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INDUSTRIAL REVOLUTION 4.0 AND ITS IMPACT ON THE EVOLUTION OF THE FIRM'S ORGANIZATION AND MANAGEMENT

Abstract

Fourth Industrial Revolution or Industry 4.0 refers to the evolution of industries, particularly in the manufacturing and chain production areas. Executive managerial decisions this industry have a substantial impact on technology, data management and analytics, data security, risk management, regulatory compliance, validation, and human resource practices, among other things. Artificial Intelligence, sensors, enterprise-level solution platforms, and Machine Learning will all be used extensively in the fourth industrial revolution. In industry 4.0, the volume of external and internal Internet of Things (IoT) data is expected to expand, resulting in a drastic shift in information.

The IR4.0 will result in an abundance of data flowing to quality experts in real-time, and this data will come from various sources at the same time, necessitating intelligent utilization to enable quick and effective decision-making. Managers and quality control employees must make the necessary decisions to provide a smooth transition to digital technology, which will increase the efficiency and quality of manufactured goods and services. Companies will be required to employ effective risk management strategies as part of the fourth industrial revolution in order to improve product quality and operational efficiency by allowing machine learning and Artificial Intelligence to give the finest services. As a result, the risk management team must develop plans to ensure that these tactics are implemented properly.

Furthermore, quality managers must ensure that Quality 4.0, which will coincide with the fourth industrial revolution, is implemented effectively. Previous research into how Industry 4.0 affects managerial decisions has been lacking and unsatisfactory. As a result, the article tries to provide a complete assessment of the fourth industrial revolution's management implications.

Keywords: *fourth industrial revolution, artificial intelligence, decision making, management, human resource*

INTRODUCTION

The fourth industrial revolution, often known as Industry 4.0 (IR4.0), relates to the evolution of manufacturing and chain production processes. The term "industrial revolution" was used by British economic historian Arnold Toynbee to describe an era that began in the late 18th century in Britain with the invention of the steam engine and the mechanization of textile manufacture. Tasks previously completed by hand by hundreds of weavers in scattered cottages were gradually replaced by power looms operating under the single roof of a cotton mill. This marked the beginning of the first industrial revolution and the establishment of the modern factory.

The definition "Industrie 4.0" was first coined in 2011 to boost German manufacturing industry competitiveness. Its forefathers come from a wide range of backgrounds, including business, academia, and politics. In its High-Tech Strategy for 2020, Germany's federal government supported the concept. Despite the fact that industry 4.0 is expected to have a substantial impact on

several aspects of quality management, many professionals are still unsure how the concept will affect their work. However, it's clear that many corporate leaders are keeping a close eye on this paradigm-shifting technique in order to have a good sense of where things are headed.

Similarly, quality professionals need to be fully involved in the monitoring process as they form the central part of each company's Industry 4.0 dialog. As quality professionals step into this new era, it is important to have a wealth of information to understand the aspects and assumptions of Industry 4.0 and their impact on production, quality management systems and supply chains. This paper focuses on a specific tool for administrators, the concept of Industry 4.0 for management.

THE ROLE OF TECHNOLOGY

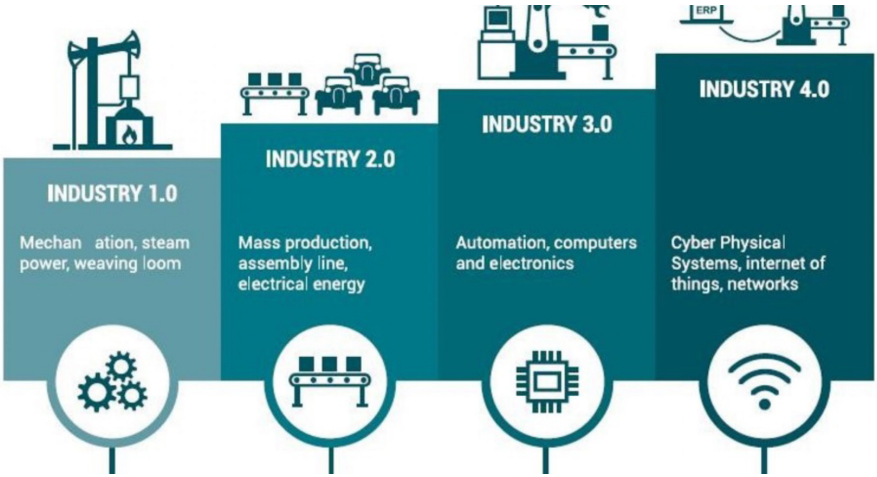
When Industry 4.0 is properly implemented, all industrial processes and products will be intelligently networked to improve quality and efficiency. In 2013, the Fraunhofer Institute performed a research to assess the potential for IR4-based enterprises to grow and expand. The survey's findings revealed five major technological areas that influence this expansion. Embedded systems, robust networks, IT security, smart manufacturing, and cloud computing are among them (Nagy et al., 2018). A similar study (Rußmann et al., 2015) identified nine technologies that will complete the industry 4.0 change.

