Application of technology based on the industrial revolution 4.0 for business strategies in various sectors: a literature review

SaptoHariyono[a], Muhammad FakhriHusein[b]

[a]Doctoral Student, Post Graduate Program of Management, University of Technology Yogyakarta, Indonesia.

[b]SunanKalijaga State Islamic University, Yogyakarta, Indonesia.

E-mail: saptoharyono1878@gmail.com.

Abstract

The term Industry 4.0 was born from the idea of the fourth industrial revolution. This study aims to obtain information from various previous studies related to the use of technology including management information systems (MIS) based on the development of the industrial revolution 4.0 in various sectors in the world. This paper is a literature review that discusses Industry 4.0, management information or technology. The review is carried out on articles with the topic of management information systems or decision-making systems. We identified about 25 articles published in the last decade then analyzed and drew conclusions. Based on this research, it is known that the use of technology based on the development of the industrial revolution 4.0 has a positive impact on various fields where the field that uses the most technology is manufacturing followed by business, education, information technology, business and other sectors. With the potential benefits that can be generated in the form of product development to be faster, efficient on resources, improved production time, able to meet individual customer needs, engineering and business processes to be dynamic, decision making becomes more optimal, improved productivity and others.

Keywords: Industry 4.0, technology, various sectors, business strategies, potential benefits.

1. Introduction

Management Information System is a process or system in processing and managing information in supporting the implementation of management, dealing with organizations and with humans as processors. Management information system (MIS) is a combination of a system between humans and machines that are integrated (integrated) or computers to be able to present information to support operational, management and decision-making functions to present information. In the development of the Industrial Revolution 4.0 that is happening today, it cannot be separated from the management of management information systems (Salvadorinho & Teixeira, 2020). The paradigm that presently emerges in the organizational context, known as Industry 4.0 (I4.0) promises to bring principles of connectivity and flexibility to the companies that embrace it. However, it is known that the adoption ofthe Lean philosophy was absorbed by the industrial environment, with results that proved to be exuberant, consideringthe simplicity of the tools. In this way, the I4.0 implementation must be prepared to preserve the existingmanufacturing systems. MES systems will be decisive in the foundation of the I4.0 paradigm. They are capable ofeliminate information silos, introduce knowledge management practices and data visualization mechanism (Salvadorinho & Teixeira, 2020).

Organizations always need systems for collecting, processing, storing, looking back and transmit information, including small entrepreneurs. Due to the explosion of information, as a result of the population explosion. Information is very necessary for activities management operations. Since the amount of information is huge, it's best Activities related to this information are partly carried out by humans and partly carried out by machines. As a result, the idea emerged to solve the problem, preferably human and machines form a system combined with checked results of dialogue and interaction between machines (computer) and human processing (Meiryani, Siagian, Puspokusumo, & Lusianah, 2020). Management Information System is flow-processing procedures based on computer data, and integrated with other procedures in order to provide information in a timely and effective manner to support decision-making and other management functions. This finding is also present when we consider that the number of contemporary business data and information exponential grow, and efficient business decision-making is possible only if the necessary information is fast, accurate and qualitative and managed by adequate staff but for the most cases not appropriate efficiency is the result of a lack of good management information systems. The rapid development of information technology coupled with the development of telecommunications technology has streamlined every area of life and human activity (Berisha - Shaqiri, 2014). Information has become an essential resource for managing modern organizations. This is so because today's business environment is volatile, dynamic, turbulent and necessitates the burgeoning demand for accurate, relevant, complete, timely and economical information needed to drive the decision-making process in order to accentuate organizational abilities to manage opportunities and threat (Ghaffarzadeh, 2015). Informational application which depends on the information already input while answering to a given query. For example, a decision support system could provide, comparative sales figures for one week/month and the next projected revenue figures based on new product sales assumptions, consequences of different decision alternatives, given past experience (Nowduri, 2011). Other studies have also shown that management information system supporting the quality of management before the management control system can be fully implemented (Tambun & Kuntjoro, 2013). Systematic information management and improvements in information and communication technology increase the quality of care and reduce costs (Murtola, Lundgrén-Laine, & Salanterä, 2013).

