Management's Initial Thought in the Industrial Era 4.0 and Millennialization, Is It Still Relevant?

Rosa Rilantiana[1], Anis Eliyana*[2], Djoko Suprayetno[3], Kresno Eka Mukti[4]

[1]Universitas Internasional Semen Indonesia
rosa.rilantiana@uisi.ac.id
[2]Universitas Airlangga
anis.eliyana@feb.unair.ac.id
[3]Universitas Mataram
Universitas Airlangga
djoko.suprayetno@unram.ac.id
Djoko.suprayetno-2020@feb.unair.ac.id
[4]Universitas Airlangga
kresno.eka.mukti-2020@feb.unair.ac.id

Corresponding Author: Anis Eliyana, Universitas Airlangga, anis.eliyana@feb.unair.ac.id

ABSTRACT

This critical study is a reflection of various thoughts related to management concepts and techniques from the industrial revolution era to the Industrial 4.0 and millennial era with an emphasis on Human Resource Management. The ongoing Industry 4.0 era and the growth of the current millennial generation have many benefits, but also problems in organizations, so the question arises whether existing management thinking, and theories are still relevant to solving these various problems. The research method used is a review of the literature related to the evolution of management thinking. This study provides an overview of the evolution of management thinking which is grouped into four theoretical areas, namely scientific & administrative management theory, behavioral management theory, quantitative management theory, and modern management theory, which is continued by providing an overview of the current industrial era 4.0 and millennials. The results of this literature review show that there is a gap in management theory related to the current industrial era 4.0 and millennials, which can then become the basis for further research.

INTRODUCTION

Basically, management thinking has been known and applied for a long time in human life. Management has been a part of human life even since ancient times, where at that time each individual formed a group to organize its members and apply agricultural and hunting techniques to achieve group goals. If traced further, the actual history of management is not much different from the development of human history itself, meaning that management has existed since humans were sent down by God to the face of the earth. This then develops in line with the development and demands of living in a cave with simple tools to deal with such a ferocious nature, using management science according to the needs and times (Wren & Bedeian, 2009). The development of management thinking theory has grown and developed in accordance with the environmental conditions behind it (Vaszkun, 2012). In situations, conditions and backgrounds as well as the times that are so fast and dynamic, management theory and thinking will continue to develop to adapt to changes in the environment (Howell, 1995). Therefore, the application and application of management thinking in different dimensions of time and place are carried out across sectors among existing theories towards an integrated, adaptive management concept that is complementary and complementary (Child, 2012).

Management science is currently developing very rapidly and changing continuously. The history of the development of management science can provide us with knowledge and understanding of important approaches or procedures in conducting research, analyzing and solving problems that occur and are related to management

science (Baalen & Luchien Karsten, 2012). The development (evolution) of management science from the past to the present occurred with the emergence of several schools of thought as a basis of thought that was divided based on classical schools, the flow of human relations and modern management which were the forerunners of management theory that developed continuously with various other schools until now (Khorasani & Almasifard, 2017; Olusoji & Ogunkoya, 2015). The history of management thinking includes the classical approaches (the classical approaches) focusing on developing universal principles that can be used in various management situations; the human resource approaches, namely focusing on human needs, group work and the role of social factors in the workplace; quantitative or management science approaches (the quantitative or management science approaches), namely focusing on the use of mathematical techniques in management planning; and modern approaches, namely focusing on system views and contingency thinking with an awareness of a commitment to high quality and performance (Baalen & Luchien Karsten, 2012; DuBrin, 2011; Petersen, 2000). The purpose of this conceptual paper is to explain the evolution of management science from time to time, and to understand the relevance of development to the Industrial Age 4.0 and the Millennial Generation.

LITERATURE REVIEW AND CONCEPTUAL MAPPING
Classic Management
Classical management developed during the era of the 18th century industrial revolution, in its study of how to improve management in increasing productivity.

Increasing the productivity of individual workers through the preparation of techniques for organizing work and placing financial incentives as drivers for higher levels of output (Rifa'I and Fadli, 2013). Frederic W. Taylor (1856-1917) believed that in the same way is the best machine at every job. Taylor thought, every task is carried out to component parts, each time division, and parts rearrangement into a state of the more efficient method of work.

