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I hereby confirm that I have examined this project paper entitled:

Investigate The Opportunities and Challenges of Industry 4.0 on Global
Manufacturing Solution Sdn Bhd

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fulfill the requirements for the award of Bachelor of Technology Management
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**INVESTIGATE THE OPPORTUNITIES AND CHALLENGES OF
INDUSTRY 4.0 ON GLOBAL MANUFACTURING SOLUTION SDN BHD**

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**The thesis is submitted in partial fulfillment of the requirements for the award
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DECLARATION OF ORIGINAL WORK

“I declared that this project is the result of my own research except as cited in the references. This research project has not been any degree and is not concurrently submitted in candidature of any other degree.”

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DEDICATION

This Research Paper is dedicated To my beloved family and friends who have been my constant source of inspiration.

They have given me the drive and discipline to tackle any task with enthusiasm and determination.

Thank you for the guidance and motivation for helping going through this research. Without their love and support this project would not have been made possible.

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ABSTRACT

Industry 4.0 is a strategic initiative recently introduced by the German government. The goal of the initiative is transformation of industrial manufacturing through digitalization and exploitation of potentials of new technologies. An Industry 4.0 introduces what has been called the “smart factory,” in which cyber-physical systems monitor the physical processes of the factory and make decentralized decisions. The physical systems become Internet of Things, communicating and cooperating both with each other and with humans in real time via the wireless web. The aim of this paper is to investigate the implementation of Industry 4.0 on Global Manufacturing Solutions Sdn Bhd (GMS). The research focuses on two important issues namely as: (1) The opportunities brings by Industry 4.0 which will benefit to Global Manufacturing Solution Sdn Bhd, and (2) The challenges faced by Global Manufacturing Solution Sdn Bhd in applying Industry 4.0. In this study the researcher will conduct the case study in qualitative research method, which include the semi-structured interview to investigate the opportunities and challenges of Industry 4.0 on Global Manufacturing Solutions Sdn Bhd. On the other hand, this paper also will purpose the innovative suggestion to overcome the willingness of implement the industry 4.0 which will enhance the productivity and worldwide competitive.

Keywords: Industry 4.0, Cyber-Physical Systems (CPS), Internet of Things (IoT), Smart Factory

ABSTRAK

Industri 4.0 adalah inisiatif strategik baru-baru ini diperkenalkan oleh kerajaan Jerman. Matlamat inisiatif ini adalah transformasi pembuatan industri melalui digitalisasi dan eksploitasi potensi teknologi baru. Industri 4.0 memperkenalkan apa yang dikenali sebagai "kilang cerdas," di mana sistem siber-fizikal memantau proses fizikal kilang dan membuat keputusan-keputusan yang terdesentralisasi. Sistem fizikal menjadi Internet Perkara, berkomunikasi dan bekerja sama dengan satu sama lain dan dengan manusia dalam masa nyata melalui web tanpa wayar. Tujuan kertas kerja ini adalah untuk menyiasat pelaksanaan Industri 4.0 pada Global Manufacturing Solutions Sdn Bhd (GMS). Penyelidikan ini memberi tumpuan kepada dua isu penting iaitu: (1) Peluang yang dibawa oleh Industri 4.0 yang akan memberi manfaat kepada Global Manufacturing Solution Sdn Bhd, dan (2) Cabaran yang dihadapi oleh Global Manufacturing Solution Sdn Bhd dalam mengaplikasikan Industri 4.0. Dalam kajian ini, penyelidik akan menjalankan kajian kes dalam kaedah penyelidikan kualitatif, yang termasuk wawancara separuh berstruktur untuk menyiasat peluang dan cabaran Industri 4.0 pada Global Manufacturing Solutions Sdn Bhd. Sebaliknya, kertas ini juga akan bertujuan inovatif cadangan untuk mengatasi kesediaan melaksanakan industri 4.0 yang akan meningkatkan produktiviti dan berdaya saing di seluruh dunia.

Kata kunci: *Industri 4.0, Sistem Siber-Fizikal (CPS), Internet Perkara (IoT), Kilang Pintar*

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Malaysia is considered to be trapped at Industry 3.0 in terms of manufacturing technology which still currently depends heavily on foreign labor for its production, it is proven by Minister in the Prime Minister's Department Datuk Seri Abdul Rahman Dahlan (2017) that 65% of jobs in Malaysia may be lost due to technological advances, so there Malaysia may need for mindset change to embrace new technology to increase efficiency and productivity and to expand markets through digital platforms.