Automated robotics, integrated horizontal and vertical systems, cyber security, 3D printing (additive manufacturing), big data analysis, simulation, industrial IoT, cloud-based services, and augmented reality were among the technologies discussed. The graph below depicts some of the major changes in industry, from the first through the fourth industrial revolutions,

In an industrial context, the fourth industrial revolution demands machines to be networked as a collaborative community. It also necessitates the use of advanced prediction tools to enable systematic data processing into information, hence assisting in the formulation of informed judgments (Nagy et al., 2018),. Most businesses will demand that some quality management systems (QMS) and supply chain platforms be upgraded in order to transform the

industry into a smart factory capable of achieving the sector 4.0 objectives. Old equipment is being replaced with modernized equipment, Artificial Intelligence (AI), sensor implementation, enterprise-level solution platforms, and Machine Learning are all examples of technical advances (ML).

Figure 1. The Industrial Transformations



Also the volume of external and internal the Internet of Things (IoT) data is expected to grow, resulting in a significant change to information. Furthermore, IR4 will lead to the development of predictive analytics that will increase prevention, and continuous learning and improvement will be the daily routine (Nagy et al., 2018). As a result, managers and quality assurance employees must make suitable decisions to ensure a smooth transition to digital technology in order to increase the efficiency and quality of goods and services provided.

Klaus Schwab in relation to The Fourth Industrial Revolution in 2016 expressed:"We stand on the brink of a technological revolution that will fundamentally alter the way we live, work and relate to one another… when compared with previous industrial revolutions, this one is evolving at an exponential rather than linear pace.… it is disturbing almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management and governance".

Meaning that Industry 4.0 will result in an abundance of data flowing to quality professionals in real-time, and this data will come from various sources at the same time, requiring intelligent utilization to enable quick and efficient decision making. Quality management experts must develop effective strategies for embracing internal and external data and technology and applying them to build an innovative culture while improving overall quality (Nagy et al., 2018). Massive changes in IT and telecommunications have occurred in recent years, resulting in the networking of electronic items known as the internet of things (IoT) (Wielki, 2017).

THE CHALLENGES OF SECURITY

Industry 4.0 is expected to result in massive amounts of data and information being produced. As a result, maintaining data integrity is critical in protecting the company's intellectual property. The manufacturer is responsible for implementing the appropriate techniques to ensure that the device communicates the correct data and information without disclosing the patient's IP address or personal information. This necessitates a delicate balance of digital trust to secure data privacy and information transparency (Shrouf et al., 2014). Organizational leaders are concerned about data security since it determines the product's distinctiveness and competitiveness. Quality management personnel must make suitable judgments to ensure controlled data access through effective encryption and improved network, sensor, and device security (Hossain and Muhammad, 2016). The big question is when is the best time to jump. This is because if a company waits too long, new entrants and existing competitors will be able to tailor the market and profit from the learning process (Tesch et al., 2017). As a result, the management team must make strategic judgments in order to avoid competing in superfluous competitions.

THE IMPORTANCE OF RISK MANAGEMENT

The process of recognizing, analyzing, and responding to hazards with the goal of fulfilling the project's objectives is known as risk management. Quality experts cannot ignore the urgent necessity to integrate a fully working quality risk management system into each QMS process (Kirazli and Moetz, 2015).

This is supported by the EU MDR and ISO 13485:2016 standardization revisions, which indicate that effective risk management is critical in the present post-crisis economy (Tupa et al., 2017). It is one of the Project Management Institute's (PMI) nine knowledge categories, and it is by far the most difficult aspect of project management.

Risk management aids businesses in comprehending risk, the people who are at risk, and risk mitigation techniques. If risk prevention approaches are competent, risk management employees must take necessary steps to ensure risks are controlled at reasonable and acceptable levels (Glas and Kleemann, 2016). Nowadays, the law requires businesses, particularly major corporations, to implement effective risk management systems in order to improve employee safety. Companies will be required to employ effective risk management strategies as part of the fourth industrial revolution in order to improve product quality and operational efficiency by allowing machine learning and AI to give the finest services. As a result, the risk management team must develop plans to ensure that these tactics are implemented properly (Tupa et al., 2017).

THE HUMAN RESOURCE PRACTICES

A culture shift is required for the industry's successful deployment. 4.0. Additional investment in both personnel and change management is required as a result of the shift in cultural habits. Human resource (HR) practices are one of the key sources that firms can use to shape employees' skills, behaviors, attitudes, and talents in order to meet the organization's goals (Shamim et al., 2016). Managers must develop successful HR strategies that will improve employees' innovativeness, learning, and knowledge management capabilities.

Staffing, training, salary, performance appraisal, and job design are some of these HR practices (Prieto and Perez-Santana, 2014).

