

IR 4.0 Technology Implementation for Safety Management in Construction Industry

Sali Amirah Razali¹ and Narimah Kasim^{1,*}

¹Department of Construction Management, Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA

*Corresponding author's email: narimah@uthm.edu.my

ABSTRACT: Industrial Revolution 4.0 in recent years is notorious for new advances in high technology, full automation, and digitalisation. This technology has demanded by academics and practitioners, especially the construction industry sector. Construction industry is involved with complex management processes causes impossible to eliminate the potential hazards at the workplaces. Despite, the rate of accidents and deaths continue to increase every year. The objectives of this research is to identify the drivers and barriers of IR 4.0 technologies implementation for safety management in the construction industry. In approaching IR 4.0 technology, a systematic literature review has been applied. The paper is reviewed by extracting information based on topics and highlighting research directed to implement IR 4.0 for safety management. Several ideas on IR 4.0 technologies with its drivers and barriers were highlighted in relation to safety management practices. This review provides insights into the areas that technology needs to focus on enabling a tangible shift towards implementing IR 4.0 in the construction industry.

Keywords: *Industrial Revolution 4.0; Safety Management; Construction Industry*

1. INTRODUCTION

Industrial Revolution 4.0 technologies drivers for safety management have been implemented in the construction industry globally. Industry 4.0 also founds as the promising approach based on the manufacturing and production industry [1]. Hence, various benefits in implementing IR 4.0 that able to be applied in industries and give a big impact on the industry players. The term IR 4.0 has gained the attention of the academic, government, and industry players. The keywords IR 4.0 in the searching of the implementation in the various country have been largely proposed by the developing countries that tend and realize the advanced technology that useful and give various benefits towards the new skill forces, management, and safety. As such the IR 4.0 such as virtual reality (VR), augmented reality (AR), Internet of Things (IoT), cybersecurity, cloud computing, and big data. Nowadays, this technology able to create technology can be seen through the visualization that contributed to the cyber-physical system (CPS). One of the technologies that recently gained attention that called

as “digital twin”, the system able to monitor physical processes that involved physical world through smart decisions in real-time communication with machines, sensors, humans, and so on [2]. Contrary to other industries, the construction industry shows low adoption of new technologies because the uniqueness of the construction sector makes up an impose for the intended adaptation of technologies that are used in many other industries. Certain problems were identifying which are ineffectiveness and low productivity of organisations, demand skills and expertise, and labour-reducing technologies. The construction process is the most complex operation compare to other industry, which leads to great difficulty in confronting with the increasing complexity of major construction projects.

2. LITERATURE REVIEW

Fourth Industrial Revolution is evolving an exponential globally in changing the global economy on the operation, utilization of resources, enhance quality and safety [5]. In Malaysia, The Ministry of International Trade and Industry (MITI) stated the advancement and convergence of technology IR 4.0 brings a new dimension to the industrial environment, growing in a dramatic increase in industrial productivity. Since the German federal government announced Industry Revolution 4.0 in the economic policy 2011, IR 4.0 technologies beginning to grow nationally with the aim toward the changing advancements in several sectors. Besides, others industry has struggle continue to shake up and make changes to compete in keep up paces with develop country. Hence, the IR 4.0 can be seen through the largest growth broad in the field of manufacturing, engineering, and business [2,4]. Safety management had been broadly discussed in the construction industry. Many countries have implemented laws and regulations of health and safety to overcome the safety issues in the workplace. The safety problem in the construction industry globally indicated based on the level of technology influences the occurrence of the accident. The level of technology between develop and developing countries differ and costly, which far in the decision to implement advanced technology in the construction industry.

3. METHODOLOGY

This research was conducted to identify the

implementation of IR 4.0 technologies, drivers and barriers of IR 4.0 technologies for safety management in the construction industry. The data were collected through the systematic literature review. The search engine based on the keywords related to research studies. The keywords act as a benchmark to analyse IR 4.0 technologies implementation with the its drivers and barriers for the safety management in construction industry. The research can be divided into phases as shown in Figure 1 which are from the database, preliminary data collection phase, data analysis phase and conclusion.

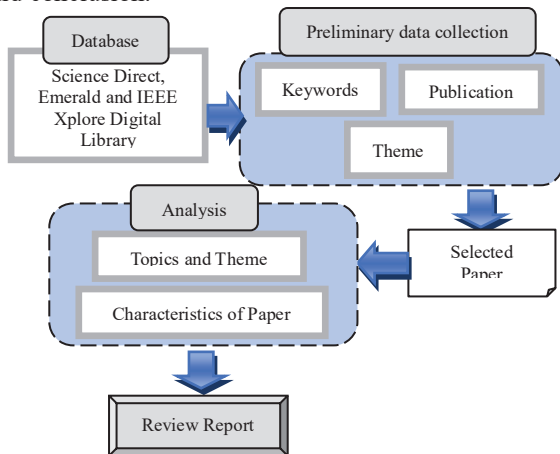


Figure 1: Flow of the Review Paper

4. RESULT AND DISCUSSION

The database of results shows the general view on the paper published from 2013 to 2021. The topic of Industrial Revolution 4.0 on the safety management has very recently gained attention over recent years the interest of scholars concerning its different aspects has grown rapidly.

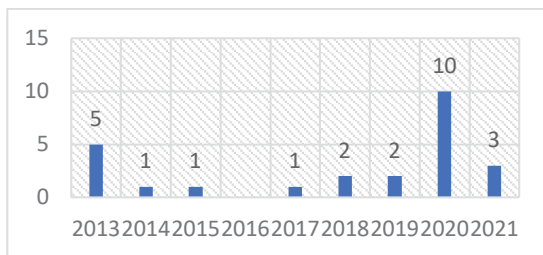


Figure 2: The Publications Interest of Scholar

4.1 Technology Implementation

Implementing technology has proven to help in minimising the number of accidents occurring on construction site and overall construction safety management. Prior to the decision to use advanced technology in an organisation, various tests of the technology have been conducted. Many of the technologies have been successfully implemented and the potential effects have been adapt at such technology that can reduce the potential risks. IR 4.0 industry components drivers e.g., Augmented Reality (AR), Virtual Reality (VR), Artificial Intelligent (AI), big data, simulation, cloud computing, Internet of Things (IoT), horizontal/vertical integration, including the cyber

security system was introduced. These components had been generalising the concepts, pros and cons for several propose to overcoming the poor productivity, low technology, workforce, and economic globally.

4.3 Drivers and Barriers

The previous researchers found that the safety practices are in a positive direction and provide better knowledge of technology application in the aspect of implementing suitable practices in the construction industry. Various benefits in implementing IR 4.0 that able to be applied in emergency detection, monitoring, and maintenance especially involve the smart sensors that can detect in real-time. Virtual technology is the one technology that is significant in enhance safety training, especially on high-risk projects. Clearly stated that advancement technology influences the safety management performance and far better than using the traditional method. Hence, this cannot be denied as the previous researcher finds that Industry 4.0 technology able to reduce costs, production time, productivity, and improve decision making. However, proper planning in the system or framework needed to avoid the reoccurrences of accidents in the construction industry. IR 4.0 implementation has emerged as an important in assist the health and safety in the workplace to reduce various factors.

5. CONCLUSION

The literature review is carried out on specific studies to uncover the drivers and barriers of IR 4.0 technologies implementation for safety management in the construction industry. The previous researchers had highlighted the IR 4.0 technologies are needed in order to prove that further enhancement of the its implementation able to enhance safety management performance. The next phases will be focuses on the key elements and the requirements of the IR 4.0 technologies.

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