**Impact of the Fourth Industrial Revolution on Society: A Global Perspective**

**Abstract**

The Fourth Industrial Revolution (4IR) represents a transformation through automation, AI, and advanced technologies, significantly affecting economies and societies worldwide. This study explores 4IR's impact on Bangladesh, focusing on both opportunities and crises in adopting new technologies. Using a review methodology, the study examines literature, reports, and case studies from regional and global sources. Academic journals, industry reports, and publications from global organizations such as the United Nations and the World Economic Forum are some examples of sources of information. Findings indicate that by 2030, 800 million unskilled workers globally may be displaced due to automation, with developing nations like Bangladesh facing significant challenges. Although Bangladesh is progressing towards digitalization, over 50% of the population lacks basic digital skills, and 38% lack internet access, contributing to social fragmentation. The rise of automation in Bangladesh's RMG and leather industries is expected to increase productivity and reduce costs, but may also exacerbate gender discrimination and the rural-urban digital divide. In conclusion, Bangladesh must prioritize policies that enhance digital literacy, improve infrastructure, and promote ethical AI development. Policies that promote ethical AI development and ensure equitable access to digital tools are essential to avoid exacerbating existing inequalities. Investing in education, skills training, and digital inclusion is critical to ensuring that the benefits of 4IR are distributed equitably across all segments of society.

**Keywords:** Fourth Industrial Revolution, technological advancements, automation, artificial intelligence, Social Fragmentation, Workforce Displacement.

1. **Introduction**

The Fourth Industrial Revolution, also called Industry 4.0, refers to the societal, industrial, and technological changes related to industry digitization, automation, data processing, and modern manufacturing techniques. This idea relies on the increased participation of smart systems and robots in various manufacturing industries and services, capable of working longer and more effectively than humans (Jarosz et al. 2020). The Fourth Industrial Revolution (FIR) is a popular term now, yet many people do not understand the extent to which this digital transformation will affect their everyday lives. Decentralization, empowerment of individuals, fewer formal rules, horizontal communication, and teamwork are recognized as relevant aspects characterizing the [Industry 4.0](https://www.sciencedirect.com/topics/computer-science/industry-4-0) scenario (Ammirato et al., 2023; Dubey et al., 2023). Technologies like- AI, robotics, VR, biotech, blockchain, 3D printing, and IoT are replacing humans in various industries. (Park, 2018).

The world is currently undergoing the fourth industrial revolution, known as Industry 4.0, which is transforming production processes and social structures at its core. The fourth industrial revolution is significantly influencing society, global processes, and people's lifestyles. It is developing through automation and robotization of production processes, fundamentally altering the nature of work; basic tasks and routines are gradually vanishing (Bikse et al. 2022). This transformation is carried out to maximise technology’s impact on society and capitalise on the opportunities event in a strategic and prioritised manner. This makes a seamless transfer of the opportunities and influences technology has on society (Mhlanga, 2024).

A study conducted recently revealed that by 2030, automation will replace 800 million unskilled workers around the world (World Economic Forum, 2020). Both developed and developing countries will encounter significant challenges in dealing with FIR technologies. Advanced technologies and skilled human resources may make developed nations face less risk compared to developing nations (Rumi et al. 2020). Developing countries are falling behind in the global market because they have inadequate skilled human resources, insufficient investment on a large scale, outdated infrastructure, unstable political culture, and ineffective public policy. South Asian developing nations like India, Pakistan, Nepal, and Sri Lanka are also gradually transitioning towards FIR. They seek to implement technologies from the Fourth Industrial Revolution to enhance their domestic industries (Adhikari, 2020; Rashid, 2020).

In Bangladesh, there are both obstacles and prospects on the path to adopting 4IR. The economy of the country is mainly influenced by industries like agriculture and manufacturing, which heavily depend on unskilled workers. (The Daily Star, 2023). Even though the government has acknowledged the importance of adjusting to the 4IR, especially through the "Digital Bangladesh" program that seeks to utilize digital technologies for economic and social advancement (ICT Division, 2018). Industry 4.0 is impacting various sectors like manufacturing, education, government, citizens, economy, healthcare, agriculture, and more to revolutionize Bangladesh into a smarter country (Hossain, 2024). It is gradually becoming one of the fastest-growing economic powers in South Asia, showing notable progress in various sectors (Rumi et al. 2020). If Bangladesh continues at this rate of development, it is predicted that it will no longer be classified as a Least Developed Country (LDC) by 2024 (Kim, 2018). Advancements in FIR have the potential to act as a crucial driving factor in assisting Bangladesh in reaching its goal (Rumi et al. 2020).

