Technological Changes involved in the 4th Industrial Revolution

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**Introduction**

The 4th industrial revolution, also known as industry 4.0, is the current, trending way of doing businesses and pursuing entrepreneurial goals. It encompasses substantial evolving changes in the existing systems and technologies. The changes involved call for adopting a proactive approach by the organizations to get prepared for the challenges of coming time. States’ governances have increased responsibilities in this regard to provide related facilities to businesses. Technological changes will expedite industrial progress and create new opportunities for business entities to thrive. However, these changes would also cause certain disadvantages to particular groups of workers and businesses. In order to respond successfully to the emerging technological changes, individuals and organizations must have to acquire specific skills and knowledge that would enable them to fulfil the requirements of upcoming jobs and opportunities. Digitalization of business systems is at the core of technological transformation of the latest revolution of the global industry. Therefore, it must be responded with an acquisition of digital work capabilities. Artificial intelligence, big data analytics, social & virtual understanding, operating the smart devices, and industrial robotics have become indispensable for all those related to industrial work.

**Body**

Technological changes occur over time and at different levels. Technological changes occurring at the highest levels shape the trends of industries and cause revolutions that entail a rise of certain things and fall of others, that is, some new trends are set, opportunities arise, innovations prevail, and so on. The current age is being characterized by the fourth industrial revolution that refers to several economic, political, cultural, and social changes ready to be unfolded in the 21st century (Bartodziej, 2017). Most of the entrepreneurs are aware of the importance of preparing for challenges posed by this revolution (Ślusarczyk, 2018). The most prominent feature of the 4th revolution is that it is being driven by digital, physical, and biological innovations.

Industrial revolutions of the past were attributed to different technological trends and valuable factors. The 1st industrial revolution was marked with the rise of merchandization, power of steam, and hydro power, as these were the building blocks of development and progress in that age. The 2nd industrial revolution was backed by the commercial use of electricity and it involved the production of goods at the mass level. The 3rd revolution took place in the age of information technology, electronic systems, and automation. Computers and IT systems changed the lives of people forever. It also provided the basic elements for the 4th revolution, wherein the basics have been taken from the innovations and discoveries of the third industrial revolution. Thus, it can be said that the three industrial revolutions were agricultural, industrial, and information revolutions.

The third revolution is particularly associated with spreading ideas, proliferating technologies, globalization, and reshaping economies as well as societies. Artificial intelligence, virtual reality, robotics, and the Internet of Things are the hallmarks of the 4th industrial revolution. Issues to deal with include threats posed by cybersecurity, misinformation through the digital media on a large scale, unemployment, and the increasing inequality of income (“The Fourth Industrial Revolution | Special Feature,” 2019). The challenge is to align the technological advancements of the 4th revolution with the universally accepted moral and human values so that the revolutionary changes could be used for the betterment of all humanity (Lee et al., 2018).

Every industrial revolution had several elements and concepts that characterize it distinguishably. The 4th industrial revolution includes discussion on concepts like ‘the future of work’, ‘the economy 4.0’, and others. An important study analyzed how the symbiosis of artificial intelligence (AI) and human mind impacts the decision-making processes in today’s organizations. It has been feared since the emergence of AI that humans will soon be replaced by smart machines, in view of the fast-paced penetration of AI in the organizational processes. The study presented the argument that both humans and artificial intelligence are complementary, and should work in collaboration with each other to ensure the success of an organization in the current business world (Jarrahi, 2018). Each would contribute its strengths to the organizational decision-making process to deal with equivocality, complexity, and uncertainty. The researchers argued that organizations face different situations where different types of abilities are needed to be employed for resolving the issues. Artificial intelligence can be deployed for handling complexities in computations, as human cognition finds it tough to deal with complex computational problems. On the contrary, the human mind is more capable of tackling uncertainty and equivocality, because the AI is machine-based and is relatively incapable of distinguishing the certain from the uncertain and identifying the relevant meaning. Humans can apply an enhanced intuitive, holistic approach to avoid uncertainty and equivocality in the decision-making process. The ideation given in the research article is worth-considering for presenting a workable solution to the possible conflicts between AI and human capabilities. It argues that AI should be augmented in the organizations to boost progress and should not be sought to replace human contributions.

