

Comparative Brief Advantages and Strategies in Indonesia and Malaysia on IR 4.0

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Abstract:- The rapid technological advancement has a vast impact on the industry contributed by the Industrial Revolution (IR) 4.0 with many developed countries either are in the midst or have applied IR 4.0. IR 4.0 is deemed as a method to simplify industrial control with various countries in the ASEAN region are exploring and penetrating the IR 4.0 or in other words known as 'Smart Factory'. A relative example is Indonesia and Malaysia. Indonesia and Malaysia have their comparative advantages and strategies to enter the smart factory. Statistics of the World Bank in 2018 shows that the economic added value from industrial activities in Indonesia contributed at 40.77% of the total value of GDP, while industrial activities in Malaysia accounted for 38.33% of the total value of GDP. This study will compare the readiness strategies between Indonesia and Malaysia to enter the Smart Factory in the aspects of human resources, technology, infrastructure, law, and government.

Keyword:- Rapid Technology, Smart Factory, Comparative Advantages, Strategy

I. INTRODUCTION

Industry Revolution (IR) 4.0 represents the latest level of automation and data exchange in manufacturing technology. This includes internet, cloud computing, and cognitive computing applications [1]. This technology enables the mass customization of manufactured products. With this, the production system becomes more flexible to be tailored to individual needs. An example of IR 4.0 is in machines working in the production process that can predict failures and make the maintenance process self-sufficient in reaction to unexpected production changes. The basic principle of IR 4.0 is to connect machines, processes, and businesses to create an intelligent production network along the chain of production whereby the chain can be controlled and communicated independently [2].

However, there are various factors to be considered including components of human resources, technology, infrastructure, law, and government. First, in the human resource perspective, highly skilled employees are seeking to have good knowledge of IR 4.0. Then, the grasp-ability

of technology in Artificial Intelligence (AI) or Machine Learning (ML) must be mastered. While in terms of infrastructure, having big data seeks that proper infrastructure is needed to run the IR 4.0 in real-time. Lastly, the government makes policies and rules as a legal umbrella for IR 4.0 to support IR 4.0.

II. PROBLEM

There is little research being performed on the readiness strategies in Indonesia and Malaysia towards IR 4.0 in their local industries. Therefore, this paper will serve to explore the readiness strategies in Indonesia and Malaysia towards IR 4.0 geared nations.

III. OBJECTIVES

The main objective of this research is to identify the readiness strategies between Indonesia and Malaysia to enter the IR 4.0 and to know the various things that become the strengths and weaknesses of the mentioned countries to implement IR 4.0.

IV. LITERATURE REVIEWS

A. Human Resources (HR)

HR plays a vital role to support in IR 4.0 as they are directly or indirectly involved in supplying a highly skilled workforce with capability in IR 4.0. Hence, a way to drive the workforce towards IR 4.0 is via effectively tailored Technical and Vocational Education and Training (TVET) education in the hope that more workforce can be trained in IR 4.0. To date, Indonesia has successfully validated the database of TVET in 2013 so that the arrangements and workforce can meet the needs of IR 4.0[4]. Besides, it is one of the ways in Indonesia towards IR 4.0 including vocational education up to higher skill levels. As this paper is written, Indonesia has a good demographic bonus in developing a workforce in need. Malaysia, however, is still in the process of TVET validation. However, the Malaysian government has allocated RM 50 million from 30% of Human Resources Development Fund (HRDF) funds collected for TVET purposes to improve competitiveness and improve the quality of labor and economic development of the nation [5].

B. Technology

Existing technology within a country is also needed to run the IR 4.0 whereby crucial industry-based technologies deemed vital in IR 4.0. These include the Industrial Internet of Things (IIoT) and cyber-physical systems, Artificial Intelligence (AI), Virtual Reality (VR) and Augmented Reality (AR) [6]. The IIoT concept (Industrial Internet of Things) refers to the use of IoT technology in the manufacturing process. While a cyber-physical system is a device that integrates processing capabilities, as well as storage and communication capabilities to control one or more physical processes. The cyber-physical system is interconnected with the global network through IoT [7].

Artificial Intelligence (AI), a rapidly expanding technology widely influences IR 4.0. With AI, IR 4.0 can work optimally with fewer errors. The direct contribution to the existence of AI in IR 4.0 is the creation of a production system that can sense the environment and processes within it so that the system can take action to increase the probability of success and reduce the risk as much as possible. While VR and AR in IR 4.0 are useful to optimize product design, production automation process, manufacturing and construction control, worker training, and maintenance activities and monitoring in an industrial environment [6].