Nevertheless, the nation encounters major obstacles in completely adopting the 4IR as a result of deficiencies in infrastructure, education, and technological availability. For instance, urban areas are rapidly embracing digitalization, while rural regions are falling behind, leading to a digital divide that could worsen social disparities. (Islam et al. 2018). It is essential for Bangladesh to tackle these disparities to ensure that everyone can benefit from the 4IR without worsening current social inequalities.

1. **Research Objectives**

* To explore the historical background of the 4th Industrial Revolution and examine its implications in Bangladesh.
* To analyze the impact of the 4IR on social development, focusing on both opportunities and crises.
* To investigate the technological advancements associated with the 4IR that influence human distrust, selfishness, and social fragmentation.
* To develop strategic policy recommendations for balancing social cohesion while addressing technological developments.

1. **Fig 1-Theoretical Framework**

**Independent variables**

v

**Dependent variables**

**Hypotheses**

Social Cohesion

Widening Skill Gap

Human Behavior

Societal Crisis

H1: Greater dependence on digital communication in the 4th Industrial Revolution reduces face-to-face interaction, leading to weakened social cohesion (Tapscott, 2014).

H2: The 4th Industrial Revolution increases the demand for STEM education, resulting in a widening skills gap in regions with unequal access to advanced education (Schwab, 2016).

H3: The proliferation of social media and AI surveillance tools increases human distrust and promotes selfish behaviours by fostering misinformation and reducing personal privacy (Hassan et al., 2020).

H4: Increased automation due to the 4th Industrial Revolution will lead to higher unemployment in low-skilled sectors, exacerbating social inequality (Brynjolfsson & McAfee, 2014).

H5: Effective government regulation of 4IR technologies leads to more equitable social outcomes, mitigating potential negative impacts such as job displacement and inequality (Islam & Hasan, 2019).

1. **Research Methods and Techniques**

This article employs a review methodology, analyzing existing literature, reports, and case studies on the 4IR to understand the multifaceted impacts of the 4IR. Academic journals, industry reports, and publications from global organizations such as the United Nations and the World Economic Forum are some examples of sources of information. With an emphasis on Bangladesh specifically, the analysis draws on both regional and worldwide literature. To explore the historical evolution of the 4IR, its global societal impacts, and the particular challenges and opportunities, academic journals, policy briefs, and white papers are reviewed.

1. **Result and Discussion**

**Historical Background and Addressing the 4IR in Bangladesh**

Klaus Schwab introduced the concept of the Fourth Industrial Revolution (4IR) in 2016, highlighting the integration of technologies that blend the lines between the physical, digital, and biological realms (Schwab, 2016). The history of the Fourth Industrial Revolution starts with the technological progress of the late 20th century when developments in computers and communication laid the foundation for the digital era (Schwab, 2017). This revolution brought about the introduction and advancement of the personal computer, while the internet led to the democratization of information, lowered prices, and rapid improvements in quality, signalling a new era of capitalism; restructuring the economic system for a post-war world, simplifying calculations for businesses and governments (Philbeck & Davis, 2018).

Industry 4.0 is characterized in various terms to illustrate a manufacturing revolution; for instance, it is known as the Manufacturing Renaissance in the US, while it is referred to as Made in China 2025 in China (MAPI Foundation, 2015; BDI, 2016). Germany's progress is more noticeable compared to that of other nations. German experts estimate they are currently at a 3.8 level and anticipate it may take around a decade to fully achieve Industry 4.0 manufacturing. Industry 4.0 is well-established and operating in certain Western nations (Leiden et al., 2018; Cleverism, 2018). Countries like India, Pakistan, Indonesia, Brazil, Malaysia, Nigeria, and Thailand are attempting to adapt the FIR to their needs (Bahrin et al., 2016; Iyer, 2018 & Ezenwa et al., 2018).

