

KNOWLEDGE MANAGEMENT IS A CRUCIAL COMPONENT IN PREPARING THE WORKFORCE FOR THE ADOPTION OF INDUSTRY 4.0

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ABSTRACT

Industrial Revolution 4.0 is marked by the radical adoption of technology whose goal is to increase productivity and efficiency and overcome various limitations through innovation. On the other hand, this new era of the industry can lead to substantial workforce challenges, including job losses from unskilled employees, workers must compete not only with a new, more skilled generation, but vulnerabilities are replaced by automated machines, which tend to be favored by top capital owners, in the name of efficiency. Major skill gaps are a new threat for labor workers and companies as well. Companies need to fulfill their duty to prepare their labor workforces by bridging those skill gaps, one of the solutions is knowledge management. Knowledge management has been known as the key to utilizing and capitalizing on knowledge throughout the centuries, as a key to enhancing performance, efficiency, productivity, and gaining sustainable competitive advantage.

Keywords: *Industrial Revolution 4.0, Workforce, Challenges, Knowledge Management, Adoption*

1. INTRODUCTION

Technological developments and adaptations have occurred throughout human history. However, a new era of technology utilization, marked by the statement of Klaus Schwab in his book in 2016, the Industrial Revolution 4.0 era is a new chapter where adaptation and integration of technology are increasingly massive and explore almost all sectors. The Industrial Revolution 4.0 started its era with sudden radical changes related to the use of automation technology, digitization, digitalization, and a complete change in how the world runs its business and production mechanisms. Like each pioneering revolution before, the Industrial Revolution 4.0 has the ultimate force in enhancing universal prosperity and well-being for the entire existing human beings so forth future generations. Technological innovation joins the improvements in the business side as a manufacturer, with long-term efficiency and productivity gains. Various costs associated with geographic boundaries are expected

to decrease (e.g., transportation and communication), and global logistics and supply chain mechanisms will become more precise, effective, and economically efficient, altogether unlocking novel industries and therefore encouraging economic growth.

However technological advances and radical adaptations in integration and efficiency have also had other impacts. Technology was developed to overcome the limitations of the previous system or the limited competence of human resources. With the adaptation of massive and holistic technology integration at all stages of the business, there is a possibility that technology and changes brought about by Industry 4.0 will achieve the strategic function of all stages of production and replace human work [1]. This condition opens a new chasm, that the new industrial revolution will be a double-edged sword for the workforce. From the manufacturer's point of view, the use of technology increases productivity, and efficiency, and

overcomes various limitations through innovation. At the same time, revolution can result in broader disparity, notably in its ability to interrupt the manpower market. As stated by Brynjolfsson and McAfee in an interview with the editorial team of Harvard Business Review, Industry 4.0 requires an alteration and abrupt change between labor for automation throughout the economy and the replacement of labor forces by automatic systems can embitter the disparity between asset owners and workforces [2]. That was the back leap toward the biggest issue in the era of capitalism, that radical changes in the adaptation of new technologies in Industry 4.0 cause the work environment to become increasingly unpredictable and uncertain. The big dilemma is that Industry 4.0 can lead to mass layoffs from low-skilled workers and mental stress when they have to compete not only with a new, more skilled generation but vulnerabilities are replaced by automated machines, which tend to be favored by top capital owners, in the name of efficiency [3].

2. LITERATURE REVIEW

The wave of the Industrial Revolution has been going on for more than 2 centuries, each with the discovery of massive developments to overcome the crises that occurred in their era. Lasting from 1760 to 1840, the first industrial revolution initiated a change in mechanical production [4]. During this decade, manufacturing industries were fundamentally supported by manual labor performed by people or work animals. Mechanical production was introduced in the wake of the construction of the railway and the discovery of the steam engine. The third Industrial Revolution became known emerged in the 1960s. It is commonly addressed as the computing or digital revolution because the development of mainframe computers, personal computing devices, and the internet was pronounced in this era of revolution. During this time, manufacturers experienced a shift from an emphasis on analog and mechanical technology to an emphasis on digital and automation architecture [5]. Industry 4.0 itself is not a completely new technology model from its predecessor revolution. The industrial revolution 4.0 that occurred in the 21st century actually took full advantage of the entire foundations of the precedent industrial revolution, but with a higher degree of integration, digitization, virtualization, technology, and reaction and adaptation times. With the intention of enhancing production automation and growing productiveness, the nonetheless forthcoming Industrial Revolution 4.0 may be characterized via

the combination of the internet and manufacturing techniques, with artificial intelligence applied to machines [6].