Human Relations Management

At the stage of the flow of human behavior or relationships the organization sees that it is essentially human resources. This flow perceives the classical flow as incomplete because it seems unable to achieve perfect production efficiency with harmony in the workplace (Kwok, 2014). Humans in an organization cannot always easily predict their behavior because they are often irrational. Therefore, managers need to be assisted in dealing with humans socially, through knowledge of sociology and psychology (Rifa'I and Fadli, 2013).

Modern Management

This flow appears to be more of a quantitative stream, which is a combination of Operation Research and Management Science. In the last 10 years, the main motivation for this approach has been the development of information technology, which minimizes space use and physical interactions (Finkelsten & Newman, 1984). The existence of computer assistance, it can provide a more rational based problem solving to managers in making decisions. Modern management focuses on helping organizational managers in various important activities, such as in capital budgeting, cash flow management, production scheduling, production development strategies, human resource planning and others (Finkelsten & Newman, 1984). This flow also has a weakness because it pays less attention to human relations. Therefore, it is suitable for planning and control, but cannot answer individual social problems such as motivation, organization and staffing (Rifa'I and Fadli, 2013).

Development of Management Theory along with the Industrial Revolution

Through the literature review above, it can be seen that management theory always develops over time. The development of management theory tends to follow the development of the external environment of the organization, which in this case is the development of technology and industry. For example, in the era of the first industrial revolution (around the middle to the end of the 18th century) where factories with steam engine technology began to emerge, at that time Adam Smith introduced the concept of division of labor which is the division or specialization of work and the obligation for each worker with the hope of increasing worker efficiency and productivity. Smith argues that the division of labor can provide benefits to society widely; whereas the population grows, new markets also grow, exceeding the demand previously met by domestic / household production. In these conditions, the application of the division of labor and economies of scale in the factory system can provide benefits (Wren and Bedeian, 2018). Furthermore, at a further stage of the industrial revolution, or it can be said as the 2nd industrial revolution that began in the mid-19th century, the use of technology became more complex and advanced, where electricity began to be used as a resource. At that time the steel and telecommunications industries were growing in America. At the beginning of this period, there was a productivity problem in the industry where the output produced by workers was still not optimal because there was still no measurable calculation of the standard output that workers could achieve. Frederick W. Taylor solved the problem through a time study, in which he calculated the time and distance that workers and materials moved using a stopwatch and measuring tape. Through this method it can determine the unnecessary waste of effort and material, as well as the optimal level of productivity that can be achieved by workers. Taylor's approach is included in the early era of "scientific management" (Wren and Bedeian, 2018). After the 2nd industrial revolution era, since the middle of the 20th century, the 3rd industrial revolution began, in which there were relatively radical changes in the industry with the use of computers, which changed the production processes in various industries. In the 3rd industrial revolution, there were relatively significant technological developments, including microchips, robots, computer aided design (CAD), fiber optics, bio-genetics, space exploration, etc. (Finkelstein and Newman, 1984). Furthermore, Finkelstein and Newman (1984) emphasize that the impact of the 3rd industrial revolution is extraordinary, where change occurs so fast that it threatens the ability of organizations to deal with these changes. Furthermore, Wren and Bedeian (2018) added that the situation of business growth around the world at that time encouraged management science to develop and discover new knowledge. In this era, strategic management science developed to face global challenges. As for one of the influential strategic management figures at that time, namely Michael E. Porter who introduced Porter's competitive advantage strategy as an attack and defense measure to continue to survive in an industry and to be able to overcome five competitive forces; namely competitors in the same industry, the entry of new competitors, the threat of substitute products, bargaining power of suppliers, and bargaining power of consumers. Porter's competitive advantage strategy is divided into 3: cost leadership, differentiation, and focus (Porter, 1980).

Based on the explanation above, it can be concluded that management theory is always evolving according to the industrial conditions faced by the organization. Although theories were born at different times, in general, each theory always has the ultimate goal so that an organization can survive and win the competition, both through achieving efficiency and productivity as well as competitive advantage. Furthermore, even the attainment of efficiency and productivity can be a source of an organization's competitive advantage, Cummings and Worley (2014).

