Technology Cost For Decentralized Manufacturing SMEs Within The Perspective of IR4.0

by

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ABSTRAK

Cabaran yang paling banyak dihadapi oleh pengilangan SME ialah mereka kekurangan sumber dalam perniagaan mereka. SME dan termasuklah perniagaan baru ke dalam pasaran, mereka mungkin menggunakan tenaga kerja sebagai permulaan perniagaan mereka. Seperti yang kita tahu bahawa pelaksanaan teknologi baru sentiasa dilaksanakan oleh syarikat besar. Mereka mempunyai sumber yang kukuh seperti kewangan. Penerimaan atau pelaksanaan teknologi ke dalam SME agak sukar kerana mereka mempunyai kekurangan sumber, mereka mempunyai masalah dalam pelaksanaan teknologi, bersama-sama dengan isu pasaran. Tujuan kajian ini adalah untuk memahami tentang Kos Teknologi dalam industri pembuatan SME yang membawa kepada pertumbuhan mampan perniagaan. Oleh itu, tujuan kajian ini dilaksanakan adalah untuk meneroka pengetahuan yang lebih mendalam antara pelaksanaan teknologi dan prestasi perniagaan dalam pembuatan terutamanya sector SME. Seterusnya adalah untuk mendapatkan pemahaman yang mendalam tentang kesalinghubungan antara kos teknologi dan prestasi perniagaan. Kajian ini dijalankan dalam kaedah kajian kualitatif dengan melakukan tinjauan skematik dan analisis tematik. Sampel “purposive” antara sampel yang dipilih dengan memberi lebih tumpuan kepada mereka yang mempunyai latar belakang dalam bidang pembuatan dan mengadakan sesi temu duga melalui dalam talian.

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ABSTRACT

The most challenge that has been faced by SME manufacturing is the lack of resources. SMEs are the new entrants into the market, they might use the manpower as the beginning of their business. As we know that the implementation of the new technologies always is implemented by the big company. They have a strong resource like financial. The adoption or the implementation of technologies in the SMEs is quite difficult because they are having lack resources, they have issues with the implementation of technologies, together with the market issues. The aim of this study is to understand the Technology Cost in manufacturing SMEs that lead to the business sustainable growth. Hence, to explore insightful knowledge between the implementation of technologies and business performance in manufacturing. Next is to gain an in-depth understanding of interlinkages between technology cost and business performance. This study was conducted under the qualitative research method by having a schematic review and thematic analysis. A purposive sample was chosen by focusing on a manufacturing background and having an interview session online.

CHAPTER 1 : INTRODUCTION

1.1 Overview

This study is beginning with the background of the study that explain more in terms of Technology Cost in the manufacturing sector by implementing the Industry Revolution 4.0 (IR4.0). This chapter continues with the problem statement, research questions, research objectives, research gap, significance of the study, scope and limitations.

1.2 Background of the study

Any organization has a unique culture, and there is no such thing as a specific strategy to IT budgeting. What is clear is the benefit that technology will provide to organisations of all sizes. While being perceived as an operational expenditure, it must be viewed as an essential component of any good company strategy, when it is handled well it may help to boost revenue, entertain consumers, and accomplish a variety among other business objectives (Dantas et al., 2021).

According to Jaegar and Upadhyay (2020), there are various challenges in implementing IR4.0 into the manufacturing sector, especially in SMEs. The key focus that affects the initial investment is the target organization's technology capabilities. From an economic perspective, it is still in the early stages; this lack of clarity on the analysis of cost-benefit and financial returns on digital initiatives is a critical obstacle to IR4.0 adoption.

Regarding Abdul (2010) and Hassan & Talib (2011), in terms of economic, social, and technological development, SMEs play a critical part in Malaysia's development. It generates jobs, infrastructure, business possibilities, innovative ideas, and economic progress First and foremost, the sector is an important engine in the manufacturing industry, consisting of multinational corporations and small and medium-sized enterprises (SMEs), and failing to pay attention to these employees in this sector will potentially ruin the productivity, employability, and economic growth.