The latest stream of the 21st-century industry revolution differed from its predecessor not only in the technology that defined it, but also in its speed, scope, and system impact. With the purpose of moving towards manufacturing automation and productivity enhancement, the upcoming Industry 4.0 could be attributed to synchronization and amalgamation amongst the network connection and manufacturing processes, with the assistance of artificial intelligence embedded to the mechanism, the most significant gap defines below:

1. Speed: Humanity is discovering new technologies and improving old ones at a pace unprecedented in history. Technology now advances exponentially rather than linearly.
2. Scope: Digital transformation is changing almost every aspect of the industry in the global economy.
3. Systemic Impact: Greater, broader, and deeper destructive forces require rapid and drastic changes in individual and occupational surroundings. Companies have to recognize and contextualize the art of technology and network evolution must play in their continued presence and development.

The ultimate industrial revolution is mainly driven using digitization and manufacturing facility automation through the Internet of Things (IoT), big data analytics, cloud computing, and artificial intelligence, which can be knowing a brand new global of cyber-physical systems. Collectively, those pillars will construct a self-sustaining holistic mechanism, with the ability to make decisions on its very own, acquire data in real-time, put in force machine learning, and evolve data processing, storage, and structures for data in cloud computing [6].

The term knowledge management is interdisciplinary from various fields including economics, management, philosophy, public policy, information science, engineering, sociology, and various other fields, that defines a technique for managing knowledge in organizations to create value and enhance competitive advantage. Many types of research and studies try to define the exact knowledge management terms [7].

1. Knowledge management is the methodical, clear-cut, and purposive structure, rejuvenation, and practice of knowledge and expertise to optimize an organization's experience and

- wisdom and benefits from its intellectual assets.
2. Knowledge management is the normative framework and transmission of practice's know-how, proficiency, and wisdom that create competencies, empower greater achievement, drive innovation, and elevate customer value.
 3. Knowledge management is a systematic series of procedures, consisting of knowledge generation, knowledge interpretation, knowledge transmission, community recollection, and knowledge utilization.

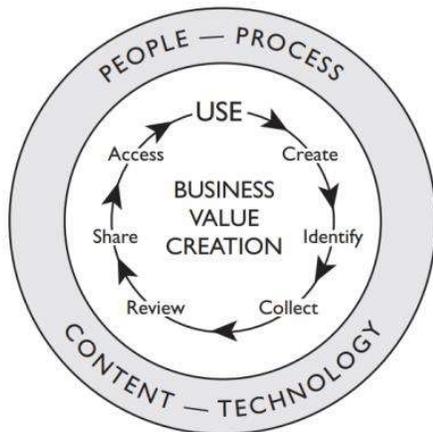


Figure 1. APQC's Knowledge Management Process

[8] later stated that knowledge management consists of main components, namely people, process, content, and technology.

1. *People and Content.* People are the source of knowledge, the doers of a system, and the ones affected by organizational strategy. So people inside the system are the ones carrying knowledge management content and the ones implementing knowledge management itself. Through an efficient knowledge network, one may foster a culture of knowledge transfer. [9].
2. *Process.* The process consists of arranged strategies, concepts, approaches, and practices to ensure adequate implementation of knowledge management.
3. *Technology.* Technology is the medium and field of knowledge management and requires competent personnel to design and operate. The deployment of a knowledge management scheme demands quite a wide range of tools to accelerate conversation, cooperation, and content material management for information seizing,

transfer, transmission, and application. During this situation, technology serves as a medium and also an enabler, for human beings are the major significant constituent of knowledge management.