According to Human Resources Development Fund (HRDF) chief executive Datuk C. M. Vignaesvaran Jeyandran (2017), most of the 15 million Malaysian workers in the private sector need to be upgraded or trained to become more adept at meeting the need for increased workplace digitalization. He also stated employers should approach their workforce training as a form of investment instead of spending. Besides, we must have plans to improve and take the necessary steps to ensure Malaysia remains relevant and competitive in the transformation that brings a new industrial era (Rubaneswaran, 2017).

The Fourth Industrial Revolution also described as Industry 4.0 is a German strategic initiative mooted in 2011 under its High-Tech Strategy 2020 and adopted

two years later (Pandiyani, 2017). This Industry 4.0 is a new era that can be improving the industry by integrating all aspects of production and trading across the boundaries of the company for higher efficiency. Industry 4.0 encompasses robotic and computer integration in manufacturing, to utilize technological advances and communications. The Internet of Things (IoT), smart factories, cyber-physical systems and big data are the factors of the Industry 4.0 to driving the project of the future. In this revolution all the solutions must be ever faster, more diverse, more flexible and more intelligent, greater availability, energy efficiency, and just-in-time production.

Industry 4.0 is the introduction of the Cyber-Physical System (CPS) into an industrial system consisting of objects, sensors, and actuators who should be able to communicate and exchange information continuously through the Internet of Things (IoT) and subsequently connecting machines, materials, and products along the value chain. Besides, the Smart Factory will also allow companies to predict when their equipment will fail and therefore take precautionary measures to ensure it does not occur (Redmond, 2017). A recent report from Future Market Insights predicted smart factories will make US\$215 billion by 2025. That's up from \$ 51.9billion in 2014. According to General Electric, the smart factory concept could be worth \$10–15 trillion to global GDP over the next 20 years (Andrews, 2017).

Therefore, Industry 4.0 will create new business opportunities models, new settlement solutions, and products. But at the same time, it will also be a challenge when manufacturers are pursuing the Industry 4.0 strategy. The challenges will come in many forms, possibly associated with the merger of new IT capabilities, the impact of gradually increasing the amount of data from the sensor and devices connected in the operating environment, suppliers, and from distribution networks. At the same time, risks will arise in connection with data security associated with an increased connection.

This research focuses on the opportunities and challenges of Industry 4.0 in the current industries to overcome the fast-moving world in a digital economy with some innovative suggestion to overcome it in order to become an advanced and competitive industry. Global Manufacturing Solution Sdn Bhd (GMS) is selected as the research since this company manufacture customize machine based on the highest quality standard started in 2003. The first product that launched by GMS is Automated Optical Inspection (AOI) under the brand name “SPOIS”. In 2005, GMS became the PCBA contract manufacturer in making the Printed Circuit Board (PCB) and make the complete function ability circuit test. GMS has also been set-up Shinsei Technology company in Thailand Bangkok to serve the PCBA electronic industry business.

In keeping with the change in technology and the opportunities presented from foreign direct investors, GMS diversified into manufacturing of precision tooling, components, and fabrication of machined parts for the hard disk, automotive, aerospace, electronics, and semiconductor to fulfill customer needs in customized machines as well as to support their manufacturing industry. GMS also added on QA Mitutoyo Crysta Plus M544, Wire cut, EDM, CNC milling (4 axis), lathe (3 axis) and auto lathe (7 axis) facilities with obtained ISO9001:2008. Besides, GMS become the first in Malaysia market to produce In-line High-Speed Inspection for Lead Frame and produce the 3D printer. This shows that GMS has moved towards to Industry 4.0 and this makes it easier to do a research on opportunities and challenges to industry 4.0 faced by GMS.

In addition, GMS has been approached to use SCARA robot which stands for Selective Compliant Assembly Robot Arm. The SCARA robot is based on a 4-axis design which it is ideal for high-speed assembly, kitting, packaging, and other material-handling applications. This SCARA robot is one of the advanced technology that GMS is likely to implement to replace existing technologies such as Computer Numerical Control (CNC) machines, CO2 Laser cut machine and etc to further improve the productivity of GMS, however, this SCARA robot is still in the

testing department before it is fully used by GMS. GMS developed strong strategic alliances with highly reputable players of the electronics PCBA industry to do the actual product test run. GMS also has been invested in sheet metal facility such as Mitsumishi CO2 Laser cut machine, Laser welding equipment, and Amada CNC Hydraulic Press Brake as well as invested in Production equipment such as CNC milling and Lathe, QC measurement tools for aerospace parts manufacturing expansion and to further enhance their production capacity in Sheet metal business.