Small and medium enterprises (SMEs) are companies with sales, assets, or personnel that fall below a specific level. A small and medium-sized firm (SME) is defined differently in each nation (SME). Certain size requirements must be satisfied, and the industry in which the firm works may also be considered (Liberto Daniel, 2020). Small and medium-sized enterprises (SMEs) also are the backbone of the Asian economy. They account for more than 96% of all Asian enterprises and provide two out of every three hirings and promotions in the country. As a result, having fully functional support measures for SMEs is critical for the economic progress of Asian economies (Matt et al., 2020)

IR4.0 enables rapid responsiveness to client needs which is now achievable. It increases the production process's flexibility, efficiency, productivity, and integrity. It also creates the groundwork for the implementation of improved business strategies, manufacturing methods, and other advances. As more industrial manufacturers invest in Industry 4.0 technology to improve and modify their goods, this will enable a new degree of mass customization (Agostini & Nosella, 2020).

The previous revolutions gave huge productivity gains and growth for the economy, but the products were largely not much affected radically. However, Industry 4.0 implementation will create products wherein IT is an integral part of every product. The obstruction to new entrants will also be determined by the marketplaces where competitors have developed vertical, horizontal, and end-to-end integration. As a result of high-end automation, computing improvements, and business strategy integration mechanisms used by firms, it would be difficult for new entrants to enter such high-barrier industries (Lichtblau et al., 2015).

To implement this design, a large amount of hardware, software, and other associated integration software must be installed. The cost might be set for the initial installation and training, and variable for operations and maintenance. Although the deployment of such structures necessitates significant initial costs. However, if intelligence is incorporated into goods and processes, the costs will fall dramatically. Fewer quality issues, reduced material waste, and lower labour and operational expenses are some of the elements that will affect cost reduction (Smith Jack, 2020)

Technology cost is about helping the manufacturer or MSMEs in reducing the cost through the implementation of automation for the production level. It involves the hardware, and software, together with the licenses for the business that they need to require for their operation. This is included together with the product life cycle, management cycle, replacement, and administrative cost. In technology cost, automation takes that component out of tasks like data reporting. Instead of that, it has a large volume of work, or they just make a simple mistake of data entry (Judge Gurmeet, 2019).

1.3 Problem Statement

Technology advances in Internet of Things (IoT), Virtual Reality (VR), Augmented Reality (AR), quantum computing, and artificial intelligence (AI); technical modification in science and engineering in nanotech and 3D printing; and biological modification in engineering, robotic surgery, implants, and wearable technologies all have developmental roots. Innovations also become reality and enter most use only when specific materials, physical, computation and commercial pricing aspects are accessible and correctly matched (Wamba-Taguimdje et al., 2020).

The adoption or the implementation of technologies into the SMEs is quite difficult because they are having a lack or resource, they have an issues in the implementation of technologies, together with the market issues (Bonnín Roca et al., 2019). As most of them are the new entrants into the market, they might use the manpower as the beginning of their business. As we know that the implementation of the new technologies always be implemented by the big company. They have a strong resource like a financial (Agostini & Nosella, 2020).

Figure 1.1 Annual Percentage of SMEs GDP

Source: Department of Statistics Malaysia

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According to the Figure 1.1 that shows the statistical from the Department of Statistic Malaysia (DOSM) the annual percentage change of SMEs GDP by Kind of Economic Activity for 2018 to 2020 at constant price of 2015, SMEs' value added expanded at a negative rate of 2.9% in 2019, dropping from 4.5% in the previous year. Negative rates of growth and economic recession are also characterized by a drop in real income, more unemployment, decreased industrial production, and a drop in wholesale or retail sales. However, the current situation of the economy might be deceiving when it comes to determine whether negative growth is occurring (Hayes Adam, 2020).

Manufacturing businesses are struggling to improve their abilities owing to a lack of awareness of the necessary skills, talents, and information for Industry 4.0. Because of the cheaper labor costs, local manufacturers continue to use low-skilled immigrant labor. Furthermore, Industry 4.0 emphasizes connection and the application of modern technology. However, according to the draught, the usage of automation is less than 50% in most local industrial firms. In industrialized nations, SMEs use information and communication technology (ICT) at a rate of at least 50%, however in Malaysia, SMEs use ICT at a rate of approximately 10% (Ling et al., 2020).

Since manufacturing is one of the contributors to national GDP, Industry 4.0 is only now beginning to emerge in Malaysia's manufacturing industry. Industry 4.0 is a relatively new idea; Malaysian firms may lack understanding about the precise implications and cost-effectiveness of Industry 4.0-related technologies on their company. Furthermore, a lack of technological infrastructures and facilities, as well as a highly qualified labor and resources, provide hurdles or impediments to Malaysian manufacturing companies implementing Industry 4.0 (Ling et al., 2020).

