

Implementation to Increase Productivity, Efficiency and Flexibility in the Production Process in Manufacturing Companies

Angga Debby Frayudha¹, Totok Mulyono², Hamzah Agung³, Riza Adya⁴, Evy Nur Amalina⁵, Ida Fitriana⁶
Informatics Engineering Department, Polytechnic of Semen Indonesia, Gresik, East Java, Indonesia

Abstract:- The development of the 4.0 industrial revolution is characterized by the rapid development of the Internet of Things (IoT) fast. This also affects the manufacturing sector in the Industrial Revolution 4.0 in manufacturing is a combination of automation technology and network technology associated with information technology. Production flexibility determines the value of effectiveness and efficiency in the industry. Some aspects of industrial development, especially the manufacturing sector, are trending very important. Therefore, it is necessary to do more in-depth research on the impact of the 4.0 industrial era on industry, especially the manufacturing sector. The development of Industry 4.0 is very suitable for application to smart production systems in the industrial world to realize the elements of smart factories. carry out the creation of Smart Factory elements. Research on the impact of the 4.0 industrial revolution is carried out using a descriptive and informative method, including the impact on the industrial production sector and on the industrial process in applying the System. smart production system. industrial processes in the application of Smart Manufacturing Systems. The realization of Smart Factory components include the development of automated, intelligent, modular and adaptive manufacturing/production systems. Along with the application of intelligent production systems to achieve high production optimization.

Keywords:- Industry 4.0, Smart Factory, Smart Manufacturing System.

I. INTRODUCTION

Industry 4.0, also known as the Fourth Industrial Revolution, brings about fundamental changes in the world of manufacturing and industry. This era is characterised by the application of advanced technologies, such as the Internet of Things (IoT), artificial intelligence, robotics, and automation, which are changing the way companies operate and produce products. One of the key elements in realising the Industry 4.0 concept is the implementation of Smart Factory, which supports intelligent manufacturing systems.

Smart Factory is a concept where factories or production facilities are equipped with technologies that enable smarter decision-making, real-time monitoring, and

greater automation. This leads to increased efficiency, productivity, and flexibility in the production process. Some of the key components in a Smart Factory include: IoT technology allows devices and machines in a factory to connect and communicate in real-time. This enables accurate data collection and data analysis to monitor and optimise production performance.

AI and machine learning systems are used to analyse data generated by IoT and forecast potential problems, optimise production processes, and identify improvement opportunities. The use of robots and automation systems enables factories to perform repetitive tasks efficiently, improve product quality, and reduce the risk of human error. 3D printing technology enables on-demand production, rapid prototyping, and more flexible designs. Integration of various production and management systems in a single platform, allowing easy sharing of information and optimising production processes.

The benefits of Smart Factory implementation in the Industry 4.0 era are: Production Efficiency: By monitoring and managing operations in real-time, companies can identify and address production issues quickly, reduce production downtime, and improve efficiency. Quality Improvement: With automation and the use of advanced technology, product quality can be improved, and the risk of defects can be minimised. Production Flexibility with Smart Factory enables rapid changes in the production process, allowing companies to adapt production to changing customer demands.

The use of robots and automation can reduce the risk of workplace accidents and improve safety in the factory. The data collected can be used to identify new business trends and opportunities, and optimise production strategies.

Smart Factory implementation is a key step to harnessing the potential of Industry 4.0 and facing increasingly complex global challenges. In this era, companies that are able to adopt advanced technologies and integrate them into their production operations will have a significant competitive advantage. Therefore, the implementation of Smart Factory in support of an intelligent manufacturing system is of paramount importance to ensure business continuity and growth in the Industry 4.0 era.



Fig. 1: Indonesia's GDP Contribution [4]

The application of industry 4.0 is starting to be applied in various countries to their industrial systems due to its advantages in increasing productivity, reducing risk, and

protecting the environment with better product quality [5]. The application of industry 4.0 in Indonesia in manufacturing as described in Figure 2 below.

