STUDY ON CONSTRUCTION INDUSTRY AVAILABILITY FACING INDUSTRIAL REVOLUTION 4.0

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ABSTRACT

The development of the history of the industrial revolution has reached the fourth generation has a wider scale, complexity, and scope than the previous generation known as the Industrial Revolution 4.0. Industrial Revolution 4.0. has the principle of interoperability, information transparency, technical assistance and independent decisions. This technological change will not only affect social, economic and political life, but also affect construction. This is because in the field of construction is to have the principle of efficiency and effectiveness requiring clear information and ease of information, as well as the existence of resources that exist to achieve management goals, namely optimization of costs, quality, time and work safety. Therefore, it is necessary to explain the availability of the Indonesian Construction Industry to implement IR 4.0, the influence of the industrial revolution in every stage of construction management and how its contribution in achieving management goals. This influence is discussed descriptively qualitatively by presenting facts and information that have been carried out and presented from various electronic media information.

From the results of the study in this study obtained data that in the construction industry, the industrial revolution 4.0 principle is needed at every stage of construction management to achieve the project objectives, namely the right costs, quality and time. Application of IR 4.0 will begin with BIM (Building Information Modeling) and the government has carried out 10 preventive steps to support this.

Keywords: Construction management, industrial revolution 4.0

I. Introduction

The Industrial Revolution 4.0 emerged in a sophisticated technology strategy project that was raised by the German government to suppress factory computerization. According to Zimmerman (2018) industrial revolution 4.0 involves work on the capabilities of science, technology, engineering and mathematics, the internet of things and lifelong learning. Whereas Prof. Klaus Martin Schwab (2017) states that at the moment we are at the beginning of a revolution that changes the way of life, works and relates to each other fundamentally. These changes provide new advantages and problems for human life. The benefits gained include the efficiency and effectiveness of work, improving the efficiency of businesses and organizations, helping to regenerate the natural environment through better asset management. In a very dangerous work environment, human health and safety (workers) can be dramatically improved. The supply chain can be controlled with data available from the parts of production and distribution, new innovations, and opening up of huge business land. Not only advantages According to McKinsey Global Institute (2017) the weakness of the application of the Industrial Revolution 4.0 can occur in the next 2030 as many as 400 million to 800 million people have to find new jobs, because they were replaced by machines and the Minister of National Development Planning, Bambang P.S. Brodjonegoro, has the same opinion as McKinsey & Co. According to him, entering the industrial revolution 4.0 Indonesia will lose 50 million job opportunities. In the 2018 National Telematics Society (Mastas) National Assembly in 2018, the Indonesian
Coordinating Minister for Economic Affairs Darmin Nasution also gave an explanation of the disadvantages of users of IR 4.0, namely the digital economy that controls public behavior where manuals are replaced online so that business closures occur, where inequality workers are replaced by robots, so demand. Competition between humans and machines, who master technology will continue to grow and survive but that will not be deposed.

In the world of construction, especially in the construction of infrastructure today, the completion of targeted work is a matter of great concern. Therefore, construction management really needs to be managed properly, especially in this IR 4.0 era. Construction management will develop. The principle of efficiency and effectiveness at IR 4.0 is very suitable with the principles of construction management. This principle applies to the achievement of project management objectives, namely optimization of costs, quality, time and work safety, leadership that directs the organization to the goal of achieving adequate resources in the form of labor, materials and equipment and stages of activities ranging from planning, organizing, implementing and controlling /control. However, many challenges are faced in the readiness of the Indonesian construction industry to implement IR 4.0 completely in Indonesian construction. Therefore, in the next sub-chapter, it will describe the availability of the Indonesian Construction Industry applying IR 4.0. the influence of the industrial revolution in every stage of construction management and how its contribution in achieving management goals.

II. Discussion
2.1. The Revolutionary Industry 4.0 principle is needed at every stage of construction management

According to Aount (MIT: 2017) to face the industrial revolution 4.0 "new literacy" is needed, which includes data literacy, technology literacy and human literacy. Data literacy is related to the ability to read, analyze and make thinking conclusions based on data and information (big data) obtained. Technology literacy is related to the ability to understand how machines work. Application of technology and work based on technology products to get maximum results. Human literacy is related to communication skills, collaboration, critical thinking, creative and innovative.