The aim for this study is to have the understanding on the Technology Cost practices in the manufacturing sector. Instead of that. The costing will come from the effect of the implementation of new technologies into the manufacturing industry. In this study also, will explore insightful the knowledge between the implementation technologies and the business performance together with the in-depth understanding technology cost that may lead to the business performance.

1.4 Research Questions

The purpose of the study was addressed by answering the following questions:

a) What is Technology Cost practice in manufacturing SMEs?

b) How can the Technology Cost benefit the manufacturing SMEs business performance?

c) Is there any interlink between the implementation of technology to the manufacturing SMEs performance?

1.5 Research Objectives

The general purpose of this study was to document to the manufacturing SMEs sector. The basic of IR4.0 already known, and it have their own specialty and expertise. To know in detail about this study, there are several purpose of this study been purposed. Below is the following purpose of the study:

a) To understand the Technology Cost practice in manufacturing SMEs that lead to the business sustainable growth.

b) To explore insightful knowledge between the implementation of technologies and business performance in manufacturing.

c) To gain an in-depth understanding of interlinkages between technology cost and business performance.

1.6 Research Gap

The fundamental of Technology Cost is the integration of the technology management and the cost management in the company. The implementation of a new revolution in the industry will be a new things to the Malaysia industry. As we know that industry manufacturing in Malaysia does not truly have the readiness in implementing the IR4.0 due to the lack of economic resources for them. The economical resource will be the hardest for SMEs to consider in implementing the IR4.0 in their manufacturing sector. According to the previous research, most of the author mentions that implementing the IR4.0 in SMEs manufacturing sector needs a high cost. But the effectiveness of implementing IR4.0 will help also the companies to reduce the cost of labour.

1.7 Significant Of The Study

The significant of this study is to explore the effectiveness by implementing the IR4.0 to the manufacturing sector among SMEs company. Some significant also might

the explanation of fundamental Industrial Revolution 4.0, the relationship between the implementation of technology in the manufacturing sector and the business performance. This study, will explore more the technology cost practice that has been implemented in the manufacturing sector and the effect of the changes in business activities.

1.8 Scope And Limitation

The scope of this study is to understand the concept of Technology Cost and to know the in-depth the relationship between Technology Cost to the business performance. As in the era if the usage of Industrial Revolution 4.0, the costing is important to the manufacturing, especially SMEs. Those organizations still did not have enough resources for them to simply implement the technology in their manufacturing.

The forecasting cost is important to guide or track the cost for their expenditure. Instead of that, the limitation of this study is lacking of information about the technology cost. Most of the journal article were explained more about the manufacturing cost and effect of the manufacturing cost to the business performance and business sustainability. The implementation of the technology of Industrial Revolution 4.0 has also been explained in this study. The effect of the implementation of the technology on business performance.

1.9 Summary

This study is structured into five chapters. Chapter 1 represent to the introduction that followed by the problem statement, purpose of the study, research question and

organization of the study. Then, it follows by the chapter two that represent to the literature review. In the second chapter, it will be included with the terms, phrases definition, previous researcher findings etc. Chapter three is the design of the study that has the theoretical framework, data sampling, procedure, and size of the study together with the instrumentation and research method and will be followed by Chapter four and Chapter five.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

In the edge of a technology revolution that would drastically change on how humans live, earn, and interact each other. The shift will be truly unique society has ever seen in terms of magnitude, scope, and intelligence. The three reasons why current revolutions reflect not simply a duration of the 3rd Industrial Revolution and therefore the entrance of a 4th revolution and diverse one: motion, context, and systems impact. The present rate of innovations is unprecedented in history.

As compared to previous industrial revolutions, the 4th revolution is progressing at an expanding instead of a linear rate. Furthermore, it is affecting practically every industry throughout every country. As well as the scope and complexity of these changes signal the evolution of whole production, strategic planning, and governance systems. Towards the coming decade, technology developments will result in a procurement surprise, featuring long-term benefits in performance and efficiency. Communication and transport expenditures will be decreased, logistics and production networks might become more efficient, and trade costs will fall, creating new opportunities and driving economic development.

Successful transformations begin with taking the time to scan the business, understand cost drivers, and find cost-cutting possibilities. Firms will use various criteria to prioritise these possibilities, but in most circumstances, they will want to start with a few simple victories to gain momentum. In any situation, the managers of the cost

reformation must put the business's readiness for change to the test in order to secure agreement as they start moving (Shah Sachin et al., 2021).

