.

Reflection: Even though the mixed methods research technique has a wider reach, using both a qualitative and quantitative methodology helped me better understand each, including the different types of analysis I used. I acknowledge that there is still much to learn, but I believe I have

a firm understanding of both qualitative and quantitative research methodologies at the very least.

LO4 – Intellectual Capabilities: develop and implement a work-based project focusing on core competence and resource allocation outcomes of the participating organisation.

Reflection: The use of mixed methods in research has benefited me in having a clearer understanding of the requirement for manufacturing organisations to support their internal ICT team. I have discovered features of SPSS software, which has greatly expanded my knowledge and provided me with a broader perspective on the data generated by SPSS functions. The outcome has greatly assisted me in discovering salient information on core competence and resource allocation.

LO5 – Intellectual Capabilities: contribute to the development of ICT strategy profession's body of knowledge by completing a doctoral dissertation on the relationship between corporate strategy and ICT strategy.

Reflection: Understanding and integrating corporate and ICT strategies have enhanced my intellectual capabilities as a result of the thesis' development. While there is much more to learn, the process of completing the thesis has given me greater certainty and clarity on the approach in developing ICT strategies.

### **6.3. Research Limitations**

This study added to the limited number of reported mixed methods studies in the literature pertaining to investigating ICT core competence and competitive advantage in the Malaysian manufacturing sector.

Although no research technique is perfect, possible limitations were identified before the study began and were taken into account in the study's objectives. This is in keeping with accepted research practice. Methodological limitations were also noted, and Chapter 3's methods were used to lessen the impact on overall validity and reliability.

The key limitations that apply to this exploratory mixed methods investigation are reviewed as follows:

1. Only a limited selection of the literature pertinent to the constructs that formed the theoretical foundation of this study was thoroughly examined due to the study's brief duration, cross-sectional design, and resource limitations. To advance knowledge in this field and help model improvement, a deeper analysis of the literature in relation to the final framework and significant findings is suggested.
2. In phase one of the research, convenience sampling was used. The researcher contacted the participants, which might introduce bias owing to individual experiences and viewpoints. Consequently, the participants may not be representative of the population leading to generalisations. This study was not intended to explain causality and the generalisability to other populations. The purpose of this study did not seek to establish causation or the applicability to other populations. In accordance with the stated objectives and research questions, it was limited to the local level. This study limits its generalisations to the local level as a consequence (State of Selangor and Kuala Lumpur). The rigour of future studies could be improved by increasing the sample size using purposive sampling.
3. Participants from phase one were identified by the researcher with participation being voluntary. This approach has a limitation that, within the desired sample frame, participants who consent to participate may not be the same as those who decline, resulting in self-

selection bias. Robinson (2014) claims that it is impossible to avoid this bias in interview research and that it is important to take into account and recognise the possibility that it will have an influence on how generalisable the findings are.

4. The intended sample size for phase two of this investigation was not reached. Despite using multiple methods to expand the sample size, this was due to the difficulties in recruiting participants since the sample population could not be reached entirely. This issue influences the sample's level of homogeneity and, in turn, the population's representativeness, which is a well-known concern in organisational and business research. Due to this, it became less feasible to develop theories and validate the utilised instrument using Exploratory Factor analysis. Future discipline-specific research and participant recruitment efforts in collaboration with an employer, employee, or research organisation might address this restriction on attaining a more comprehensive sample frame and meeting sampling quotas. This could involve offering incentives for involvement, which has been proven to be one way to increase engagement.
  
5. Communication challenges about the use of English have emerged in phase one between the researcher and interview participants. English has never been a common language used in Malaysian manufacturing organisations other than written correspondences to external stakeholders such as suppliers, customers and other partners. There have always been a mix of different languages and dialects used in Malaysian manufacturing business community. Hence the researcher has an added effort in explaining terms such as 'core competence' and 'competitive advantage' to the participants during interview sessions in order for better understanding of their meanings and applications. However, different participants interpret 'core competence' or



'kecekapan teras' in Malay language according to their own environment.

6. Oxford dictionary define the word 'advisory' as 'having or consisting in the power to make recommendations but not to take action enforcing them'. In advisory practice, 'advisory' is the practice of assisting a client to improve their systems and processes over time. The management expects that internal ICT resources would not only provide ICT advisory services but also realise and implement the suggestions, despite the fact that they lack the necessary skill sets. The number of recommendations may thus be limited by ICT resources given that they must also carry out the recommendations. The researcher therefore had to consider the underlying assumptions of the views of participants that advisory is not purely as what the intended meaning is to be.

#### **6.4. Opportunities for future research**

Based on the findings of this study, and taking into consideration the limitations presented above, the following opportunities for future research are proposed:

- To reach greater conclusions on the topic of ICT strategy, ICT core competence, ICT resource allocation and competitive advantage, further studies can be conducted on professional firms who have the opportunity to service manufacturing clients in the area of development of ICT Strategy Blueprints, implementation of various technology based solutions and/or business process reengineering. Undertaking research on these firms will provide differing views which will allow future researchers the opportunity of proposing improvements to the Malaysian manufacturing sector;

- The Malaysian government has embarked on various initiatives to encourage Malaysian manufacturers to embrace Industrial Revolution 4.0 (IR4.0) to automate processes and reduce dependencies on foreign workers. In line with the government's National 4IR Policy effort, it is aligned with the Malaysian National Policy on Science, Technology and Innovation (DSTIN) 2021-2030, to optimise production output (OEE) and reduce costs (TCO) that aims to develop Malaysia as a high-tech nation by 2030. Future studies can investigate various IR4.0 technologies such as sensing, blockchain, augmented reality, automation and robotics and the use of additive manufacturing in the future.

## **6.5. Conclusion**

The results of the study reinforce evidence that Malaysian manufacturing companies look at the development of ICT core competence and ICT resources as a key component in driving the organisation's corporate strategy. Acknowledgement by the manufacturing organisations' senior management investing in ICT resources (people, process and technology) and allocating an annual budget play a major part in up-skilling ICT resources and developing core competence. The study shows strong evidence of senior management's support, backing and validation of exploiting ICT strategy across all business areas.

Moving forward, the researcher hopes to continue researching the application of IR4.0 in the Malaysian manufacturing sector and other industries and how components of IR4.0 compliment and replace routine, rule-based, and repetitive human tasks.

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## **Appendix A: Semi-structured interview questions**

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- RQ1 How does ICT's Resource allocation (People, Process and Technology) moderate the relationship between ICT strategy and the development of ICT core competence in the Malaysian manufacturing firms?
- RQ2 What are the deployment capabilities related to ICT Project deployments in Malaysian manufacturing firms?
- RQ3 What are the dimensions of ICT core competence?
- RQ4 What is the perceived competitive advantage associated with ICT core competence in the Malaysian manufacturing firms?
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