# REVIEW ON THE IMPLEMENTATION OF FOURTH INDUSTRIAL REVOLUTION (IR4.0) IN MALAYSIAN INDUSTRIES

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## DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.....(Abdul Malik Bin Mohd Sahshidi)

Date ..... (12/7/2021)

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by giving explicit references.

Bibliography/references are appended.

Signed.....(Abdul Malik Bin Mohd Sahshidi)

Date ..... (12/7/2021)

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for interlibrary loan, and for the title and summary to be made available outside organizations.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| AI | Artificial Intelligence |
| AM | Advanced Materials |
| AR | Augmented Reality |
| BDA | Big Data Analytics |
| DI | Data Integration |
| EAI | Enterprise Application Integration |
| EDI | Electronic Document Integration |
| FYP | Final Year Project |
| IR | Industrial Revolution |
| USM | Universiti Sains Malaysia |

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# KAJIAN SEMULA PELAKSANAAN REVOLUSI PERINDUSTRIAN KEEMPAT (IR4.0) DALAM INDUSTRI MALAYSIA

## ABSTRAK

Revolusi Perindustrian Keempat merupakan penambah baik daripada Revolusi Perindustrian Ketiga. Revolusi Perindustrian Keempat atau IR 4.0 berlaku kerana inovasi pelbagai jenis teknologi membantu meningkatkan pengeluaran industri. Justeru, Malaysia mengambil usaha melaksanakan IR4.0 kepada industri dengan dasar negara iaitu Industry4WRD. Oleh itu, daripada kertas penyelidikan ini, objektifnya adalah untuk menjalankan sama ada IR 4.0 digunakan di industri di Malaysia.Selain itu, saya telah menyiasat sama ada inisiatif Kerajaan Malaysia memberi impak yang akan membangunkan kemajuan Revolusi Perindustrian Keempat (IR4.0) kepada industri. Dengan tinjauan soal selidik, yang merupakan jenis metodologi ini, saya mendapat hasil di mana pelaksanaan IR4.0 dalam industri ini dicapai pada 79.9% di mana Internet benda (IoT) adalah penggunaan teknologi yang paling banyak digunakan dalam industri di Malaysia.Kemudian, untuk objektif kedua, saya dapat menyimpulkan bahawa 79.25% responden bersetuju bahawa inisiatif Kerajaan Malaysia memberi kesan yang akan membangunkan kemajuan Revolusi Perindustrian Keempat (IR4.0) kepada industri. Akhir sekali, kertas penyelidikan ini boleh dikaji semula untuk melakukan beberapa penambahbaikan untuk penyelidikan masa depan.

**Kata Kunci:** Industri 4.0, pelaksanaan, industri, Malaysia, Revolusi Perindustrian Keempat, IR4.0, Industry4WRD

# REVIEW ON THE IMPLEMENTATION OF FOURTH INDUSTRIAL REVOLUTION (IR4.0) IN MALAYSIAN INDUSTRIES


## ABSTRACT

The Fourth Industrial Revolution has been improved from the Third Industrial Revolution. The Fourth Industrial Revolution or IR 4.0 happens as the innovations of many types of technology helps to improve the production of the industry. Hence, Malaysia takes the effort to applies IR4.0 to the industry with the national policy that is Industry4WRD. Thus, from this research paper, the objectives are to conduct whether IR 4.0 is applied at industries in Malaysia. Besides, I had investigated whether the Malaysia Government initiative give the impact that will develop the progress of the Fourth Industrial Revolution (IR4.0) to the industries. With the questionnaire survey, which is this type of methodology, I obtain the result where the implementation of IR4.0 in the industries is achieved at 79.9% where the Internet of Things (IoT) is the most useful of the technology is applied in the industries in Malaysia. Then, for the second objective, I can conclude that 79.25% of the respondents agreed that the Malaysian Government initiative gives the impact that will develop the progress of the Fourth Industrial Revolution (IR4.0) to the industries. Lastly, this research paper can be reviewed to do some improvement for future research.



**Keywords:** Industry 4.0, implementation, industry, Malaysia, Fourth Industrial Revolution, IR4.0, Industry4WRD

# CHAPTER 1

# INTRODUCTION

## 1.1 Background Study

The First Industrial Revolution began in the 18th century with the use of steam power and automation in manufacturing. The automated version can create three times the volume in the same amount of time as threads produced on ordinary spinning wheels. Steam power's applications at the time were aimed at increasing human profit. Moreover, steam motors might be used to power weaving looms rather than muscle-powered looms. With the advancement of technology, such as the steam-controlled train, people and goods were able to travel vast distances in less time.