2. Literature Review

a. Definition of Industry 4.0

The definition of Industry 4.0 varies because still in the research and development stage. Industry 4.0 is integration of Cyber Physical System (CPS) and Internetof Things and Services (IoT and IoS) into the processindustries include manufacturing and logistics and processesother. CPS is a technology for combiningbetween the real world and the virtual world. Merger this can be realized through the integration of physical processesand computing (embedded computer technology andnetwork) in a close loop (Lee, 2008). Industry 4.0 is a termto name a collection of technologies and organizationsvalue chain in the form of smart factory, CPS, IoT and IoS.Smart factory is a modular factory with technologyCPS that monitors the physical process of later productiondisplay it virtually and performdecentralized decision making. Through IoT, CPSable to communicate with each

other and work collaborativelyreal time including with humans. iOS is allservice application that can be utilized by every user
Stakeholders both internally and between organizations. There are six principles of Industrial design4.0 namely interoperability, virtualization, decentralization,real time capabilities, service oriented andmodular. Based on some of the explanations above, Industry4.0 can be interpreted as an industrial era in which allthe entities in it can interact with each othercommunicate in real time anytime withbased on the use of internet technology and CPSin order to achieve the goal of achieving new value creationor optimizing the existing value of each processin the industry(Hermann, Pentek, & Otto, 2016).

The term Industry 4.0 was born from the idea of the fourth industrial revolution. Its existence offers a lot potential benefits. In order to realize Industry 4.0, it is necessary to involve academics in the form of research.This article aims to examine the aspects and directions of research developments related to Industry 4.0. Approachused is a study of various definitions and models of the Industry 4.0 framework and mappingand analysis of a number of publications. Several publications with the theme of Industry 4.0 are sorted byresearch methods, study aspects and industrial fields. The results of the study show that Industry 4.0 has fourtwelve aspects. Judging from the research method, most of the research was carried out through descriptive and qualitative methodsconceptual. Judging from the aspect, the business and technology aspects are the focus of the researchers' research. Reviewedfrom the field of industrial application, most of the research is carried out in the manufacturing sector. In terms of
In number, research related to Industry 4.0 experienced a significant upward trend(Prasetyo & Sutopo, 2018).

b. Information System Technology Definition

An organization held transactions that must be processed in order to carry out daily activities. Salary factors must be prepared, sales and payments on estimates must be needed. All this and stuff the other is data processing activities following a standard procedure certain. Computers are useful for data processing tasks such as this, but a management information system also performs tasks and more than just a data processing system. Is a processing system information that applies skills for management and for decision making decision (Martins, Assis, Coelho, & Almeida, 2019). A Management Information System (a term commonly known to people) is a human/machine system integrated (integrated) to provide information that supports the function operations, management and retrieval decisions in an organization. This system uses software (software) hardware (hardware) computer, manual procedure, model management and decisions and a databases (Vafaei & Harati, 2010).

c. Decision Making System

The design allows human decision makers to allocate tasks for themselves or on a computer. Limited human takers decisions in the organization in addition to the relative efficiency of human processing on the decision means that the driver's license must program as many decisions as possible. If the decision cannot be fully programmed, then what is

possible is partial programming. In this case the rules have been determined previously used to a certain extent and then the final decision is left to a human decision maker. MIS should be designed to monitor programmed decisions and to recognize decisions which seems impractical by the decision rules or which do not appear to produce the appropriate results plan. Programmed decisions are usually unstructured. For this SIM provide if possible a set a tool by which decision makers can structure the decision-making process. For problems no iteratively programmed, SIMs can be designed with partial structuring to speed up processing of the rest by humans (Al-Tarawneh, 2011; Janssen, van der Voort, & Wahyudi, 2017; Khakheli & Morchiladze, 2015; Nooraie, 2012).

Decision system closed obviously assumes a rational person who logically examines all alternatives, ranks according to the importance of the results, and selects the alternative that leads to the desired outcome best/maximum. Quantitative model decision making is usually closed decision system model. An open decision system view decisions as being in a complex environment and partly unknown. Decisions are influenced by the environment and in turn the decision process then affects the environment. Decision makers are considered not to be logical and completely rational, but more show rationality only within the limits suggested by the background, view of alternatives, ability to handle a decision model, and so on (Nooraie, 2012).The role of decision makers includes the ability to gather information, the ability to analyze and interpret, the ability to use a broad enough concept of human behavior and predict a better future (Utami, 2011).