C. Infrastructure for Big Data

An infrastructure that is meant in this case is infrastructure related to the management of big data. The amount of stored information is interconnected with various processes and systems (industry and logistics), services (sales, connections between users, power consumption, etc.) or data traffic (log in routers and equipment, etc.) are so large that may be done manually. A very large data analysis can't be done from traditional data processing architectures because traditional data sources are structured [9]. In the data analysis, large data is modeled into several rows and columns then fed into enterprise data storage [10]. Large data is too large in which data must be processed using traditional methods. As data develops, the industry needs a consistent, robust and fast analysis tool that works automatically. With large data analysis, data can be anywhere and in bulk. Some technologies such as Hadoop, NoSQL, and Map Reduce are essential for large data analysis. For example, in the large data analysis, the Hadoop system captures the data set from multiple sources and then implements functions such as storing, cleaning, distributing, indexing, modifying, searching, accessing, analyzing, and visualizing [10]. Thus, unstructured data is converted into structured data. Large data requires several approaches to traditional or advanced analysis, depending on the problem.

Components	Traditional Data	Big data
Architecture	Centralized	Distributed
Data Volume	Terabytes	Petabytes or exabytes
Data Type	Structure or transactional	Un-structure or semi-structure
Data Relationships	Known	Unknown
Data Model	Fixed Schema	Less schema

Table 1:- The difference between Traditional Data and Big Data [9]

D. Government and Law

Implementation of IR 4.0 requires support from the government whereby in this case it is concerned about the rule of law which is in accordance and favors IR 4.0. The government of a particular country is in-charge to create a long-term plan to take advantage of the existence of IR 4.0. A roadmap that is established by the government for the implementation of IR 4.0 is highly dependent on the success of IR 4.0. However, the government has to analyze the SWOT analysis related to the implementation of IR 4.0 before suitable laws and rules can be enforced in IR 4.0 [11].

Analysis approach based on Strength and Weakness [11].

No	Strength	No	Weakness
1	Global competitiveness, raise the revenues	1	High dependence on resilience of technology and networks: small disruptions can have major impacts
2	Growth in High-skilled and well-paid jobs	2	Dependence on a range of success factors including standards, coherent framework, labor supply with appropriate skills, investment, and R&D
3	Improved customer satisfaction - new markets: increased product customization and product variety	3	Costs of development and implementation
4	Production flexibility and control	4	The potential loss of control over enterprise
5	The power of new job creation is widespread	5	Semi-skilled unemployment
6	Increased productivity and efficiency by new high skill labor	6	Need to import skilled labor and integrate immigrant communities

Table 2:- SWOT table of IR4.0

Analaysis approach based on Opportunities and Threats [11]

No	Opportunities	No	Threats
1	Strengthen Europe’s position as a global leader in manufacturing (and other industries)	1	Cyber-security, intellectual property, data privacy
2	Develop new lead markets for products and services	2	Workers, SMEs, industries, and national economies lacking the awareness and/or means to adapt to Industry 4.0 and who will consequently fall behind
3	Counteracting negative EU demographics	3	Vulnerability to and volatility of global value chains
4	Lower entry barriers for some SMEs to participate in new markets, links to new supply chains	4	Adoption of Industry 4.0 by foreign competitors neutralizing EU initiatives

Table 3:- SWOT table of IR 4.0

V. DISCUSSIONS

Indonesia and Malaysia are countries exploring and involved in IR 4.0 system. In support of the implementation of IR 4.0, it involves the role of human resources until government regulation. As described above, in terms of human resources, Indonesia can support IR 4.0 via improving skills through vocational schools in Indonesia up to higher levels. The ability of Indonesian vocational education graduate workers has also been mapped validated by the database in Indonesia on TVET in the year 2013 [4]. On top of that, Indonesia has demographic bonuses in 2010 - 2035 which can serve as one of the advantages to implement IR 4.0 [12]. Meanwhile, Malaysia is currently mapping workers who are in vocational education and are still due to the TVET validation process as this paper is written [4]. The Malaysian government has outlined steps to improve the quality of vocational education. This is evident through the budget allocated to improve the

vocational education of Malaysia reaching 50 million RM, which is 30% of Human Resources funds [5].