Then, in the nineteenth century, the Second Industrial Revolution began with the discovery of electricity and assembly line production. Henry Ford, for example, began large-scale production in a Chicago slaughterhouse. When the pigs were swung off the transport lines, the procedure began, and each butcher performed only a fraction of the killing work. He applied these concepts to the manufacturing of automobiles, significantly altering the industry. Previously, a whole automobile was constructed at a single station; currently, automobiles are built-in partial phases on a conveyor belt, which is faster and less expensive.

Partially automating processes using memory-programmable controllers and computers launched the Third Industrial Revolution in the 1970s. After all, these technologies have laid the groundwork for us to be able to fully automate a manufacturing process without the need for human intervention. Take, for example, robots that follow pre-programmed instructions without the need for human involvement. The Fourth Industrial Revolution is taking shape right now. This is referred to as "Industry 4.0," and it is defined as the application of data and

correspondence advancements to industry. It builds on the advances made during the Third Industrial Revolution. Furthermore, manufacturing systems using computer technology are enhanced by a network connection and have a digital twin on the Internet. These enable contact with various facilities as well as the collection of information about themselves. All the system management results in "cyber-physical production systems" (CPS) and, as a result, smart factories and the production is almost autonomous [1].

Because the Fourth Industrial Revolution (IR 4.0) has extended to other countries, this is the case. For example, leaders in global manufacturing industries such as the United States, Japan, and Germany view Industry 4.0 as an opportunity rather than a danger, even though some businesses are wary of the difficulty of redefining industry borders. Asian nations near Malaysia, such as Singapore and China, have also affected the rise of Industry 4.0. The Smart Industry Preparedness Index, for example, was created by the Singapore Economic Development Board to assist businesses in taking the first step toward Industry 4.0 adoption by measuring their current preparedness [2].

Furthermore, the Chinese government has established the "Made in China 2025" initiative to assist the country's industries in transitioning to a high-tech mode and competing in the global market. Because Industry 4.0 is such a novel idea, Malaysian businesses may be unaware of the precise implications and cost-effectiveness of Industry 4.0-related technology [3].

As a result, the Malaysian government has established Malaysia's National Policy on Industry 4.0, or Industry4WRD, which aims to change our manufacturing industry and related services completely, as well as assist in assessing their readiness and gaining access to government financing and grants [4].

## 1.2 Problem Statement

Based on the literature review, shows that several studies have been done on review on the Implementation of the Fourth Industrial Revolution (IR4.0) in industry. However, most studies have no report on how the Fourth Industrial Revolution (IR4.0) that are currently available in Malaysia and things that the Malaysian Government need to be consider improving Industrial Revolution 4.0 (IR 4.0). Hence, the purpose of this present research paper is to scrutinize the present status of the Fourth Industrial Revolution (IR4.0) that was emphasized in the industries and by the Malaysia Government initiative. Besides, from this research paper, I want to determine whether the Malaysia Government initiative give the impact that will advance the progress of the Fourth Industrial Revolution (IR4.0) to the industries.

## 1.3 Objectives

Based on the problem statement, the objectives of this present research paper are to carefully examine the present status of the Fourth Industrial Revolution (IR4.0) that was emphasized on the industries and by the Malaysia Government initiative towards the industry. Besides, from this research paper, I want to determine whether the Malaysia Government initiative give the impact that will advance the progress of the Fourth Industrial Revolution (IR4.0) to the industries.

## 1.4 The Scope of The Project

To achieve these objectives, I need to create the online survey which is a structural questionnaire about the implementation of Fourth Industrial Revolution (IR4.0) and the impact of the Malaysia Government initiative that target the respondents from the various industry in Malaysia. Based on that, I will obtain the

results and be able to analyze the data's reliability and validity by using The Statistical Package for Social Science (SPSS). From there, I can conclude whether the industry implies the Fourth Industrial Revolution (IR4.0) and whether the Malaysia Government initiative gives the impact that will develop the progress of the Fourth Industrial Revolution (IR4.0) to the industries.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

