

# The Key Factors of the Industrial Revolution 4.0 in the Malaysian Smart Manufacturing Context

Mohd Syaiful Rizal Abd Hamid, Universiti Teknikal Malaysia Melaka, Malaysia

Nor Ratna Masrom, Universiti Teknikal Malaysia Melaka, Malaysia

Nur Athirah Binti Mazlan, Universiti Teknikal Malaysia Melaka, Malaysia

## ABSTRACT

IR 4.0 is a new phase for the current trend of automation and data exchange in the manufacturing industry that focuses on cloud computing, interconnectivity, the internet of things, machine learning, cyber physical learning, and creating smart factories. The purpose of this article was to unveil the key factors of the IR 4.0 in the Malaysian smart manufacturing context. Two key data collection methods were used: (1) primary data from the face-to-face interview and (2) secondary data from the previous study. Significantly, five key factors of IR 4.0 were considered for this study: autonomous production lines, smart manufacturing practices, data challenge, process flexibility, and security. As a result, IR 4.0 for quality management practices might get high impact for the best performance assessment, which is addressed in various ways. Few studies in this area have been conducted in the Malaysian manufacturing sector to recommend the best practices implemented from the managers' perspectives. For scholars, this enhances their understanding and highlights opportunities for further research.

## KEYWORDS

Industrial Revolution 4.0, Key Factors and Case Study, Quality 4.0, Quality Management, Smart Manufacturing

## 1.0 INTRODUCTION

Malaysia is one of the countries that are forging into the Industrial Revolution 4.0. From water to electricity to nuclear, Industrial Revolution 4.0, also known as Smart Factory 4.0 is digital technology to the emergence of a virtual world. It will have an impact on our daily life, and quality management is no exception.

Industrial Revolution 4.0 is a development vogue of smart industries where all use of proper equipment and is influenced by technological elements that are creating. The emergence of Industrial Revolution 4.0 affects all aspects of the field, including quality management. Industrial Revolution 4.0 derives from the word "Industrial Revolution 4.0," a project in the German government's advanced technology strategy that prioritises factory computing. To maintain Germany's leading industrial

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position, Industrial Revolution 4.0 was innovated and supported by the German Government (Felderer, 2016).

Before entering the era of Industrial Revolution 4.0, it starts the beginning with Industry Revolution 1.0. The occurrence of the Industrial Revolution 1.0 in the late 18th century began with a steam engine. While the Industrial Revolution 2.0 took place at the beginning of the 19th century, beginning with implementing mass production through interchangeable parts production, which created cars, telephones, aeroplanes. The Industrial Revolution 3.0 occurred in the early 20th century, which began with the emergence of technology and digital.

While the Industrial Revolution 4.0 occurred at this time or this century began with the emergence of IoT (Internet of Things) which was focused on Artificial Intelligence” (Felderer, 2016).

Industrial Revolution 4.0 is defined as the technological development of embedded systems for smart cyber-physical systems that occurred in the industry. The German Government first proposed and implemented it on its 2020 High-Tech Plan. Often known as “Smart Factory,” Industrial Revolution 4.0 aims to sustain productivity and achieve high consumer and brand satisfaction. The effect of Industrial Revolution 4.0 was not only to introduce a new so-called “Smart Factory,” but also the introduction of the word “Smart Product,” where goods are embedded with sensors and smart processors which give customer experience and provide input to the manufacturer on the product’s success in the field (Salimova et al., 2018).

The concept of smart manufacturing and Industry Revolution 4.0 are related to recent technological progress in which the Internet and supporting technologies (e.g. embedded systems). It serves as the mainstay to integrate or create human-machine interfaces, materials, products, production lines, and processes within and outside company processes to form a new kind of intelligent, linked, and agile value chain.

With the emergence of the Industrial Revolution 4.0, quality management has advanced through the use of smart electronics linked together in internal or external data networks (IoT), which can be controlled automatically without human intervention. These have had a positive and negative impact on the approaches to quality management (Foidl and Felderer, 2016). In general, the objective of quality management was to benefit business stakeholders, where both organisations and business processes work together to produce value-for-money products and services that meet and exceed customer satisfaction positively.

In most recent studies carried out by authors such as Kusiak (2018); Diamandescu (2015); Rauch et. al (2019) in the areas of quality management and Industrial Revolution 4.0 seem to lack to see how the current quality management approach need to change, improvise and to be in line with the development of the Industrial Revolution 4.0 particularly in the area of smart manufacturing. However, there is a challenge on how to use extensive information for quality management, of which Industrial Revolution 4.0 proposes a solution. While this formative study is exploratory in nature, our findings provide a significant insight that contributes to unveiling the key factors of the research. For instance, contribution to knowledge provides insight into the main factors of Industrial Revolution 4.0: autonomous production line, smart manufacturing practices, data challenge, process flexibility, and security. Then, this research could contribute to practicality, which means it could be used in industry.

The objective of this study was to unveil the key factors of industrial revolution 4.0, particularly in the Malaysian smart manufacturing context. Therefore, the research question of this study is, “What are the key factors of Industrial Revolution 4.0 particularly for Malaysian smart manufacturer?”

In saying that, this article aims to answer the research questions, “What are the key factors of Industrial Revolution 4.0 particularly for Malaysian smart manufacturer?”.

The rest of the paper is structured as follows: the first section provides the literature review of smart manufacturing in Industrial Revolution 4.0. The second section discusses the methodology of the study. In the third section, the paper continues with the findings and discussion. The final section discusses the conclusion of the study.

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