Industry 4.0

After the era of the 3rd industrial revolution, now we are in the era of the 4th industrial revolution or what is known as industry 4.0 (I4.0). I4.0 was first introduced by the German Government at the Hannover Exhibition event in 2011 (Lucato, et al 2019). Müller (2019b) added that the German government has two objectives related to the development of I4.0, namely changing the industrial environment in Germany and developing relevant technology, especially technology derived from the information technology (IT) sector. Furthermore, Müller (2019a) also stated that the German government together with German industrial and research institutions would like to introduce a paradigm shift towards digital and a connected future in the creation of industrial value in order to ensure a competitive level of industry in Germany. This concept is then referred to as digitization.

The term I4.0 refers to the integration of the Internet of Things (IoT) towards industry value creation making it possible for factories to take advantage of a fully connected, digitized, smart and decentralized value chain. Through this integration, it can help organizations / companies to be more flexible, create business structures that are more adaptable, maintain organizational excellence, and make it easier for organizations to face changes in the business environment (Bousdekis, et al, 2019). In summary, Müller (2019b) explained that the I4.0 concept is related to IoT applications in the manufacturing industry. The two explanations are in line with the statement of Lasi, et al. In Muller (2019a) that the technology used in I4.0 in general includes cyber-physical systems, which depend on IoT. As for the production side, Martin and Scaffer in Alcácer and Cruz-Machado (2019) describe I4.0 as the flow of material produced from machine-to-machine in a factory based on real-time communication between machines. In such an environment, I4.0 makes factories work smart and adaptive in using a collaborative and flexible system to make the best decisions to solve problems. In general, I4.0 can influence the way of life, create new business models, create new ways of managing factories, and renew the industry called digital transformation.

I4.0 aims to work using an automation system at a higher level, with the hope of obtaining a higher level of productivity and efficiency (Alcácer and Cruz-Machado, 2019). Apart from being able to increase productivity and efficiency, I4.0 can also contribute to several aspects of quality management (Müller, 2019b). Furthermore, I4.0 can even help factories to minimize waste in implementing lean manufacturing (Bousdekis, et al, 2019). Based on these studies, it can be seen that I4.0 provides many benefits, but Radel (2017) states that at this time we are still in a very early stage in I4.0, where we do not fully understand the impact on society. , organizations and individuals.

Management in the Industrial Age 4.0

Current technological developments have had a significant influence on various aspects of human life. Technology not only helps humans in their field of work but has become a necessity in life (Turulja & Bajgoric, 2018). Technological progress is a form that cannot be avoided in human life, because technological progress will run in accordance with human development and science. The industrial revolution 4.0 requires humans to be involved in technological development. The industrial revolution 4.0 has a fundamental influence on the way humans think, live and relate to other people (Olusoji & Ogunkoya, 2015). The era of the industrial revolution 4.0 will disrupt various human activities in various social interactions. The behavior and habits of the millennial generation aged 18-40 years have a high level of enthusiasm for the use of technology, but they greatly affect their attitudes and behavior (Rachma & Sobari, 2020).

In this digital revolution era, human resources are an important factor in the success of a company. Companies that are able to turn a challenge into an opportunity will be able to be more productive, innovative and adaptive for each generation. The presence of the Internet of Things (IoT) helps to emerge this industrial revolution. The basic principle of industry 4.0 is the amalgamation of machines, workflows and systems, by implementing an intelligent network along the chain and production processes to control each other independently (Oztemel & Gursev, 2020). Then Shamim et al., (2016) stated that in implementing industry 4.0 in the workforce component, it must fulfill human collaboration with robots, remote control and control, digital performance management, and work knowledge automation. The challenge of human resources in the era of industrial revolution 4.0 is the integration of the use of the internet with production lines that take advantage of the sophistication of technology and information (Rana & Sharma, 2019). The characteristics of the 4.0 industrial revolution include digitization, optimization and customization of production, automation and adaptation, human-machine interaction, added value of services and business, automatic data exchange and communication, and the use of internet technology (Oztemel & Gursev, 2020).