1.2 Problem Statement

The fourth industrial revolution has never been popularized and still many of them do not know, do not aware and do not get ready to adopt Industry 4.0 in their organizations. According to global consulting firm McKinsey (2017), Industry 4.0 is the next phase in the digitization of the manufacturing sector which needs to be applied although have various of disruptions, but the reality is that Industry 4.0 will take manufacturing to the next level, increasing productivity as well as lowering costs for companies (Ganapathy, 2017).

For Global manufacturing Solution Sdn Bhd (GMS), Industry 4.0 have been the benefit in terms of efficiency which it is fully aided by auto computer assist which has low defects on end products. The agility also has increased when the production speed increases with time. However, the costs of mass production are higher on the starting, but when GMS have a good tuned of machines, it can calculate a bigger difference on investment cost because production will achieve maximum at its finest. Next is customer experience, which customer was demand their respective parts or machine as the perfect one as they need. This study of Industry 4.0 will create a platform to solve following problem to make sure the product given is the best among all.

1.3 Research Questions

- I. What are the opportunities bring by Industry 4.0 that benefit to Global Manufacturing Solution Sdn Bhd?
- II. What are the challenges that faced by Global Manufacturing Solution to adopt Industry 4.0?
- III. What are the innovative suggestions to overcome the challenges which been faced by Global Manufacturing Solution?

1.4 Research Objectives

The challenges often exist when there are many opportunities to start something new in industries. It is also has been faced by Global Manufacturing Solutions Sdn Bhd in adopting Industry 4.0 where the opportunities that GMS have of Industry 4.0 give their a plenty of challenges. Therefore, the innovative suggestion is important to GMS to able them to grab the opportunities of industry 4.0 and at the same time can overcome all the challenges that will likely to occur when applying industry 4.0. Thus, the following are the research objective of this study.

- I. To examine the opportunities brings by Industry 4.0 which will benefit to Global Manufacturing Solution Sdn Bhd
- II. To identify the challenges faced by Global Manufacturing Solution Sdn Bhd to apply Industry 4.0
- III. To propose the innovative suggestion to overcome the challenges which have been faced by Global Manufacturing Solution.

1.5 Scope, Limitation, and Key Assumptions of the study

This scope is focused on opportunities and challenges faced by GMS, with the propose innovative suggestion so that the company able to adopt the Industry 4.0. The limitation and key assumptions of this study are to assume that firstly, the staff in Global Manufacturing Solution Sdn Bhd provide an honest answer during data collection, and secondly, the researcher assumes that all the respondent have the same adequate knowledge about the Industry 4.0.

1.6 Importance of the Study (Significance/Contribution)

The current global challenges are faced growing global demand to ensure the largest sustainable human existence in social, environmental and economic dimensions. At present, Industry 4.0 will shape the creation of industrial value by providing a great opportunity to realize sustainable manufacturing based on recent developments in research and practice (Stock and Seliger, 2016).

Therefore, the purpose of this study will help Global Manufacturing Solution Sdn Bhd to create a competitive efficiency and increase the productivity through the opportunities that bring by the implementing Industry 4.0 in their major business. Even though there are various challenges such as customer feedback that their regular customers at first seem to not believe the new invention, but the benefit of the Industry 4.0 in terms of efficiency, agility, innovation, costs, and customer experience provide a new business opportunity to GMS in applying Industry 4.0.

1.7 Summary

This chapter discusses the Industry 4.0 which increasingly challenging existing industries with the introduction of new technologies that create new ways to meet existing needs and disrupt the existing value chain. The Global Manufacturing Solution Sdn Bhd also faced the same challenges as others industries and there are plenty of opportunities to involve into Industry 4.0 so that the purpose of innovative suggestion is needed to advance GMS towards a new era of globalization.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Industry 4.0

Industrial production is now driven by global competition and the need for rapid production adjustments for ever-changing market demands. This requirement can be met only by radical progress in current manufacturing technology. Industry 4.0 is a promising approach based on the integration of business processes and manufacturing, as well as integrating all actors into company value chains such as suppliers and customers. According to Rojko (2017), the technical aspects of these requirements are addressed by the application of the generic concepts of Cyber-Physical Systems (CPS) and industrial Internet of Things (IoT) to the industrial production systems.

According to Rojko (2017) Industry 4.0, as the first such initiative and inspiration for other initiatives comes from Germany and the basic concept was first presented at the Hannover fair in the year 2011. The main idea is to exploit new technologies and concepts such as Internet availability and IoT, integration of business process technology and business processes, digital mapping and real-world virtualization and 'Smart' factories. They make it possible to set up end-to-end integration of smart machines, warehousing and production facilities, including logistics, production, marketing, logistics and external services that combine the entire manufacturing process that transforms factories into smart environments.