Equity is the most serious societal worry related with the 4th Industrial Revolution, it expected to be a major economic concern. As a result, one of the key reasons why salaries in high-income nations have remained, if not declined, for the majority of the nation is that the demand for highly qualified individuals has grown while the number of youths with less education and lower abilities has decreased (Wouters et al., 2016a). As a result, there is significant demand at the top and minimal levels of the employment market, but empirical studies have been carried out in the centre.

A big organization doesn't have to worry about making large expenditures, and they're adaptable enough to remain competitive in the market. Whereas, small and medium enterprises have constraints of adding large investments. It can be abandoned over in the marketplace because they may not be able to cope pace well with transformation. As a result, it is vital for them to develop their own plans for integrating IR4.0 at the right moment .

2.2 Industrial Revolution 4.0

Current revolution of industry that been implemented by our industry especially in manufacturing is Industrial Revolution 4.0. Production lines which already include computing technology being enhanced by a network link and it will enable interaction with the other equipment as well as the production of data for itself (Schwab Klaus, 2018). That will be the next phase in the automation of production. All systems networking leads to "*cyber-physical system (CPS)*" and hence smart manufacturing, whereby manufacturing systems, elements, and people interact via a connection and output is practically fully independent (Othman & Zaidi, 2021).

Unlike the 1st Industrial Revolution, which relied on water and steam power to automate manufacturing, the 2nd Industrial Revolution emphasised the use of electricity to achieve mass production. Electronics and information technology are at the heart of the 3rd Industrial Revolution, which has already given rise to the Industrial Revolution 4.0 (IR4.0). But, unlike the last revolution, IR4.0 is about allowing technology access to your body, decoding your thoughts, and unlocking your mind's black box. Automation has been replaced by a cyber-physical systems in IR4.0 (Verma Shalini, 2022).

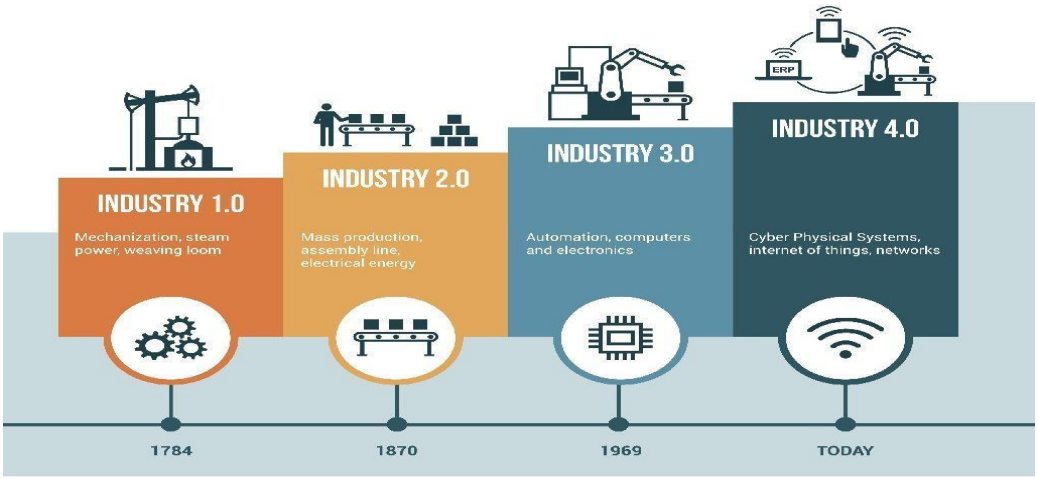

Figure 2.1 Timeline of Industrial Revolution

Source: We The Greek (wethegreek.com)

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Industrial Revolution marked the move from handcrafting items to the use of machinery. Scholars disagree exactly when it began and ended, although it typically lasted from 1760 until 1840. According to these, the major historical shift is concerned for a rise in population, an increasing in living conditions, and the establishment of the capitalist system. By look up at the other country, the development or the implementation of the IR4.0 in their industry is almost fully implemented and shows the positive feedback. From the observation by the other country, it lead to the question of Malaysian Industry. Did Mthe alaysian industry ready for the implementation of these technology on the IR4.0? Especially in SMEs manufacturing industry. As been mention before, that large company nothing much worry about this implementation in their factory.

Malaysia is faced with both internal and foreign issues. Some researchers observe that in order for Malaysia's digital economy to thrive, Malaysian firms must adapt to rapid

technological developments that impact how enterprises function. To remain competitive, businesses must accept change (Lee Racheal, 2020). The growth of IR4.0 in the manufacturing industry in Malaysia is sluggish. It is still in the range between Industrial Revolution 2.0 and Industrial Revolution 3.0 for the manufacturing sector (Ling et al., 2020).