Science influences changes in the use of communication and technology, which are the basis for changes in the industrial world (Finkelsten & Newman, 1984). Through the presence of the internet and automatic digitization, there is a deeper understanding and control of aspects that result in efficiency and increased productivity in the company. Digitalization changes affect organizations to adapt and change their business processes. Communication and control of organizational business can be carried out online (Oztemel & Gursev, 2020). Another advantage, related to the use of digital technology and information in finding or processing information quickly (Finkelsten & Newman, 1984; Rana & Sharma, 2019).

Millennial Generation

Millennial Generation (Millennial Generation) is a generation born in the time span after the 1980s to 2000, which is often referred to as Gen-Y, Net Generation, Generation WE, Boomerang Generation, Peter Pan Generation, and others (Howe and Strauss, 1992; Ng & McGinnis Johnson, 2015; Ng & Perry, 2016; Rachma & Sobari, 2020). In the context of the world of work, each generation has different preferences in aspects of work.

Millennial Generation, or Millennia Generation, also known as Generation Y, who were born after 1980, have interacted with technology since birth (Howe and Strauss, 1992). Therefore, psychologically and the behavior of the millennial generation can be seen when it comes into contact with internet technology, through the way they get information, networks and meetings are held on social media, this is not in accordance with the social aspect which emphasizes face-to-face meetings to improve communication relations more. well. According to (Zemke et al: 2000) that the millennial generation is a cooperative and more optimistic generation than previous generations.

Management in the Era of the Millennial Generation

Millennials experience the most life and work pressures, this is due to the pattern of the industrial revolution 4.0 which demands companies to work faster and unstable economic conditions and food intake factors that affect the mental health of millennial generations (Wang et al., 2016). This generation tends to be self-centered and wants to be the center of attention because this condition is actually influenced by the development of social media. Millennials see that perfectionism as the main orientation, perfection or pressure on social media will affect social status so that they experience multidimensional perfectionism or a pressure to get a higher standard.

RESEARCH METHODS

This research uses qualitative methods to explain the overall development of management science in the millennial generation in facing the technological era 4.0. The analysis used is based on literature studies from studies related to the development of human resource

thinking in the millennial generation and the technological industrial revolution in the 4.0 era.

DISCUSSION

The advancement of internet and digital technology has resulted in the digital era. The management of the company is influenced by employee trends and the ever-changing demographics, and HR poses a planning challenge that suits the digital era.

A number of studies on I4.0 that have been discussed above tend to focus on a technology and engineering point of view (for example: the effect of implementing I4.0 on the level of efficiency, productivity, quality management, and lean manufacturing). It should be noted that the implementation of industry 4.0 also has an impact on the social side. Müller (2019a) states that from a social point of view, I4.0 provides a number of benefits in the form of calculating fairer wages for workers, increasing learning opportunities for workers, and increasing worker motivation. However, I4.0 also raises a number of issues among workers, including the risk of losing their jobs, lack of training and competence, resistance from workers, and rejection of organizational structures. Of these issues, the risk of losing a job is quite high for workers, especially workers with low skills / no certain skills because their tasks can be done by automatic machines. This is in accordance with the opinion of Radel (2017) which states that in I4.0, tasks that are not complicated and are usually done repeatedly and can be done with automatic machines require very few workers. As for work that demands innovation and is usually done not repeatedly, it will always require human labor. Furthermore, Müller (2019b) added that the implementation of I4.0 is more significant for carrying out operational tasks (for example: planning for ordering goods from suppliers). I4.0 tends not to provide significant benefits for carrying out strategic tasks.