3. METHODOLOGY

This study uses a qualitative approach, specifically through a review of the literature to explore relevant information and references as the basis for the author's analysis. The purpose of the qualitative method used is to be able to obtain information more broadly and in-depth, by comparing theoretical reviews to address the problem. Qualitative methods are carried out by browsing publications, scientific references, and other relevant sources of information via the internet on related topics. Based on the references and information obtained, an analysis of the problems raised in this paper will then be carried out.

1. Collecting literature, both on theory and changes in the implementation of the concepts raised in this paper.
2. Studying literature and extracting information according to the topic of the problem raised.
3. Identify the relationship between literature and information to be able to answer the problem.
4. Rewriting the results of the literature review and adding an analysis of the results of the author's thoughts on the problems that occur in a structured manner.

4. RESULT AND DISCUSSION

One of the biggest risks associated with massive technology adoption is that digitization, automation, and artificial intelligence capabilities of production machines would substitute labor forces in the industry leading to a reduction in the contribution of human workers and an increase in unemployment. This risk is not just a paranoid fear for no reason. Meanwhile, in the era of the industrial revolution, where all industries and businesses are faced with the same disruption and global flows, it becomes a necessity for the industry to adapt to the speed of global flows to survive in the competition.

“These transformations, if managed wisely, could lead to a new age of good work, good jobs and improved quality of life for all, but if managed poorly, poses the risk of widening skills gaps, greater inequality, and broader polarization.” - World Economic Forum, 2018 Report

Several discussions and studies, raising the gravity of this issue, see this risk as a reality that will be faced by all countries and businesspeople shortly. A big question about the chance of replacing labor forces due to efficiency, digitization, and an increasing portion of smart machines, even robots, has been discussed in various types of research. A study from Bowles on The Computerization of European Jobs concluded that the fraction of professions at jeopardy of being exposed to shifting of human labor to machines due to automation in Europe varies but with a high level, i.e., from 45–60%, with the Southern European region having a probability of being exposed to a wave of automation higher [10].

prospect of drastic change poses a frightening threat to some who have chronicled years in their current roles.

Meanwhile, a comprehensive study presented by the World Economic Forum in 2018, surveyed 313 multinational companies in 20 countries employing more than 15 million employees in total. The series of studies on the aftermath of the fourth industrial revolution deduced that around 7 million jobs are at jeopardy in the next 5 years. According to the management of the companies surveyed, the jobs that are expected to intersect with the role of machinery or automation during the 2018–2022 period are white-collar jobs with a routine job profile and intermediate skills, which are vulnerable to new technological advances and supply-chain automation across industries worldwide. These shifts portray growing and hustling currents that have evolved. By 2022, 59% of entrepreneurs stated as sources of WEF study, anticipate that they will rearrange the structure of their value chain with a noteworthy amount of portion. Additionally, about half portion of the surveyed companies envision that automation is bound to reduce a certain portion of their employee, based on the assignment profile of their current worker maps [12].

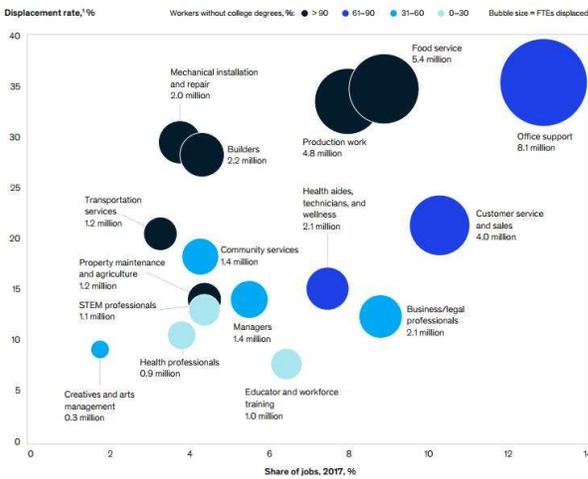


Figure 2. Occupational Categories By Share Of US Employment And Displacement Rate Through 2030 [11]