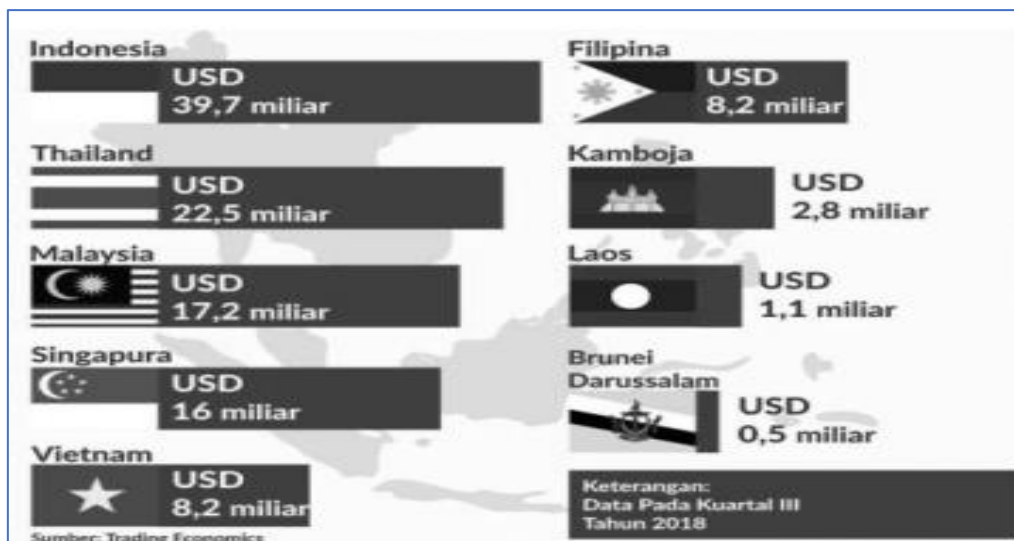


Fig. 2: Contribution of Manufacturing Industry to ASEAN Region GDP [6]

The core of Industry 4.0 in the manufacturing industry manufacturing industry is the Smart Factory. Connectivity that is created can be used to make predict, adapt, and serve according to customer needs. according to customer needs. There are five key characteristics of a Smart Factory, namely connection, optimization, transparency, proactivity, and agility.

Smart Manufacturing System is a work system based on industry 4.0. Smart Manufacturing System is an initiative

to realize a revolution in manufacturing business strategy by transforming the conventional cost-centered industry into an industry as the center of industry 4.0. industry by transforming conventional cost-centered industries into industries as integrated and profitable innovation centers. Through the integration of automation industry, IIoT, and information system (IT) technologies including cloud services, 3D models, computational convenience, and related integration platforms.

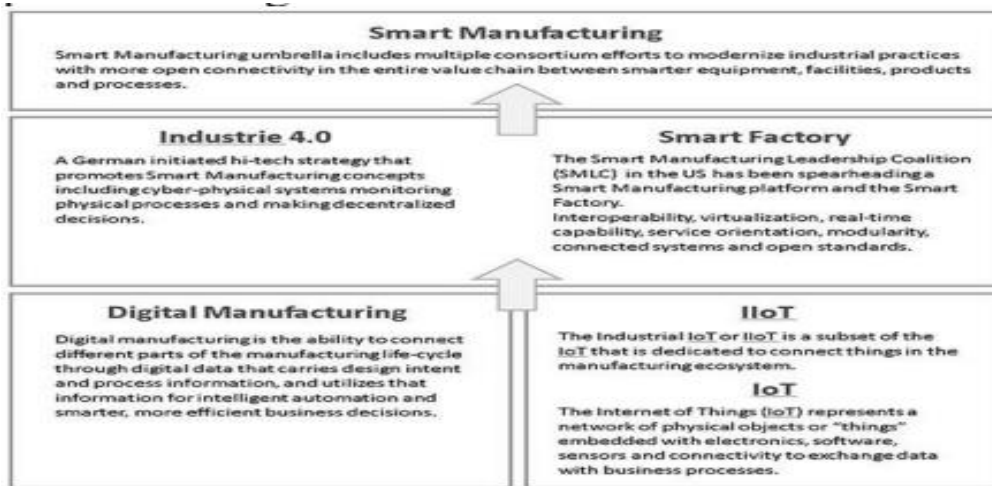


Fig. 4: Smart Manufacturing System

The readiness level of an industry can be seen through management and organization, people and culture, products and services, technology and factory operations according to the Indonesia Industry 4.0 Readiness Index (INDI 4.0).