Areas that experienced breakthroughs thanks to new technological advances include 1) artificial intelligence robots (artificial robotic intelligence) 2) nanotechnology 3) biotechnology 4) quantum computer technology 5) blockchain 6) internet-based technology and 7) 3D printer

The stages of construction management, namely the planning, organizing, implementing and monitoring phases are highly needed by high coordination and good data transparency to support the achievement of project objectives, namely cost, quality and time. In the IR 4.0 generation, several breakthrough fields can help achieve these targets, including the following:

1) Planning Phase

In the construction planning stage, very complete data is needed regarding the existing conditions that are usually obtained by conducting a survey directly into the field. In obtaining the data, adequate resources are needed, including survey and mapping and survey experts and equipment. This is always done repeatedly by using new data. And the data is only owned by the data taker. Not only the human resources needed, the costs incurred to
obtain these data are also not small, coupled with the travel time to the location and data processing time which takes a long time.

With the Information Transparency principle, namely the ability of an information system to create a copy of the physical world virtually by enriching the digital factory model with sensor data, then the data can be obtained easily without having to go to the field with various tools, we can know the physical condition of the field and have long unity is better. The data obtained will be processed to get the design. With the help of IR 4.0 technology through internet-based technology that is able to provide data processing software and usage tutorials, it will help resolve the design process faster. In addition to the data and design process, in planning another thing that is needed is a 3D printer to make it easier to illustrate and interpret the results of the design to stakeholders and implementers about the project to be implemented. So that the initial picture can be analyzed and corrected as needed to minimize design changes.

2) Organizing Phase

At this stage it is necessary to establish divisions that will play an active role in supporting the achievement of the objectives of the construction project. In each division will be arranged in the form of a chart of the organization of coordination and cooperation and leadership. In the flow of coordination and collaboration between divisions, it is necessary to have intensive communication regarding information on the development of construction projects as well as the next steps to be done, workers experiencing delays, resources needed, lack of supplies and other problems from each division to be known as guidance in decision-making. IR 4.0 technology that is able to facilitate the work through the principle of Interoperability (conformity). Where this principle applies the ability of machines, devices, sensors, and humans to connect and communicate with each other through internet media for everything (IoT) or the internet for audiences (IoT). In addition to this principle, the principle of Technical Assistance; first is the ability of the help system to help humans collect data and make visualizations in order to make wise decisions. Second, the ability of a cyber-physical system to help humans carry out various difficult, unpleasant or unsafe tasks for humans.

3) Implementation Phase

The stage of pelasanaan is the determinant stage that mostly drains time and costs and risks the quality of construction that has been previously designed. At this stage, the design that has been prepared from the planning stage by the planner will be carried out by taking into account all aspects of construction management, namely quality and time and worker safety costs. In achieving these targets, information resources (SD) are needed in the form of workers, materials and equipment. Workers who can help realize the project sasran are those who have competence and certification, map the location of the material, type and quality and location of equipment rental. realized. With the technical assistance, transparency and technology of the blockchain (supply chain system) data on the information system built on a construction company, work progress can be monitored even though the leadership is not at the project site.
4) Monitoring / Control Phase

Monitoring and controlling construction projects in tandem. The data needed is the same for decision making. Implementation data will be reported by the supervisor through IR 4.0 technology with the principle of Interoperability so that the data can be read by the divisional division. By applying these principles, it will facilitate the control of work by leaders and stakeholders.