Industry 4.0 is projected to create closer cooperation between business partners such as with suppliers, customers and between employees for providing new opportunities for mutual benefit (Lydon, 2016). The 4.0 refers to the idea of a fourth industrial revolution:

- I. Industry 1.0: Production mechanization using water and steam power
- II. Industry 2.0: Mass production
- III. Industry 3.0: Digital revolution such as machine tool numerical control, programmable logic controllers, direct digital control, and enterprise resource planning
- IV. Industry 4.0: Leveraging cyber-physical systems, embedded computing, Internet of Things technologies

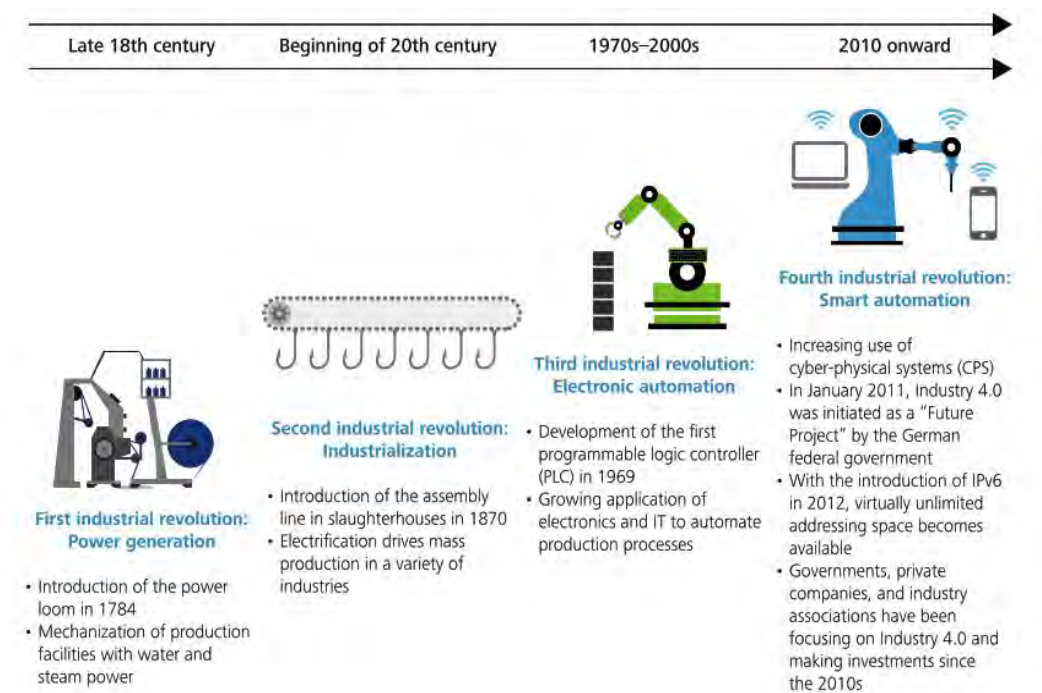


Figure 1: A history of revolutions: Industry evolution with key development

Sources: Sniderman (2016)

Before the advent of this Fourth Industrial Revolution, Malaysia has gone through three revolutions which the First Industrial Revolution happened in the 1800s when the world was first introduced to steam power, mechanization and factories that marked the new era of modernization. As time progressed, the rapid growth of technology the Second Industrial Revolution in the 1900s, taking mankind to the age of electricity. As demand increases, many new products are created and key developments are made in the mass production structure. The third of the Industrial Revolution better known as the Digital Revolution which took place in the 1970s welcomed the advent of computers and the early stage of automation which substantially replaced the online workforce with robots and machinery (Rubaneswaran, 2017).

The vision of Industry 4.0 is higher in productivity, efficiency, and self-production process where people, machines, equipment, logistics systems, and working components are in the process of communicating as well as working with each other directly (Lydon, 2016). The use of digital technology leads to drastic changes in business models to make many innovations come true as soon as possible, production must be more flexible. According to Vuksanovic (2016), two factors that will help achieve this goal are hardware and software solutions for real-time data assessment. Product lifecycle management (PLM's) digital innovation can be used for smart production by way of affecting the entire product lifecycle, from 3D product designs and 3D simulation tools, through automation and systems for product control, supply chain management, and logistics, to recycling.

Besides being the natural consequence of digitalization and new technologies, Rojko (2017) state that the Industry 4.0 is also promising that factory could result in a decrease of production costs by 10-30%, logistic costs by 10-30%, and, quality management costs by 10-20%. There are also several advantages and other reasons for adapting to this concept include shorter time for new products, better customer response responses, and enabling the massive production of custom without increasing the overall cost of production, a more flexible friendly environment and