In addition, automation will affect workforce vulnerability across age groups, but the youngest and oldest segments of the workforce face significantly more disparate risks. Young people in the United States, for example, have tens of millions of first-time jobs in the retail or food service sector, but these roles are at the highest risk of being replaced by automation. Around 14.7 million workers under the age of 34 could be replaced by automation; almost half of them are freelancers, so business owners have no incentive to train and rehire them. In the segment of the oldest generation, about 11.5 million US workers over 50 years of age are vulnerable to being replaced by automation, considering that the majority of their performance is manual, routine work, which is relatively less effective and efficient than the younger generation [11]. Some of them may already be entering retirement age, but it is also possible that they are the breadwinners of their families who depend on one job for their lives. The

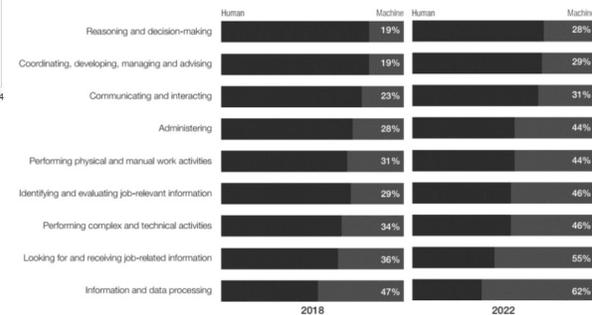


Figure 3. Shifting Of The Ratio Of Human-Machine Working Hours (2018 Vs 2022)

These studies provide sufficient support that the risk of a massive replacement of the workforce with technology as a result of the fourth industrial revolution is not an unfounded concern. However, it is a necessity that will occur in almost all sectors and all economic actors in the world, although with different levels of risk across sectors and countries.

Knowledge is a critical enabler for establishing a sustainable competitive advantage. It may well be translated effectively into better productivity and even more effective business operations, while also helping strengthen a business's capability to identify creative ideas and produce goods that appeal to its

target market. According to the narration of the literature review about knowledge management presented earlier in this study, knowledge management represents a network of systems that utilize and take advantage of an organization's holistic proficiency to attain sustainability and make adjustments to the arising environmental dynamics.

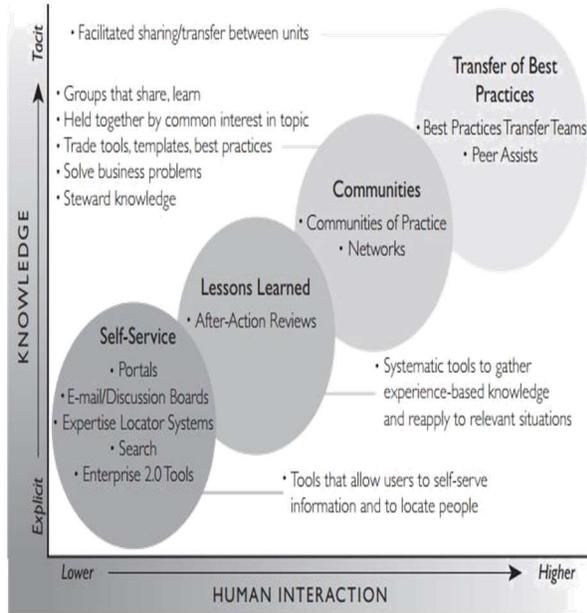


Figure 4. Categories Of Knowledge Management Approaches

When initially introduced, knowledge management has become a sword as well as a shield for companies to prepare their resources to face market competition, by increasing the quality of available knowledge and sharing it throughout the company network, reducing the loss of intellectual assets caused by employee turnover, reducing or controlling costs, encouraging innovation within the company, which leads to increased competitive advantage. Thus, knowledge management may have the potential to be one of the solutions for companies in bridging the skill gap, to be able to optimize the level of competitiveness and excellence by adopting accelerated technological developments, while still maintaining their ethics and relationships with their employees [13].