Although Industry 4.0 is not widely accepted in Bangladesh, it is essential to adapt to the evolving work environment and adhere to global standards. Hence, in order to reap considerable advantages from Industry 4.0, it is time for the Bangladesh Government and the leaders of private entities to act swiftly in order to implement and incorporate Industry 4.0 in the manufacturing and service sectors (Islam et al. 2018).

The country encounters major obstacles in fully adopting the 4IR as a result of deficiencies in infrastructure, education, and technological accessibility (Islam et al. 2018). However, Bangladesh is attempting to encourage entrepreneurs to use new technology in order to capitalize on the FIR concept and increase stakeholder awareness of it (Rumi et al. 2020). Since Bangladesh is still preparing and establishing its technological infrastructure, other developing and emerging nations like China, India, Sri Lanka, Vietnam, Malaysia, and Thailand are incorporating Industry 4.0 elements into their establishment processes (Buhr, 2015; Bahrin et al., 2016; Jones & Li, 2017).

**Impact of the 4IR on Social Development focusing on both opportunities and crises**

Industrial revolutions have taken place in the past and should be understood within the framework of advancements in technology, which lead to significant changes in economic and social systems. (Schwab, 2016). The 4IR has led to significant advancements in healthcare, education, and industry, driving social development in many regions. It is possible to establish five dimensions developed by the 4th IR—positive influence on healthcare efficacy and efficiency, impact on government action, impact on human resources, impact on the organization of the health system, and financial impact on the health sector (Araújo, 2020).

The fourth industrial revolution impacted human resources, leading to the development of the concept of Industry 4.0. The concept involves merging digital technology and the internet with traditional industries to boost productivity, and efficiency, and drastically decrease unemployment (Harahap & Rafika. 2020). Industrial automation may boost production and efficiency, which reduces the cost of goods and raises demand for commodities (Mokyr et al. 2015). It requires people to have a high level of education, professionalism, and skills; there is a growing need for individuals to develop employability and digital skills in order to adapt to and utilize new technologies. (Bikse et al. 2022). It enables convenient access to information and easy trade of goods and services, the latter reducing the environmental energy impact. (Prisecaru,2016). In the future, blockchain, Cloud Computing, and cybersecurity will play a significant role in enhancing learning opportunities and preserving students' activities for an extended period (Elayyan, 2021). The fourth industrial revolution drastically changed how technology, communication, data, and analytics affect society and the economy (Bikse et al. 2022).

On the contrary, considering the widespread application of automated processes in industries, mass unemployment is unlikely to be a significant issue over the coming decades (Arntz et al., 2016; Autor, 2015; Furman, 2016). In 2019, the World Bank projected that the rise in automation would put about 57% of jobs in OECD nations, 77% of jobs in China, and 47% of jobs in the United States at risk. Putting too much faith in emerging technologies can result in the occurrence of large-scale or novel accidents. Global business networks will lead to the disruption of workers' biological rhythms, certain types of cancer, excessive workloads, and complicated tasks. The mental health of workers may be at risk due to social disconnection caused by working independently (Min et al. 2019).

The various sectors in Bangladesh, including the RMG, leather, and tourism sectors, stand to gain from Industry 4.0 as automation lowers costs per unit, enhances communication effectiveness, reduces accident risks, and supports the development of a sustainable economy (Islam et al. 2018). In Bangladesh, as women possess poor knowledge on the technical side, this revolution will also increase gender discrimination (Moktadir, 2018). Common challenges faced by Bangladesh include inadequate infrastructure, access to affordable labour, costly technology installation, lack of government assistance, and limited expertise. Because of this, the urban areas are rapidly becoming digitalized while the rural areas are falling behind, resulting in a digital divide that could worsen social disparities. (Islam et al. 2018).

**Technological Advancements Influencing Human Distrust, Selfishness and** **Social Fragmentation**

The 4IR is characterized by fast progress in technologies like AI, IoT, blockchain, and advanced robotics (Schwab, 2016). These developments have a significant impact on society, changing people's behaviour in ways that may promote social fragmentation, selfishness, and distrust. The spread of false information and deepfakes, made possible by artificial intelligence and sophisticated algorithms, adds to the public's rising distrust. As artificial intelligence (AI) technologies develop, it becomes harder to differentiate between real and fake information, which increases scepticism and uncertainty (Floridi, 2014).