According to Othman & Zaidi (2021) they shared some perspective of the government from US, Germany, the UK, South Korea, China, Japan and the other country that already do their amounts of billions to invest in the leading-edge technological innovation to guide the upcoming generation of the industry. Nationwide debates, development prospects and initiatives, congresses, forums, and exhibits are organised all over the world to inspire a new business model, particularly in manufacturing.

2.3 Technology Cost

The industry necessity to provide advanced computing product at the least cost rate requires the linkage between technology management and cost accounting. Technology should be seen as possible sources of innovation since they have a significant impact on the financial level and cost structure with processes and products. In analysing goods and operations from the standpoint of technologies, a suitable expansion of the business strategy of cost controlling to long-term cost management may be added (Smith Jack, 2020).

As the current situation in worldwide which is in pandemic, one of the research state that by having the budget of the technology will help in increasing the revenue of the business, especially SMEs up to 42%. Instead of that, the enhancement of the business strength is the next reason for the Technology Budget in the organization (Electric, 2021). Organizations that budget their Technology expenses depending on their demands and the evolving market landscape will achieve success in a competitive and uncertain business climate. Those who do not plan for the future of technology will fall behind. The budgeting of the Technology Cost will guide the organization for the technology expenses and reduce the consequences of having a failure in technologies. This Technology Cost Budgeting will help in saving the cost and would have some contingencies expenses (Bonnín Roca et al., 2019).

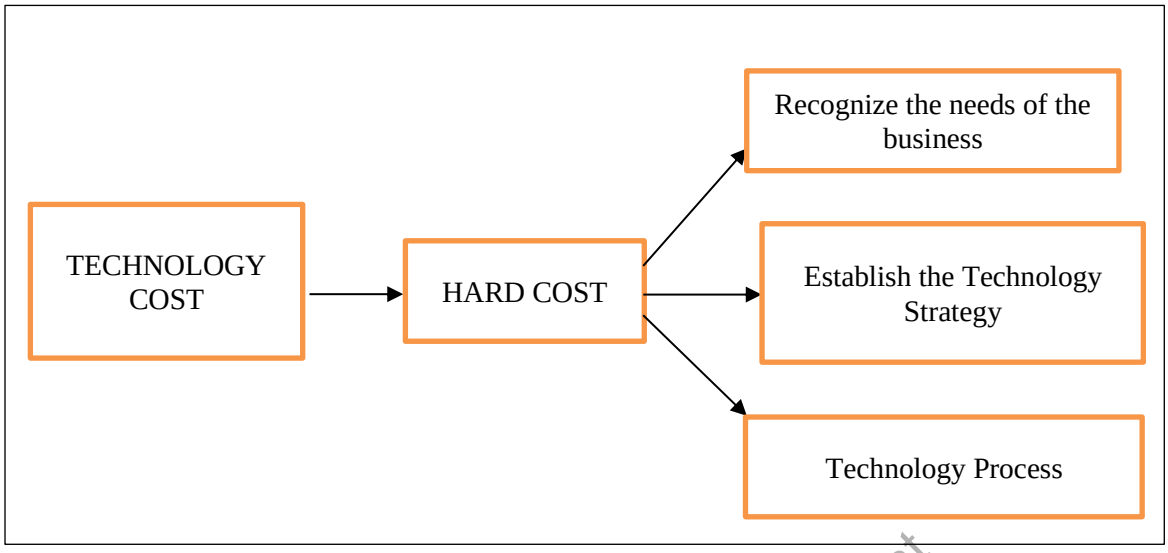

Figure 2.2 Summary of the Technology Cost

The cost of technology is about the amount that been spent in an organization including the remuneration for the professional and expenses of the maintenance and also the services (Mary K. Pratt, 2015). The studies founded that up to 35% of the organization expenses regarding on the technology is controlled by the business divisions. The understanding of these cost is important for the SMEs to know how this cost will helps their businesses. It might appear by giving a benefits to the SMEs but it also can appear by giving a bad perspective to the SMEs (Mary K. Pratt, 2015)

Most of the enterprise, especially SMEs need to understand the breakdown of the Technology Cost, it is because the it will completely will give a big impact to the business and the costing budget for the companies (Judge Gurmeet, 2019). The author mentioned that by considering the items in calculating and understanding the hard cost in the Technology Cost. the cost is included together with all equipment, programming, and licencing necessary for operations of the company, as well as product life cycle management, maintenance, and general expenses.