"Individuals are unwilling to work for or invest in a firm that does not uphold social responsibility. Therefore, it is crucial and necessary to invest in their present and future workers by creating programs for lifelong learning, reskilling, and skill development.." -

Shea Gopaul, founder & executive director, of Global Apprenticeship Network [14]

A study stated that there was a shift in how companies and executives view their obligations towards developing the skills of their workers to face Industry 4.0. Companies continue to face challenges in secure that their laborers have the competencies necessary to thrive in an environment of rapid change, only 20% of executives believe their entities do seem to be currently fully prepared, and only 10% believe they are making significant advancements in discovering, capturing, and keeping the right talent. Remarkably, the commitment to constructing those competence indicates to have raised. An escalating number of decision-makers now embrace the obligation to flourish their employees, with fewer managers imposing the burden on individuals compared to last year. Over 80% of Chief executives have also established or are attempting to establish an organizational culture of lifelong learning, with another 17% preparing to do so, and training has become a top investment prime consideration [15]. Knowledge management that evolves and adapts significantly affects organizational performance in the 4th Industrial Revolution regime. The conclusion of the discussion and literature in the study also clearly direct that companies must juxtapose the massive implementation of knowledge management with the application of Industry 4.0 innovation. The interaction between technology and humans is increasingly inseparable and requires companies to reconfigure mechanisms in the supply chain organization, production, product development, and services. Companies and top management, if they want to remain competitive, need to build an environment in which the effectiveness of the upcoming transformation can be well understood and anticipated by the workforce and company systems. In this decade where changes occur rapidly and the era of a knowledge-based economy dominated, companies must consider the organization's ability to handle and manage the high flow of knowledge as a result of the adoption of the industrial revolution, which the key is the implementation of holistic knowledge management.

Key Strategies of Building Knowledge Management in Adoption of Industry 4.0

1. Identify needed skills and core competencies

In a study by Liebowitz and Beckman on knowledge management, eight steps are proposed to build an effective knowledge management scheme

in a business. The first 3 steps are a benchmark for companies so that knowledge management can be effective and answer the needs and challenges related to employee skills and competencies. In essence, the first three steps are targets for increasing competence and skills to be achieved from a knowledge management system within a period. This stage is very relevant, especially in the industrial era 4.0, due to the significantly increased complexity of workspaces and systems, the demands of the workforce should become capable of swiftly adjusting to dynamics in the flow of technology and artificial intelligence so that labor forces require explicit wisdom and a new skill paradigm [16]. So key point for companies to prepare their workforce is to identify the skills and competencies needed now and in the future, as well as map out the position of the skills and competencies of their workforce to be able to formulate the gaps that must be covered.

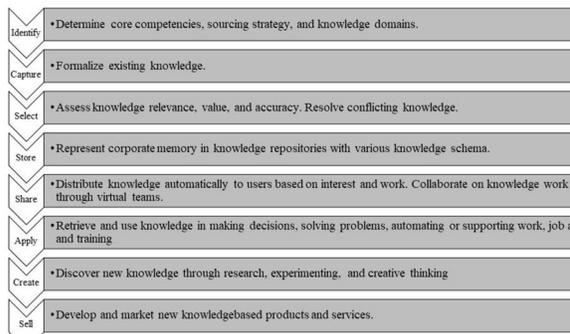


Figure 5. Eight-Stage Process For Knowledge Management

Three primary stakeholder sectors are involved in recognizing the dynamic requirements for reskilling and upskilling in the workplace:

1. Universities and other higher education and training institutions (knowledge and skill suppliers),
2. Industry/Commerce Companies (those that offer jobs and goods and services in a competitive market)
3. Workers/Students (individuals making a living while pursuing personal development).

The difficulties that any industry faces are:

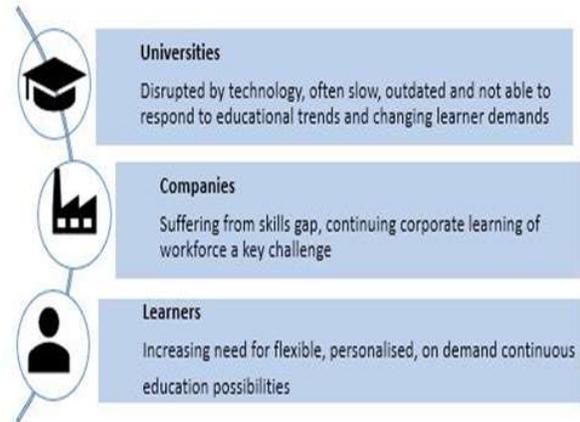


Figure 6. Challenges To Sectors Involved In Industry 4.0 (Resei Et Al., 2019)