The ethical considerations surrounding AI are also very significant. The increasing importance of AI in everyday life has led to a greater focus on issues like privacy, data security, bias, transparency in decision-making, and accountability (Cath, 2018). The lack of accuracy in the information from AI is a widespread worry. This problem is frequently mentioned in relation to modern generative AI tools like ChatGPT (Teel, Wang, & Lund, 2023).

There are fewer risks or ethical concerns regarding customer protection in the fourth industrial revolution (Shkalenko. 2020). Social networking platforms, driven by algorithms that prioritize interaction, have the ability to worsen feelings of isolation and selfishness. These platforms often create echo chambers, reinforcing users' existing beliefs and fostering division. Fragmentation in social discourse can lead to a decline in social cohesion and trust (Sunstein, 2018). Urban areas are quickly undergoing digital transformation while rural areas are lagging, leading to a digital divide that causes social fragmentation (Islam et al. 2018).

**Strategic Policy Recommendations for Balancing Social Cohesion and Technological Developments**

In Bangladesh, where over 50% of the population lacks basic digital skills, fostering technological literacy will be critical to ensuring that all citizens can benefit from 4IR technologies (World Bank, 2021). To balance technological advancement with social cohesion, strategic policies must focus on inclusive education and digital literacy. In Bangladesh, where 38% of the population lacks internet access (World Bank, 2021), policies must ensure equal technological opportunities to prevent further marginalization. In order to reduce the adverse effects of the Fourth Industrial Revolution on social cohesion, it is crucial to create strategies that support digital integration, safeguard privacy, and encourage ethical AI advancement. Governments must allocate resources to education and training initiatives that prepare workers for the digital economy, prioritizing the use of technology to build social trust rather than erode it (Schwab, 2016).

To maintain cohesion within society while embracing technological advancements, it is essential to enforce measures that enhance digital skills, guarantee fair technology access, and set moral guidelines for AI and new technologies. Governments need to prioritize developing strong digital infrastructures, funding education and training programs, and establishing regulations that balance individual rights and encourage innovation. An effective response to the global challenges brought by the 4IR will require cooperation between public and private sectors, alongside international collaboration (Brynjolfsson, 2014).

Bikse et al. (2022) suggested that enhancing youth employability depends on strong collaboration between educational institutions and entrepreneurs. Moreover, there is a need to invest in human capital and the digitalization of businesses. To reduce the effects of job loss caused by automation, strong social safety nets need to be put in place. This might involve benefits such as job loss compensation, skill development initiatives, and assistance for moving into different sectors. Ensuring the inclusivity and accessibility of these systems is crucial for preserving social stability (Ford, 2015).

1. **Conclusion**

The Fourth Industrial Revolution (4IR) has brought significant transformations across global economies and societies, with both positive and negative impacts. Technologies such as artificial intelligence, robotics, and the Internet of Things (IoT) are revolutionizing industries, making production more efficient and driving social and economic development. However, the rapid pace of these advancements poses challenges, particularly for developing countries like Bangladesh. While the country's progress in digitalization offers promising opportunities for economic growth, a significant portion of the population still lacks access to the necessary digital skills and infrastructure, exacerbating social inequalities. The rise of advanced technologies also raises ethical concerns, particularly regarding privacy, data security, and social fragmentation. The proliferation of misinformation, deepfakes, and AI-driven social media algorithms may contribute to growing distrust and social isolation, challenging social cohesion.

To address these challenges, Bangladesh must prioritize investments in education, digital literacy, and technological infrastructure. Policies that promote ethical AI development and ensure equitable access to digital tools are essential to avoid exacerbating existing inequalities. Moreover, collaborative efforts between government, private sectors, and international partners are crucial in developing robust strategies to mitigate the potential crises posed by the 4IR while maximizing its opportunities for inclusive growth. By focusing on digital inclusion, skills development, and ethical governance, Bangladesh can harness the benefits of the 4IR and build a more cohesive and resilient society in the face of rapid technological change.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Details of the AI usage are given below:

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