INDI 4.0 was initiated by a team from the Industrial Research and Development Agency (BPPI) of the Ministry of Industry, involving experts, industry players, academics and consultants.

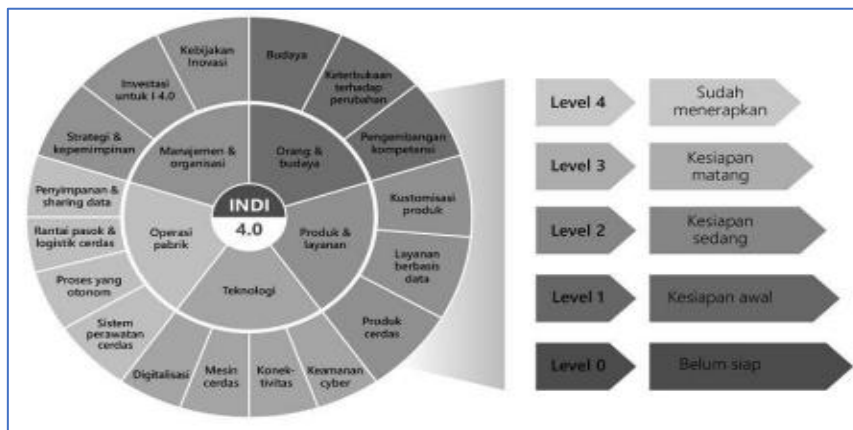


Fig. 5: Indonesia Industry 4.0 Readiness Index / INDI 4.0 [4]

II. MATERIALS AND METHODS

Study of the influence of Smart Factory in supporting the Smart Manufacturing System in the era of industry 4.0 is a collection of literature studies from several references to find out the extent extent to which the industrial revolution 4.0 is related in affecting the manufacturing industry as benchmark material. This study is descriptive and informative. The stages that conducted, including the collection of literature studies through articles and websites, then describe the influence of the interconnectedness of industry 4.0 in the manufacturing industry, then provide information on these influences from point of view of various articles. Followed by by drawing conclusions and providing advice on readiness for the implementation of industry 4.0 in Indonesia.

III. RESULTS AND DISCUSSION

Smart Manufacturing System with based on industry 4.0, namely "Fulfillment of individual customer needs, process engineering and business processes become dynamic, more optimized in decision making, and able to

create new business models and able to increase the added value of products in a new ways [9]."

Smart Manufacturing System based on industry 4.0 "Able to develop faster product development, creating specialized demand, fast flexibility in responding to production problems and in responding to production problems and efficient use of resources [11]."

The effect of the Smart Manufacturing System based on industry 4.0 is "Technological advances in four areas: increased productivity in conversion costs related to the application of industry 4.0 which will be adopted by many companies, revenue growth through the demand of industrial producers related to industry 4.0. through the demand of industrial manufacturers related to equipment that supports the implementation of industry 4.0 as well as consumer demand for various customized products, increased employment through employment through the demand for workers with competencies, increased investment through preconditions for manufacturers to invest [11]."

Through the Smart Manufacturing System based on industry 4.0, "The realization of mass production of mass production of a product's specialty, utilization of idle data and time improvement in production process [12]." Smart Manufacturing System based on industry 4.0 "As applied research has advantages, namely increased efficiency in the manufacturing industry and has a competitive advantage competitive advantage of being able to produce goods that can be customized individually and customized goods at a reasonable and feasible cost [13]."

Smart Manufacturing System based on industry 4.0 "Has advantages in increase productivity, reduce production risk, and protect the environment with production, and protecting the environment with better product quality [5]."

