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A Potential Study of Automation System in Industrialised Building System (IBS) in Enhancing Malaysian Construction Industry's Performance

Siti Azira Abd Rahim[1], Mohd Amir Shazwan Hashim[2], Wong Sook Shen

[1,2]Faculty of Engineering and Quantity Surveying (FEQS), INTI International University, Persiaran Perdana BBN, Putra Nilai, 71800 Nilai, Negeri Sembilan, Malaysia

Email: [1]sitiazira.rahim@newinti.edu.my [2]amirshazwan.hashim@newinti.edu.my

Abstract

Automation is one of the advanced technologies which can be used for improving the efficiency and performance of construction projects in various aspects of the construction industry. Although the introduction of automation technologies can enhance efficiency, many manufacturers of the Malaysian Industrialized Building System (IBS) do not support the presence of automation technology. Construction-related IBS problems such as declining efficiency and productivity, labour shortages, weak occupational safety, and unsafe working environment have hindered the implementation of IBS in Malaysia, but have opened up opportunities for more practical ideas within the industry. Another prospective choice is to implement advanced building technology such as automation through the IBS, which has the potential to enhance the industry in terms of efficiency, protection, and quality and IBS adoption rate in Malaysia. Automation means replacement of human labours by machines; or the operation of a machine or device automatically, or remote control which enhanced productivity, quality and also reduce human efforts. This paper study on the potential implication of Automation through IBS in enhancing Malaysian construction industry's performance. In order to achieve research goals, qualitative method is adopted which is through in-depth interview with industry experts. Content analysis and descriptive statistic is used to explore and categorize the opinions from professionals. The result is expected to provide a clearer understanding of the current construction problems facing the industry without the implementation of the Automation system in IBS, other than as a guidance for contractors to enhance their current approach and practise.

Keywords

Industrialised Building System (IBS), Automation Approach, Construction industry's performance

Introduction

The Industrialised Building System (IBS) agenda in Malaysia begun in the early 1960's when Ministry of Housing and Local Government of Malaysia visited several European nations and assessed their housing development programmes (Thanoon et al. 2003). After their fruitful visit

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in 1964, the government initiated the first project utilizing IBS. The aim was to accelerate the delivery time, and to construct affordable and quality houses. This statement also supported by Kamar, Alshawi & Hamid (2009) as the introduction of Industrialized Building System (IBS) is to tackle with an expanding request of affordable housing, solving issues associated with foreign labours and upgrading image, quality and productivity of construction industry.

With the era of Industrial Revolution 4.0, the construction industry also has to move forward. Currently, the Construction Industry Transformation Program (CITP) 2016 – 2020 reported that the productivity level of Malaysia's construction industry has been reported as one of the lowest in the economy, and compared to the advanced countries. This is due to the slow uptakes on technology and modern practices such as Building Information Modelling, Automation and Robotics to increase productivity (CIDB, 2015). Adopting these new process and technologies requires change, which requires an initial increase in costs for the Malaysian construction industry to move forward as a whole there needs to be the will among all stakeholders to make this shift – "driving construction excellence together" as per the underlying principle of the CITP. The implementation of technology and modern practices will certainly have an effect on the industry but, to date, the construction industry in Malaysia has not achieved the advanced technology adopted by developed countries, especially, in the field of robotics and automation (Rashid et al., 2018). Therefore, there is a need to study on the potential implication of automation technologies through IBS's in improving Malaysian construction industry's performance.

Methodology

Fourteen (14) potential factors towards implementation of Automation in IBS extensively researched and extracted from the literature. (Kaplinski et al. 2002; Lim et al. 2012; Waris & Khamidi 2013; Ardiny et al. 2015; Kamaruddin et al. 2016; Pan et al. 2018). Besides, the problems associated with Malaysian construction industry have been collected extensively from literature as well (Kamar et al. 2014; CIDB 2015; Rashidi & Ibrahim 2017; Abd Rashid et al. 2018). Based on potential implications and issues retrieved from literature, it builds theoretical foundations for research questions or interview questions and similar. In-depth interviews were conducted between September 2019 and October 2019. The questions for interview was divided into four part: Part A on respondents' background; Part B is to investigate the type of issue occurred without the adoption of automated IBS; Part C is to evaluate the potential implication towards implementation of Automation through IBS and lastly; Part D is to justify the extend of Automation in IBS in improving conventional IBS's issues. The range of respondents was targeted between three to five respondents. Furthermore, Selangor state has the highest numbers of construction activities and IBS manufacturer and professional body such as CIDB IBS. Respondents were locked in Selangor state only and was limited to professional who have knowledge in Automated IBS. Content analysis method was used for qualitative data analysis.

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Results and Discussion

Respondents' Background

The average years of experience in the construction industry related to IBS of the respondents interviewed ranged between 3 to 8 years. The first respondent is Mr Che Muhamad Zahir Che Ahmad (Respondent 1), holding a Technical Executive position in IBS CIDB with 6 years of working experience related in IBS. The second respondent is Ms Effa Syarmiza Saharudin (Respondents 2) from IBS CIDB as well, holding a position of Technical Executive with 3 years of working experience in construction industry related to IBS. Apart from IBS CIDB, third respondent is Ms Lim Hui Yan (Respondent 3) which is from Gamuda Berhad with a position of Head of Project Management who has 8 years of working experience in the industry related to IBS. Poor quality and low productivity due to reliance on manual workers are among the issues associated with the construction industry before the adoption of Automation in IBS. In line with that, Kamar et al. (2014) also stated that the problem of Malaysian construction industry with respect to productivity, reliance on foreign labours, and high level of construction wastage still being the serious issues in the industry.