Furthermore, according to Müller (2019a), there are several things that hinder the application of I4.0 to a factory that is the object of research. Some of the main barriers are as follows:

1. Low levels of acceptance of workers (mainly due to fear of losing their jobs and lack of experience with work processes in I4.0, lack of competence, and lack of knowledge about I4.0)

2. Lack of competence and knowledge regarding the application of I4.0 to their workplace (especially because they do not have the work qualifications needed to work in an I4.0 environment, have never received training in this matter)

3. Lack of cooperation between departments in the organization (mainly due to different approaches for each department)

4. Lack of implementation strategies and targets (mainly because workers do not know the extent to which I4.0 implementation will be carried out in their workplaces and have never been involved by management)

5. Fear of workers regarding the openness / transparency of data between the organization and customers can cause problems for them in the future

6. Workers' fear regarding the tighter management controls on them as I4.0 is implemented.

Meanwhile, organizational change requires support and initiative in order to succeed (Seijts and Robert, 2011; Ludviga and Sennikova, 2016).

5. Changes to the Implementation of Industry 4.0 and Millennialization

Based on the above case, Müller (2019a) states that organizations must first define a clear vision before starting to implement I4.0. Through a clear vision, it can be seen how the role of I4.0 implementation in achieving that vision. Workers will tend to find it difficult to accept these changes if they do not know the organizational plan clearly. Kaplinsky and Cooper (2005) add that digitalization is one of the main factors in the industrial revolution 4.0. The most prominent thing from I4.0 is the use of technology and machines in industrial processes, through the difficulties that need to be paid in the form of adjusting to changes in technology used (Kaplinsky and Cooper, 2005). From these two opinions, it can be concluded that workers will find it increasingly difficult to accept changes made by the organization if the organization does not clearly convey its vision and plans because workers will certainly experience difficulties in adjusting to changes in technology used.

Furthermore, management must prepare steps for change by forming a special team to oversee the implementation of I4.0 in the organization, because it requires synergy between management, workers, and IT Müller (2019a). This opinion is in line with the opinion of Kadir and Broberg (2020) where according to him the introduction of new digital technology in companies in an industry creates new socio-technical interactions between physical and virtual elements, so that changes are needed in matters relating to humans, technicalities, and and organization. Digital transformation is not only about change and innovation, but also about how these technologies are adopted and used (Finkelsten & Newman, 1984). The application of digital technology in companies needs to be considered openly because digitalization has penetrated all aspects and forces companies to apply and change the habits of their workers. Habits that are accepted and carried out continuously, will form a new culture in an organization. Organizational culture will be effective if it supports the mission, goals and strategy of the organization (Wallach, 1983; (Finkelsten & Newman, 1984).

With the advancement of technology and communication, companies need to think about strategic steps in making plans to use their resources, especially human resources who are able and able to keep up with developments in technology and communication. Meanwhile, changes occur within and outside the organization. Larry Greiner through an article in Harvard Business Review (1972) states change management can be carried out effectively when organizations adapt to predictions of major changes (revolutions) (Worley & Mohrman, 2014). Mondy and Premeaux (1995: 6) explain their opinion that management is the process of obtaining an action through the efforts of others. Especially if there is a high age range of workers, where the millennial generation has the advantage of being born with the advancement of digitalization. The development of technology will benefit every organizational resource, but only organizations that are able to adapt will be able to control technology (Worley & Mohrman, 2014). Organizations need to consider the resources that come from the Millennial generation, so that they can quickly adapt and take advantage of changes in technology and telecommunications. The millennial generation was born in a state of all technology, logically they will quickly adapt to technology, so that it will make it easier for companies to win the competition in the I4.0 Era.

CONCLUSION

In terms of social functioning, the millennial generation has strengths that the previous generation did not, namely the issue of creativity, extensive social media networks and confidence in their work. The organization must first define a clear vision before starting I4.0 implementation. Through a clear vision it can be seen how the role of I4.0 implementation in achieving that vision. Workers will tend to find it difficult to accept these changes if they do not know the organizational plan clearly.

With the advancement of technology and communication, companies need to think about strategic steps in making plans for the use of their resources, especially human resources who are able and able to keep up with technological and communication developments. Steps of change are needed in guarding the implementation of I4.0 in the organization, because it requires synergy between management, workers, and IT. The development of technology will benefit every organizational resource, but only organizations that are able to adapt will be able to control technology. The results of this literature review show that there is a gap in management theory related to the current industrial era 4.0 and millennials, which can then become the basis for further research.

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