Internet service for IR 4.0 plays a major role considering in this fourth industrial revolution which is needed in all industrial needs ranging from production to marketing aspects to support the IR 4.0 implementation via IoT technology. Currently, the internet in Indonesia is not expensive but the quality is weak. Mobile broadband pricing in Indonesia is 3.4 USD / 500 megabytes while in Malaysia is 26 USD / 500 megabytes. Looking at the price offered in Indonesia, it is somewhat cheaper than Malaysia, but internet bandwidth in Malaysia is much better than Indonesia where Malaysia has 27.2 Kbps/user while Indonesia only for 6.2 Kbps/user [13]. Besides, in terms of average internet speed in 2017, Malaysia is better than Indonesia with an average internet speed of 8.9 Mbps while Indonesia is only at 7.2 Mbps [14].

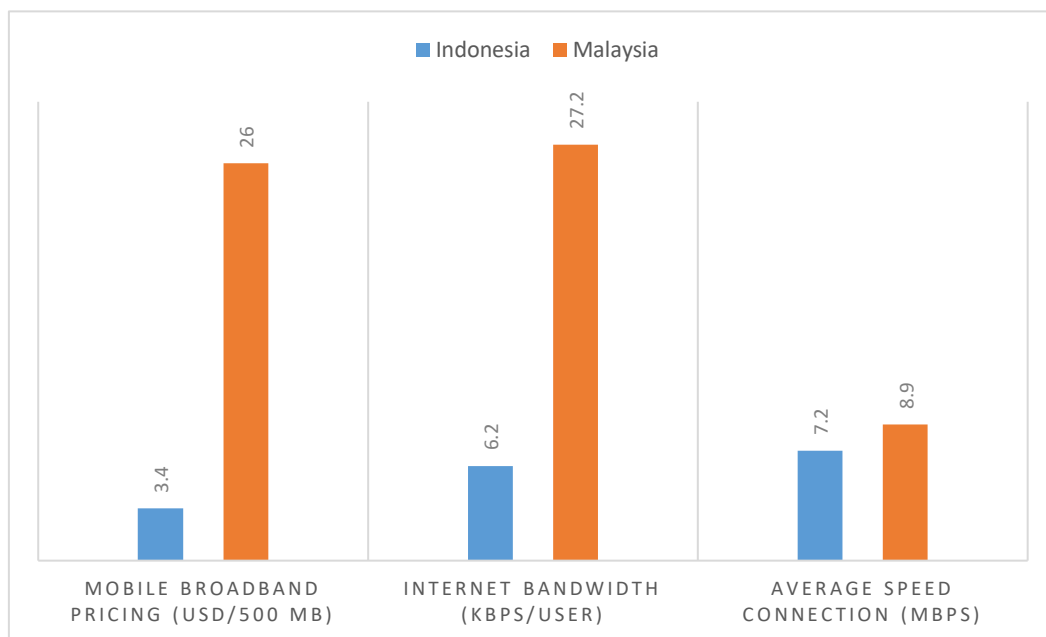


Fig 1:- Internet Service between Indonesia and Malaysia [13][14].

Cloud service in IR 4.0 revolution is very important considering the industry needs on big data and advanced analytics in the process. Analyzing the data by BSA which assessed how good the quality of a country's cloud services is in 2016, Malaysia scores 69.7 while Indonesia scores 49.4 which means that the quality of cloud service in Malaysia is better than Indonesia [15]. The cloud quality assessment is the result of several assessments of privacy, security, cybercrime, intellectual property rights, Support for Industry-Led Standards & International Harmonization of Rules promote free trade and IT readiness broadband deployment [15].

No	Properties	Malaysia	Indonesia
1	Data Privacy	5.9	6.4
2	Security	6	2.4
3	Cybercrime	7.2	7
4	Intellectual Property Rights	17.4	12.2
5	Support for Industry-Led Standards & International Harmonization of Rules	10	7.6
6	Promoting Free Trade	5.8	2
7	IT Readiness, Broadband Deployment	17.4	11.8
8	Overall	69.7	49.4

Table 4:- Cloud Service Qualities between Indonesia and Malaysia [15].