Objective 1: To Investigate the Type of Issue Occurred Without the Adoption of Automated IBS.

Apart from that, the main factor that leads to problems mentioned above is high involvement of manual unskilled worker in production process. In addition, Dato Richard Riot Jaem, former Minister of Human Resources, said that the government should allow labour-intensive industries to use modern technology, in particular IBS. (CIBD, 2018). This transition would help the government achieve the target of generating 35% of skilled labour by 2020. Shortly, increase in productivity and improve in quality are main potential improvement after adopting Automation Technologies in IBS. These improvements also in line with Wakisaka (2000), Kamaruddin et al. (2016) and Pan et al. (2018) study where they proposed that by implement automation will result in significant waste reduction, significant time savings, and improved quality, affordability, total cost reduction, improved productivity and improved safety.

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Table 1: Opinions on the research objective 1

Respondents Questions	Respondents 1 (Mr Zahir)	Respondents 2 (Ms Effa)	Respondents 3 (Ms Lim)
Research Objective 1			
Issues encounter by the company before adoption of Automation in IBS	• Low productivity • Low quality • Longer construction time	• Low productivity • Low quality	• Relies heavily on low skilled foreign workers • Inconsistent productivity • High content of manual works
Factors leading to the problems mentioned above	• Human error • Unskilled worker	• Unskilled worker • Reliance on manual work	• Nature of construction works

3.3 Objective 2: To Evaluate the Potential Implication Towards Implementation of Automation Through IBS.

In addition, two out of three respondents mentioned that adoption of Automation system in IBS able to produce high skilled workforce. This is in line with one of the CITP 2016-2020 goal which is to continuous upgrading of local staff and entrepreneurs and equip them with specialized skills that enhance their capabilities and, in turn, earnings and wages (CIBD, 2015). However, manufacturer has to take negative implication as mentioned above into consideration when adopting Automation.

Table 2: Opinions on the research objective 2

Respondents Questions	Respondents 1 (Mr Zahir)	Respondents 2 (Ms Effa)	Respondents 3 (Ms Lim)
Research Objective 2			
The improvement after the adoption of Automated IBS	• Able to cope projects with larger capacity • High productivity	• High productivity • Improvement in quality • No run out of schedule	• Reduced reliance on low skilled foreign workers • Enhanced consistent quality • Enhanced productivity • Optimised efficiency

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If most of the IBS manufacturer uptake the Automation in producing IBS components, what are the potential implication towards Malaysian construction industry	Positive Implication • High skilled workforce • Reduce reliance on low-skilled workers • Reduce reliance on foreign worker Negative Implication • Maintenance of machine	Positive Implication • Increase competition between IBS manufacturer Negative Implication • Only applicable when there is large scale project	Positive Implication • High skilled workforce • High productivity

Objective 3: To Justify the Extend of Automation in IBS in Improving Conventional IBS's Issues

After IBS manufacturer adopted Automation, the adoption rate of IBS will definitely increase. According to Abd Rashid, Abdullah and Ismail (2018), the implementation of IBS in Malaysia has been hindered by construction-related IBS problems. However, in objective 2, it found out that after adopting Automation system in IBS manufacturer, it has potential to increase productivity and enhance quality. This should be seen by Gamuda IBS, which successfully implemented Automation in the development of IBS construction. Gamuda IBS Managing Director Tan Ek Khai said that some of the benefits of Gamuda IBS provide shorter project cycles, excellent quality and safety, and decreases reliance on foreign and current workers while developing a pool of versatile and skilled employees. (Singh, 2018). Apart from that, high initial fund is the main reason that hampered the adoption of Automation. This in line with Mahub's (2012) statement where the operation of automation technologies in construction acquiring great financial commitments. On the other hand, the challenges that a company might face during the adoption of Automation such as high cost to train staff, time consuming in training staff, high capital cost, require skilled workers and immature industry. In the view of Kamaruddin, Mohammad & Mahbub (2016), the introduction of a new system requires a large and realistic budget, time dedicated to the training courses and specialist machinery and equipment. Besides, Mahub (2012) stated that the technologies are complicated to use and are not readily understood by current workers. Thus, the construction industry should co-operate with government initiative to encourage off-site manufacturing. (Kamaruddin et al., 2013).

Table 3: Opinions on the research objective 3

Respondents Questions	Respondents 1 (Mr Zahir)	Respondents 2 (Ms Effa)	Respondents 3 (Ms Lim)
Research Objective 3			
Adoption rate of IBS will increase	Yes	Yes	Yes
Issues resolve using Automated IBS	High extend	High extend	High extend
Two companies in Malaysia adopting fully-automated IBS. Why the uptake of Automation is not widespread?	• Lack of knowledge • Require high capital • Require trained staff to manage the machineries • Geographical segmentation	• Demand in other state is less	• High capital fund
The challenges that the company faced if the company have decided to implement Automated IBS	• Cost to train staff to operate and manage the machineries • Training takes time	• High cost in buying machineries • Require skilled worker	• Immature industry
Party plays the most important role in Automated IBS	• Government • Industry players	• Government	• Government

Conclusion

The relatively low level of productivity and poor quality reflects the needs for industry to adopt modern technologies and practices bringing a better Malaysian construction industry. Positive implications including produce high skilled workforce, improved productivity and reduction of low-skilled workers which lead to enhanced quality of end products. Therefore, in order to boost the construction industry's performance, it is recommended that big companies who have consistent numbers of projects on hand to adopt Automation system. Besides, the research on automation and robotics in IBS in Malaysia is very limited. Hence, it is recommended for the future researcher to explore more on this topic and create awareness about Automation benefits and technologies, and its adoption across the industry.

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