In my literature research, I came across some good explanatory literature on Industry 4.0. The phrase "Industries 4.0" was coined by the German Federal Government in 2011 to characterize a government-sponsored industrial endeavor aiming at digitalization and automation to maintain industrial sustainability in a competitive global market [5]. Industry 4.0 is a term that refers to a set of advanced technologies and digitalization concepts that are being utilized to organize value chains [6]. Adoption of Industry 4.0 takes place in stages. Consequently, key elements of Industry 4.0, such as big data and analytics, autonomous robots, simulation, horizontal and vertical system integration, internet of things (IoT), cloud computing, cybersecurity, additive manufacturing, and augmented reality, can be comprehended [7]. As Industry 4.0 evolves, machine-to-machine components, cyber-physical systems (CPS), autonomous vehicles, biotechnologies, nanotechnologies, energy storage, and quantum will all play a role in guaranteeing connection and communication [8].

## 2.2 Pillar of enabling technologies for the adoption of IR4.0

The Fourth Industrial Revolution is made up of nine major pillars, which are new technologies used by manufacturers to improve all areas of their operations. Whether or whether you operate in the manufacturing industry, these pillars should be familiarized since they are expected to have a substantial impact on all industries and society [9]. Table 2.2.1 below describes the pillar of enabling technologies for the adoption of IR4.0 [10].

| No. Pillar | Description |
|---|---|
| 1. Additive manufacturing | Using 3D printing technology to create a product out of novel materials. Making artificial bone from composite materials, for example. |
| 2. Artificial intelligence (AI) | Machine learning is used to create computer programs that can train an actuator/robot to do a task as specified by the programmer. Artificial intelligence (AI) can be used to create a smart plant factory, in which data from supply chains, design teams, manufacturing lines, and quality control is linked to creating a highly integrated and intelligent system. |
| 3. Big data analytics (BDA) | Data acquired by sensors is analyzed, and the trend of the data is observed to make real-time decisions. BDA can be used to improve product quality, energy efficiency, and maintenance forecasting. |
| 4. Advanced materials | New materials and nanostructured components with improved durability and strength are being developed. Material having good form preservation and thermoelectric efficiency, for example. |
| 5. Cybersecurity | Many sectors' communication levels are growing increasingly complex and intertwined. As a result, digital security becomes a key component in preventing outsiders from hacking any online system. |
| 6. Simulation | Engineers use simulation to forecast how a product will behave under certain scenarios. Simulation is used in the field to anticipate crop output owing to a variety of agronomical methods and meteorological conditions. The goal of the simulation is to identify the best technique to grow a crop. |
| 7. Cloud computing | Small businesses can now rent cloud computing services to use cloud-based product design, simulation, AI, and big data solutions to boost their output, thanks to the availability of cloud computing systems. |
| 8. Augmented reality | Part replacement instructions can be delivered to maintenance personnel in the field via augmented reality. |
| 9.Internet of things (IoT) | IoT is a platform that allows multiple sensors to be connected at the same time. AI and big data can be used with IoT to create autonomous systems that can revolutionize crop production. |
| 10. Autonomous robots | Drones and unmanned tractors are examples of autonomous robots that can carry out tasks according to a |

| | |
|---|---|
| | pre-programmed order. Autonomous robots can think, act, and react in the same way as humans do. |
| 11. System integration | System integration is designed to allow industry participants to share data and information. The system exists both within and across numerous value chains in the sector. |

Table 2.2.1 Pillar of enabling technologies for the adoption of IR4.0 [10].

## 2.3 Implementation IR 4.0 in industry Malaysia

According to earlier research, Malaysia's manufacturing sectors are somewhere between Industry 2.0 and 3.0 in terms of industrial revolution implementation. Table 2.2.1 shows that small and medium enterprises (SMEs) account for 98.5 percent of the total 49101 businesses in Malaysia's manufacturing sector, while big businesses account for 1403 [11]. The bulk of manufacturing industries in Malaysia are SMEs. In 2018, SMEs employed 59 percent of the country's workforce and contributed 38.3 percent of the country's gross domestic output [12]. It will be a national tragedy if SMEs are oblivious of the need of comprehending Industry 4.0 to enhance their industrial competitiveness in the future [13]. Industry 4.0 is a concept that just 30% of Malaysian manufacturers are aware of [14]. While manufacturers recognize the need for Industry 4.0 for future growth and competitiveness, the level of preparation for implementation varies considerably by country, industry, and even individual business. Nonetheless, a sizable number of Malaysian executives are looking forward to the arrival of the fourth industrial revolution [15]. According to the Global Competitiveness Index 2017-2018, Malaysia has improved its global competitiveness rating from 25th (2016-2017) to 23rd (2017-2018) out of 137 global economies. Among the 17 economies in East Asia and the Pacific, Malaysia ranks ahead of Korea Republic (26), China (27), Thailand (32), and Indonesia (36). Malaysia's manufacturing industry accounted for 23% of the country's gross domestic output (GDP) [16]. Despite the lack of familiarity with Industry 4.0, Malaysia maintains a stable and competitive position among global competitors.