The government must prepare its strategy to apply IR 4.0 to fit the desired and favorable needs in their respective countries. The Indonesian and Malaysian governments have set up specific strategies to implement IR 4.0. Specifically, Indonesia's current government has set up 4 main strategies to penetrate the fourth industrial revolution, the first is to increase the skills possessed by the Indonesian workforce to become highly skilled [16]. With that, the government of Indonesia should encourage workers in Indonesia to upgrade their knowledge in information technology and its application in the production line. Secondly, the use of digital technology for all forms of medium and small industries should not be neglected [16]. The use of digital technology to improve productivity and competitiveness, especially in small and medium industries (SMI) is vital so that the export market is highly feasible for penetration through the SMI e-smart program. Third, the national industry requires the use of digital technologies such as Big Data, Autonomous Robots, Cybersecurity, Cloud, and Augmented Reality [16]. IR 4.0 system will provide benefits for the industry, such as increasing efficiency and reducing costs. This means it is a flourishing opportunity for startup development innovation [16]. This innovation can be through startup development by facilitating business incubation sites. This effort has been embraced by the Ministry of Industry of the Indonesian government by creating technopreneurs at established technoparks built in several regions in Indonesia, such as in Bandung (Bandung Techno Park), Denpasar (TohpaTI Center), Semarang

(Business Incubator Center of Semarang), Makassar (Makassar Techno Park - Home Software Indonesia, and Batam (Mobile Design Center) [17].

Malaysia has several strategies to embrace IR 4.0 with first being to increase awareness, a clear understanding of the benefits and development of IR 4.0 strategy across the industry, government, and academia [18]. Secondly, the industry must be able to develop a clear business to adopt IR 4.0 [18]. If an industry has developed its business clearly, it will ease the process to attain funding to implement IR 4.0. Third, it is about the collaboration of industry and academia with the government [18]. Industry, government, and academia play a role in collaboratively developing long-term strategies and policies on how to recruit and train in the chosen industry, while academia educates and supports the government consistently over the long term. The fourth strategy is to standardize digital strategies [18]. Implementation of IR 4.0 needs to adopt a new "digital standard" that is relevant and ready to be implemented. Fifth, it is about increasing the security of cybercrime [18]. Cybercrime security threats must be actively monitored and eradicated well because good cybersecurity promotes safe research and investment invested by the institutions, industry, and researchers. Lastly, good communication at all levels is vital [18]. Good communication is important so that effective and efficient communication and delivery of tasks can be established.

No	Malaysia	No	Indonesia
1	Awareness-raising, understanding of benefits and strategy development IR 4.0	1	Improve the skill that is owned by Indonesian workforce to become highly skilled
2	Industry should be able to develop a clear business	2	Use of digital technology for all forms of medium and small industries
3	Gather industry, academics gathered with the government	3	The national industry must use digital technologies such as Big Data, Autonomous Robots, Cyber security, Cloud, and Augmented Reality
4	Digital standardization	4	Startup development innovation
5	Improved cybercrime security	6	Enhanced cybercrime security
6	Good communication at all levels	5	Coordinate all ministries

Table 5:- Malaysia and Indonesia strategy in the implementation effort of IR 4.0 concepts in its industry [16] [18].

VI. CONCLUSION

As discussed, it can be concluded about the readiness of Malaysia and Indonesia to implement the concept of IR 4.0. Based on the data, in terms of technology and infrastructure, Malaysia is more ready and able to apply IR 4.0 relative to Indonesia. However, in terms of human resources, Indonesia is more ready to face the IR 4.0 as Indonesia has mapped its workforce through TVET

validation while Malaysia is still doing the validation process as this paper is written. Lastly, in terms of government and law, Indonesia and Malaysia have their strategy to apply IR 4.0. However, this research is constricted and bounded by the strategies in Indonesia and Malaysia that have been adapted to the local adaptation in each country making it a complicated process to compare in terms of the strategies.

Properties	Indonesia	Malaysia
Human Resource	Equality of manpower, and labor Indonesia has been mapped well through TVET validation	Still in the process of mapping vocational workforce
Internet service for technology	Internet service in Indonesia is cheap but the quality is less good. But the average internet speed in Indonesia is higher than Malaysia	Internet service is much better than Indonesia but is expensive and the speed is below average in Indonesia
Cloud service for Big Data	Overall cloud service in Indonesia still needs to be upgraded even further to support industry 4.0	cloud service Malaysia good and more ready for IR 4.0 than Indonesia
Government and Strategies	The applied strategy is more of a direct impact and has a direct change that can be felt	Strategies for IR 4.0 are medium-term and long-term and have many considerations that result in more mature preparations for the implementation of IR 4.0

Table 6:- Comparison of Indonesia and Malaysia strategies to enter IR 4.0

The results of this comparison illustrate that both countries can implement IR 4.0 in its distinctive way by leveraging on the advantages possessed. The authors believe that Indonesia and Malaysia are ready to apply the IR 4.0 by leveraging on the competitive strengths possessed.

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