IV. CONCLUSION AND FUTURE WORK

A. Conclusion

The influence of industry 4.0 is largely have the potential to improve the speed and flexibility of production, increased production revenue and product improvement to customers in order to achieve high production optimization production optimization. Because the concept of industry 4.0 concept encourages the creation of an industrial environment that is environment by maximizing new components such as new components such as IoT that can unify physical and digital operations in the production process. This concept targets through the data system process from upstream to downstream. It is expected to be able to contribute to economic growth in Indonesia.

B. Future Work

Transformation for the implementation of the industry 4.0 concept is adjusted to the index assessment of the readiness of the industry itself. In accordance with Indonesia Industry 4.0 Readiness Index (INDI 4.0) which includes management and organization, people and culture, products and services, technology and factory operations..

C. Implication Managerial

Smart Factory implementation can help industries improve their productivity, efficiency, and competitiveness. This can support national economic growth and help the government achieve economic development goals.

The results of this study can serve as a basis for the government to formulate policies that support the adoption of Industry 4.0 technologies in the manufacturing sector. This can create a conducive environment for investment and smart industrial development.

REFERENCES

- [1]. Lucas, Robert E., Jr. Lectures on Economic Growth. Cambridge: Harvard University Press, 2002.
- [2]. Muntone, Stephanie. "Second Industrial Revolution". Education.com. The McGrawHill Companies. Diakses tanggal 14 October 2013.
- [3]. The Digital Revolution Ahead for the Audio Industry, Business Week. New York, March 16, 1981, p. 40D.

- [4]. Kementerian Perindustrian Republik Indonesia, "Mengenal Indonesia Industry 4.0 Readiness Index (INDI 4.0), [Online].
- [5]. Lu, Y., "Industry 4.0: A survey on technologies, applications and open research issues", 2017, Journal of Industrial Information Integration 6, 1-10. doi:10.1016/j.jii.2017.04.005
- [6]. Direktorat Jenderal Industri Kimia, Farmasi dan Tekstil, 2019, "Kontribusi Industri Manufaktur Terhadap PDB Kawasan ASEAN", [Online].
- [7]. Rick Burke, Adam Mussomeli, Stephen Laaper, Martin Hartigan, Brenna Sniderman, 2019, "The Smart Factory", [Online].
- [8]. Conrad Leiva, 2015, "On The Journey to a Smart Manufacturing Revolution", [Online].
- [9]. Kagermann, H., Wahlster, W., & Helbig, J., "Recommendations for implementing the strategic initiative Industrie 4.0: Final report of the Industrie 4.0 Working Group", 2013, Berlin: Forschungsunion.
- [10]. Lasi, H., Fettke, P., Kemper, H.G., Feld, T. & Hoffmann, M., "Industry 4.0. Business & Information Systems Engineering", 2014, 6(4), p.239.
- [11]. Rüßmann, M., Lorenz, M., Gerbert, P., Harnisch, M. "Industry 4.0: The future of productivity and growth in manufacturing industries" , 2015. Boston Consulting Group, p.14.
- [12]. Schmidt, R., Möhring, M., Härting, R. C., Reichstein, C., Neumaier, P. & Jozinović, P. "Industry 4.0-potentials for creating smart products: empirical research results. International Conference on Business Information Systems", 2015, pp. 16-27.
- [13]. Neugebauer, R., Hippmann, S., Leis, M., & Landherr, M. "Industrie 4.0-From the Perspective of Applied Research", 2016, Procedia CIRP, Vol. 57, pp. 2-7.
- [14]. Wikipedia Ensiklopedia Bebas, 2019, "Industri 4.0", [Online]. Available: https://id.wikipedia.org/wiki/Industri_4.0, diakses Oktober 2019
- [15]. Eko Roestanto, Shiddiq Ardhi Irawan, Ramdhan Ibad, 2019, "SERI #10: BELANJA INDUSTRI 4.0 IMPLEMENTASI MAKING INDONESIA 4.0", [Online]. Waldner, M., Justus, J., Engel, P. &