Below Table 2.3.1 shows the Total establishments of Malaysia in 2016 by sector Economic Census 2016.

| Sector | Total | SMEs | % of SMEs to total | % of SMEs to total SMEs | % of SMEs to total by sector |
|---|---|---|---|---|---|
| **Services** | 818,311 | 809,126 | 87.9 | 89.2 | 98.9 |
| **Manufacturing** | 49,101 | 47,698 | 5.2 | 5.3 | 98.5 |
| **Construction** | 40,558 | 39,158 | 4.3 | 4.3 | 96.5 |
| **Agriculture** | 11,168 | 10,218 | 1.1 | 1.1 | 87.9 |
| **Mining & Quarrying** | 1,026 | 865 | 0.1 | 0.1 | 84.3 |
| **Total** | 920,624 | 907,065 | 98.5 | 100.0 | - |

Table 2.3.1 Total establishments of Malaysia in 2016 by sector Economic Census 2016 (Department of Statistic Malaysia, 2016[11])

## 2.4 Implementation of Malaysia's National Policy on Industry 4.0 (Industry4WRD)

As a result, Malaysia's National Policy on Industry 4.0 (Industry4WRD) was adopted, which recognized both internal and external challenges, such as the slow adoption of Industry 4.0 among local manufacturing industries at this early stage. The first obstacle is a lack of knowledge among industrial businesses about the impact and necessity of Industry 4.0 technology, either in terms of business model disruption or business possibilities. As a result, the idea of Industry 4.0 is still a work in progress in the local manufacturing sector, with just a few successful examples to draw from when it comes to integrating Industry 4.0 technologies and procedures in manufacturing plants. Local businesses were temporary without a centralized and easily available data platform to learn about Industry 4.0 best practices. The high cost of Industry 4.0 is another issue that is delaying the transfer of industrial sectors to Industry 4.0. The long profit period for Industry 4.0 improvements, along with a lack of cost and benefits

understanding in the Industry 4.0 business case study, makes it difficult for businesses to embrace the technology [17].

Another cause for concern is a lack of skill enrichment among manufacturing firms due to a lack of awareness of the necessary abilities, skills, and knowledge for Industry 4.0. Especially when, due to reduced labor costs, local industries continue to use low-skilled overseas workers [18]. Beyond that, Industry 4.0 is defined by connection and the use of breakthrough technology. Nonetheless, the draught said that the usage of automation in most local industrial businesses is less than 50%. In developed nations, SMEs use information and communication technology (ICT) at a rate of at least 50%, whereas in Malaysia, SMEs use ICT at a rate of approximately 10%. [19]. SMEs in Malaysia are restrained in their use of ICT for personal digital material and social media, according to research, despite having Internet access and computer skills [20]. The use of ICT to enhance business operations is under-appreciated. According to the 2018 digitalization study, SMEs in Malaysia are less aware of digital tool usage and lack advanced expertise [21].

Manufacturing businesses in Malaysia have a low level of digital readiness and ICT connection. It is difficult for businesses to revamp their present processes to meet future client demand for items in a short amount of time. As a result, Industry4WRD summarizes several potential external issues. One of the issues is the lack of a national platform and governance mechanisms for Industry 4.0, which are related to programmers, structures, and methods. Industry 4.0-related equipment, technologies, and systems have unclear norms. There are no direct financial incentives for the development of Industry 4.0 currently. In addition, there is no financial support accessible to industrial enterprises for technology research, exploration and development, prototyping, testing, and advancement to lead facilities. Another gap in the adoption of Industry 4.0 is the need to accelerate the construction of high-speed broadband networks in important industrial and training sites, as well as the availability of people who are