The word "organizational success" is inclusive and covers a wide range of organizational operations. Several factors can interact to produce organizational success. These include defining and identifying a strong market niche, creating goods and services for that niche, acquiring and developing the resources required to run the business, creating daily operating systems, creating management systems essential to the organization's long-term viability, and, lastly, creating the organizational culture essential to directing the enterprise. Despite its difficulty, measuring organizational performance is essential given its importance to organizations and their long-term survival. There are numerous ways to gauge an organization's success, based on factors like the industry or stage of development. It is also reasonable to compare the success of an organization to that of other comparable businesses. In the banking sector, a bank's ability to succeed is determined by several crucial elements, including a positive reputation and image, efficient asset and liability management, and the capacity to create new ventures to meet unmet demand. According to the report, a key component of contemporary banks' performance is their employees' involvement. While the findings of another study indicated that customer support, convenience, efficiency, privacy and security, and coordination and design were crucial success factors for the implementation of sustainable mobile banking, monitoring, coordination, design, training, and institutional environment were also critical success factors for World Bank projects. The key components of Kenya's commercial banks' success are their use of modern technology, affordable service costs, and strong corporate governance. In a different study, the primary success

characteristics that differentiate Islamic banks from regular banks were examined and compared prior to and during the COVID-19 pandemic. In addition to reducing hazards, risk management can increase an organization's chances of success. The significance of risk management in enhancing performance, promoting innovation, and aiding in the accomplishment of goals is emphasized in ISO 31000:2018. As such, it is reasonable to assume that KRM in banks will help achieve organizational success. As a result, the initial theory is upheld. The World Economy Forum, in their study about future job trends as the impact of the technological disruption in the latest industrial revolution, describes that some skills are a must-have for any workers in broad sectors of business fields. A set of more future-oriented and adaptative skills such as analytical thinking, innovation, active learning, initiative, and creativity are still in demand. Meanwhile, skills and competencies that are more directed at the technical implementation of tasks in business processes, routine activities, and technical management as well as basic competencies are decreasing and can be replaced by the role of technology automation.

2. Build a supportive culture

Building a supportive culture while developing these knowledge management systems accounts for a major part of the success of knowledge management. Culture and knowledge technology must complement one another. This is because the motivation to learn and develop individual knowledge can arise if the individual feels it is something that is considered positive and has more value by his culture and work environment. The first component of a supportive culture that the company must build is the commitment, support, and involvement of the company's leaders and senior managers. Through the situational approach to the study of organizational behavior, the basic consideration is that employee behavior is shaped by the environment and the people around them so that leaders can recognize and mitigate challenges. This becomes very important because the leader is the party that will shape what the company and its employees will be today and, in the future, (the leaders shape the company). The role of a leader performs functions such as directing/providing a vision, motivating and inspiring to be better, giving commands to deal with dynamics, and communicating to unite an organization to achieve goals. In general, leaders are not only oriented towards achieving stagnant conditions but encourage and prepare for change, knowledge

management should have a dedicated chief in the company.

Finally, technology support and systems and facilities to accommodate knowledge management are no less important factors. Adaptation of increasingly sophisticated technology can also be an acceleration path for companies to raise the level of knowledge management in their companies. Improvements can be in the form of access to knowledge exchange even with other companies at the global level, increasing system proficiency, and making it easier for employees to access and utilize existing knowledge.

5. CONCLUSION

Global business sectors will witness significant changes and technology advancements as a result of Industrial Revolution 4.0. Increasing production's efficacy and efficiency is anticipated to be business actors' ultimate objective. Companies may find that knowledge management can help close the skills gap and maximize their level of excellence and competitiveness by embracing faster technological advancements without compromising their morals or their relationships with their workforce. Companies must identify the skills and competencies that employees need to meet the challenges of the modern workplace and cultivate a supportive culture around a knowledge management system through commitment and explicit instructions if they hope to organize knowledge management effectively and maintain a competitive edge in the age of Industry 4.0.

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