3. Method

This paper is a literature review that discusses Industry 4.0, management information systems or technology and decision making. Articles are collected by Google, Google Scholars and mendeley databases. We identified about 25 articles published in the last decade then analyzed and drew conclusions.

4. Results and discussion

Industry 4.0 brings many changes in human life. Industry 4.0 has fundamentally changed the way people do activities and has a big influence on the world of work. The positive influence of industry 4.0 is in the form of the effectiveness and efficiency of resources and production costs, lean manufacturing, despitethe impact on reducing employment. Industry 4.0 needs a workforce that has skills in digital literacy, technological literacy, and human literacy(Harahap & Rafika, 2020; Sanders, Elangeswaran, & Wulfsberg, 2016; Zhou & Le Cardinal, 2019).

Contents of this article includes a study of the definition and model frameworkIndustry 4.0 to find out what aspects are in the concept of Industry 4.0. Next is the explanationregarding methods for tracing the direction of developmentIndustry 4.0 research, followed by discussion of resultsand conclusions. This article is expected to providean overview of what Industry 4.0 is, developmentsand the research potential in it.Based on the results of the literature review, it is known that previous research revealed the benefits of the industrial revolution 4.0 in various aspects as follows:

Table 1. Potential Benefits of Industry 4.0

Author	Potential Benefits
(Kagermann, Wahlster, & Helbig, 2013)	Able to meet individual customer needs, engineering and business processes to bedynamic, decision making becomes more optimal, giving birth to new business models and waysnew in creating added value
(Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014)	Product development is faster, realizing individual demands(product customization), production that is flexible and fast in responding to problems andresource efficiency.
(Russmann et al., 2015)	Improved productivity, boosted income growth, increased labor demand skilled work, increased investment.
(Schmidt et al., 2015)	Realization of mass customization of products, utilization of idle data and improvement of timeproduction.
(Neugebauer, Hippmann, Leis, & Landherr, 2016)	Realize an efficient, intelligent and on-demand (customizable) manufacturing processat a reasonable cost.
(Sanders et al., 2016)	Cost-intensive operation, and is met with reluctance from several manufacturers
(Harahap & Rafika, 2020)	Increase productivity, efficiency and reduce the number of unemployed significantly

The table above shows thatthe use of technology based on the development of the industrial revolution 4.0 has a positive impact on various fields where the field that uses the most technology is manufacturing followed by business, education, information technology, business and other sectors. With the potential benefits that can be generated in the form of product development to be faster, efficient on resources, improved production time, able to meet individual customer needs, engineering and business processes to be dynamic, decision making becomes more optimal, improved productivity and others.

Meanwhile, when viewed from the distribution of the use of industrial revolution 4.0 technology in various fields, the data obtained are as follows:

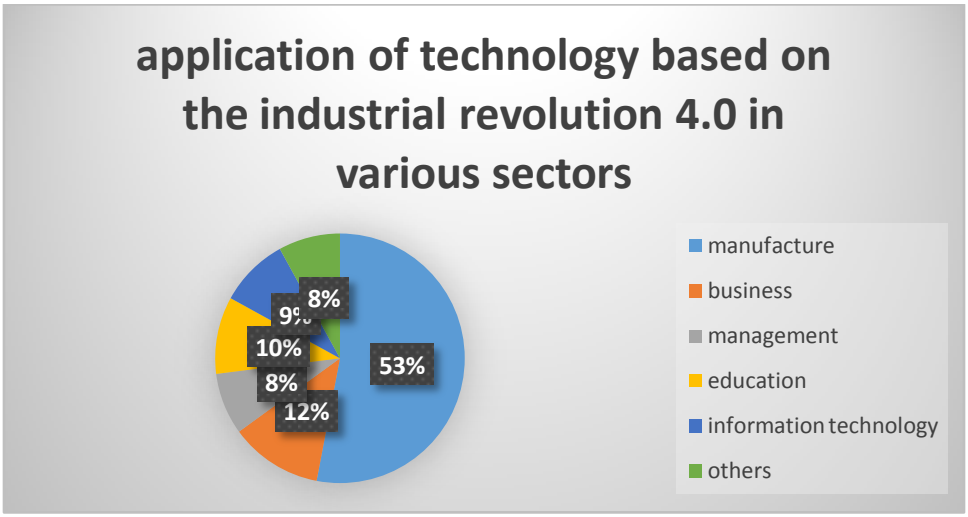

Figure 1. The application of technology based on the industrial revolution 4.0 in various sectors.