Staffing: In an industry 4.0 scenario, recruiting should be based on competence, skills, and knowledge heterogeneity. As a result, before hiring someone, recruiters should conduct comprehensive interviews to analyze these qualities. Companies should put in a lot of effort to find the best applicants for each job by using extensive selection and recruitment methods (Prieto and Perez-Santana, 2014). ´ To hire innovative candidates, for example, recruiters can focus on identifying the attributes that are critical for innovation, such as being open to new experiences, which may be assessed using psychometric testing throughout the selection process. Active imagination, attentiveness, intellectual curiosity, flexible thinking, inner feeling, variety preferences, and interest are all traits of a candidate who is open to new experiences.

Additionally, applicants that are open to new experiences will show a good attitude toward learning (Bonekamp and Sure, 2015). Employers should prioritize employees with a greater learning orientation throughout the screening and recruitment process since this fosters learning and innovation, connecting company goals with those of industry 4.0. Employees that have a strong learning goal orientation are eager to participate in difficult jobs, are continually looking to better, have a proclivity for mastery, and are eager to learn new abilities (Kim and Lee, 2013). The hiring manager should also think about the candidate's future potential and how significant he or she will be in helping to realize the fourth industrial revolution's goals.

Training: Organizations should build their training programs in an industry 4.0 setting to boost learning and innovative capability. Employees should be able to multitask as a result of the instructional sessions, which will increase productivity. The training provided does not have to be directly related to the employee's job, but it should aim to broaden the employee's skill set (Marques et al., 2017). Employees should be reminded of their scope, duties, and responsibilities through ongoing training and refresher courses. They should also concentrate on developing a team and teamwork abilities, and managers should mentor employees on a daily basis to improve production efficiency. Furthermore, managers must ensure that staff receive training in order to improve their problem-solving abilities (Shamim et al., 2016).

Compensation: In an industry 4.0 context, the compensation system for employees should reflect the employees' contributions to the organization. Employees should be compensated according to their individual, group, and organizational performance (Prieto and Perez-'Santana, 2014). Managers should use measures that establish a link between job performance and compensation, such as additional incentive payments and profit sharing. A compensation scheme like this fosters an environment that is conducive to innovation and learning (Prieto and Perez-' Santana, 2014).

Performance Appraisal: For industry 4.0, the ideal performance appraisal should focus on enhancing results, habits, and staff development. Employees should be informed about their performance on a daily basis. Furthermore, the performance evaluation should be objective rather than subjective, which means that the performance should be measured statistically using matrixes (Shamim et al., 2016). Development of performance standards, communication of expected results, evaluation of actual performance, comparison of actual performance to set standards, discussion of the appraisal with employees, and implementation of corrective measures where necessary should all be part of an ideal performance appraisal process. There are other ways for evaluating performance, but management objectives (MBO) are the most prevalent. MBO is a practical performance strategy that is in line with the fourth industrial revolution (Shamim et al., 2016).

Job design: It is how an industry organizes tasks in a certain position, including how and when duties are completed, as well as any other aspects impacting work, such as working environment and the order in which functions are to be fulfilled. Job rotation, extensive role transfer to employees, and flexible assignments in many sectors are all important factors that contribute to an atmosphere of learning and creativity. Furthermore, the job design should foster a culture of collaboration and teamwork (Prieto & Perez-' Santana, 2014). A work design can greatly assist a company in adapting to the business climate in an industry 4.0 context, which is defined by learning and innovation.

CONCLUSIONS

The development processes in manufacturing industries and chain production are referred to as Industry 4.0. Technology, data and analytics management, data security, regulatory compliance, risk management, validation, and HR practices are all expected to be impacted by the fourth industrial revolution. Learning and innovation characterize the industry 4.0 environment, which has an impact on HR activities like as training, performance appraisal, compensation, staffing, and job design. Innovativeness, learning, and knowledge management skills are highly valued in the hiring process. Active imagination, attentiveness, intellectual curiosity, flexible thinking, inner feeling, variety preferences, and interest are all qualities of a candidate who is open to new experiences. Employee training should be aimed on growing the variety of abilities because top learning goal orientation are highly motivated in participating in demanding tasks, are always ready to improve, have a tendency to achieve mastery, and are more than willing to create a new set of skills. Focus on forming a team and developing teamwork skills to boost production efficiency. Managers should also use measures that establish a link between job performance and compensation, such as the payment of additional incentives and profit sharing. Performance evaluation should be objective rather than subjective, which means that performance should be measured objectively using matrixes. Last but not least, job design is an important aspect that contributes to an atmosphere of learning and creativity. It should include job rotation, extensive role transfer, and flexible assignments in many areas. Furthermore, the job design should foster a culture of collaboration and teamwork. As a result, managers should execute tactics that have a beneficial impact on these characteristics in order to enable industry culture. 4.0. The fourth industrial revolution will boost the productivity and quality of goods and services produced.

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