2.2. Contributions to IR 4.0 in Achieving Management Objectives

Syarif Burhanuddin, Director General of Construction of the Ministry of Public Works and Public Works at the time of giving material in the public lecture on Technical Guidance on Construction Services, Distance Learning through SIBIMA Construction and Public Lecture with the theme "Towards Reliable Construction HR in Industrial Era 4.0" in Malang. 4.0, namely technology providers, digital infrastructure providers, and users of industrial technology and infrastructure 4.0, with their respective responsibilities and authorities. The application of information technology (internet) since from planning, designing, managing, maintaining, to rebuilding is a system that is included in the construction industry 4.0, is expected to create project management that is cost-effective, timely and quality-appropriate. Including the presence of BIM technology (Building Information Modeling)

2.3. Willingness of the Indonesian Construction Industry implements IR 4.0

The application of this IR 4.0 generation technology in the construction industry is currently in desperate need of government support because the government is the controller of national development. The government in the face of the construction industry era 4.0 has also made several policies, such as Link And Match World of Education with the World of Construction Services, Strengthening Vocational Education and Vocational Schemes for Apprenticeship Based on World Needs of Work, and Program for Accelerating Expert Certification.

Lestari (2019) wrote that Secretary of the Directorate General of Housing Provision Dadang Rukmana said the implementation of 4.0 through the PUPR 4.0 Expo was held, in which the Internet of Things (IOT) system for housing assistance was implemented, such as Sirusun, Sibaru and e-RTLH, and others. This means that there is a discourse on the use of robots in the process of housing development.

To make it easier to get quality human resources, the government through PUPR prepares digitization of licenses or e-submissions. Digitalization will also be applied to the procurement process (e-procurement), monitoring and supervision (e-monitoring & e-supervision), and the digital market construction sector (library data).

According to the Minister of Finance, To improve Indonesia's readiness to enter the industrial revolution 4.0 various elements are needed. There are 12 components of Indonesia's infrastructure readiness in dealing with industry 4.0, ranging from institutional components, infrastructure, health, capability, to innovation capabilities

The government has set 10 national priority steps in an effort to implement the Making Indonesia 4.0 road map. as follows:

1) Improved flow of goods and materials. This is done to strengthen local production in the upstream and middle sectors through increasing capacity and accelerating technology adoption.
2) Redesigning the industrial zone. From several industrial zones that have been built across the country, Indonesia will optimize the policies of the industrial zones by aligning the road map of industrial sectors which are the focus of Making Indonesia 4.0.

3) accommodate sustainability standards. Indonesia sees the challenges of sustainability as an opportunity to build national industry capabilities, such as those based on clean technology, electricity, biochemistry and renewable energy. Indonesia will strive to meet the sustainability requirements in the future, by identifying applications for technology and opportunities for environmentally friendly growth, as well as promoting a conducive environment.

4) Empower micro, small and medium enterprises (MSMEs). The government is committed to supporting MSME entrepreneurs by building an e-commerce platform, which can also be used by farmers and craftsmen.

5) Building a national digital infrastructure. Indonesia will accelerate the development of digital infrastructure, including high-speed internet and enhance digital capabilities through cooperation between the government and the public and the private sector to be able to invest in digital technologies such as cloud, data center, security management and broadband infrastructure.

6) Attract foreign investment. This can encourage technology transfer to local companies. Indonesia will actively involve global manufacturing companies, choose the world's top 100 manufacturing companies as prime candidates and offer attractive incentives, and dialogue with foreign governments for national level collaboration.

7) Improving the quality of human resources (HR by reforming the education curriculum by emphasizing more on Science, Technology, Engineering, the Arts, and Mathematics (STEAM), as well as improving the quality of vocational schools.

8) Development of an innovation ecosystem. The government will develop a blueprint for the national innovation center, prepare a pilot innovation center and optimize related regulations, including the protection of intellectual property rights and fiscal incentives to accelerate cross-sector collaboration between private business actors or state-owned enterprises and universities.

9) Incentives for technology investment. The government will redesign the technology adoption incentive plan, such as subsidies, corporate tax deductions, and excise duties on import taxes for companies committed to implementing industrial technology 4.0. In addition, Indonesia will launch a state investment fund for additional funding support for investment activities and innovation in the field of advanced technology.

10) Harmonization of rules and policies. Indonesia is committed to harmonizing rules and policies to support industrial competitiveness and ensure close coordination of policy makers between ministries and institutions related to local government.

III. Conclusion

From the results of the study in this study obtained data that in the construction industry, the industrial revolution 4.0 principle is needed at every stage of construction.
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