Figure 1 shows that the implementation of technology based on the industrial revolution 4.0 is mostly applied to the manufacturing sector, followed by business, education, information technology, and management. This shows that in the field of management and management information systems there is still a lot of opportunity for further development.

A number of researches were conducted in the manufacturing industrymass-producing goods, job shops,metal processing and furniture. Most objectsresearch studies related to production processes such asmachining, production scheduling optimization, automation,system design and manufacturing layout and interactionsbetween humans and the production process. This findingshows that Industry 4.0 research is morecarried out at the production floor level which is the corefrom the wheel of industry. The next field is business (12%) with object the study includes all efforts to preparethe business world in facing Industry 4.0. Partlarge number of publications discussing the business world in the regionEurope. Education (10%) is also an area that of interest to researchers. Multiple publications suggests developing training facilities and Industry 4.0 technology related demonstration. Technology field information and management sequentially have9% and 8% portions. In addition, there are also fieldsothers (8%) who became the object of interest of theresearchers, namely public services, agriculture, industryfood, automotive, law, socioeconomic, constructionand electricity.

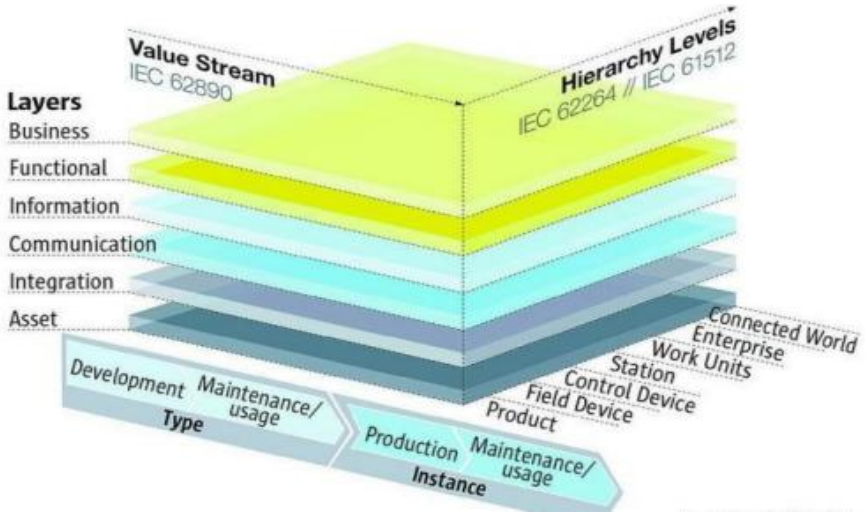

Figure 2. Various points of view industry to Industry 4.0.

The picture above shows various points of view industry to Industry 4.0. That point of viewcovering market/business aspects, functions, information,communication and perspective on abilityintegration of components (company assets). Axisthe left horizontal shows the life cycle flowproducts or value added flows in the production process inindustry accompanied by the application of digitalization.The horizontal axis on the right describes theproduction system control hierarchy starting from product,equipment on the production floor to the levelcompany and the outside world(VDI/VDE-Gesellschaft Mess-und Automatisierungstechnik, 2015).

5. Conclusion

Based on this research, it is known that the use of technology based on the development of the industrial revolution 4.0 has a positive impact on various fields where the field that uses the most technology is manufacturing followed by business, education, information technology, business and other sectors. With the potential benefits that can be generated in the form of product development to be faster, efficient on resources, improved production time, able to meet individual customer needs, engineering and business processes to bedynamic, decision making becomes more optimal, improved productivityand others.

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