The economy 4.0 can be considered another subset of the industrial revolution. It was initially publicized by a group of professionals, businesses, and academia in 2011. It is an industrial trend that can be characterized by increased digitalization, automation, and data exchange (Marjanovic et al., 2017). It includes concepts of smart factories and smart manufacturing. The internet of things allows systems, devices, sensors, and computers to connect and facilitate data exchange between different constituents of a network. The components of economy 4.0 include smart sensors, mobile devices, advanced algorithms, big data analytics, interfaces for advanced human-machine interactions, and new technologies for location detection, data transfer, 3D printing, etc. (Balhar, 2017).

A study was conducted to find out the influences of digital transformation on labour markets by analyzing the impact of digitalization on wage inequality (Mönnig et al., 2019). The analysis made in this study suggests that digitalization increases wage inequality. The increase is, however, to a low degree. The increase is due to the demographic and structural change. It is the digitalization that enhances the impact of structural change on inequality of wages. It is further argued in the research that the digital transformation influences low-skilled workers less than it impacts high-skilled workers. The argument is valid since high-skilled workers are in high demand these days, and employers are willing to pay them unusually (Roblek et al., 2016).

Several studies have been conducted to understand and foresee the implications of the 4th industrial revolution. Researchers have given adequate attention to discussing the pros and cons of the latest industrial revolution and presented various arguments to disclose challenges and responsibilities of businesses and governances. Bernard Marr elaborates on five important ways jobs are likely to be changed in the current revolution. He argues that our ways of life and work are changing as is evident in the loss of jobs due to AI, autonomous systems, and machine learning. Positions will become more fluid, and employees will prefer doing multiple roles in single employment. Remote workers are increasingly becoming part of organizations. Employees will expect alternative forms of motivation, have to continue learning for life-time, and require augmentation of their jobs through technology (*The Future of Work: 5 Important Ways Jobs Will Change In the 4th Industrial Revolution*, 2019). ILO, one of the UN Bodies of work, has published an article that identifies the role of robots in changing production processes. It states that robots are extensively being used by the firms to enhance performance and stay abreast of the technological advancements. It has been argued thereby that the use of industrial robots will cause large gains in productivity and creation of new jobs. The article is based on primary research and presents factual data on the subject. Huge investments will be required for training the employees and transitioning from traditional to anticipated new jobs (*The deployment of industrial robots is rapidly intensifying, with the potential to change production processes worldwide*, 2017).

Technological changes in the 4th industrial revolution have implications for higher education. Transformation to the digital environment requires skills and education that could keep pace with the latest trends. Higher education designed to produce skilled professionals can contribute significantly to meet the needs of evolving business trends. Increased interdisciplinary teaching, innovation, and research have the potential to reduce the distance between technology and human capability (Xing & Marwala, 2017). Management accountants consider it necessary to stay up-to-date with the emerging technologies so that they can keep their businesses lucrative and relevant. They need to develop relevant programming and data-processing skills to remain competent in their industry. The role of accountants in organizations is, however, inevitable and cannot be replaced by any machines, because they will always be the final authority to make evaluation and decisions based on the processed data generated by the automated systems (Rasid et al., 2019). From human resource management's perspective, the demand for digital skills is intensive in every sector of the industry. Current data available on digital literacy of employees suggests that more than twenty per cent of employees have no digital skills at all. Around 70 per cent of the population do not have basic digital skills. The vacancies for ICT professionals remain unfilled due to lack of competent candidates (Karanikola & Panagiotopoulos, 2018). Hence, training and education of students as well as employees to fulfil the requirements of the digital age have become essential for economies to grow.

Embedded devices are increasingly being connected to the Internet and the number of these devices is expected to exceed billions in near future. This has started an era of the internet of things, closely associated with the 4th industrial revolution. Further challenges on the way of digitalization include efficient distribution and management of resources to get more scalable services. Improvement of energy efficiency and utilization of bandwidth given for the whole system have become big challenges to cope with for efficient implementation of applications and services associated with IoT (Paek et al., 2018). Certain inventions have led to the fast progress of modern industry. Semiconductors, for instance, are an important component of modern systems and electronic devices. They have an unparalleled capability to copy and then create anything the human eye can imagine. Semiconductors have enabled the scientists to invent many things in electronics, and they are expected to play an even more important role in the 4th industrial revolution. Robots, data centres, smart factories, smart cars, and artificial intelligence, all involve the use of semiconductors (Jung, 2018).

**Conclusion**

The 4th revolution of global industry has presented many new opportunities as well as challenges before individuals and businesses. Everyone is in dire need of getting adapted to the evolving technological changes in business systems and environments. Several challenges have already been faced by business entities, and yet many are expected to be confronted by them in coming times. Entrepreneurs understand the need of digitalization of businesses, however, the implementation of related technologies has been of varying degree.

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