

The Concurrent Journey of Sustainable Development Goals (SDGs) and Fourth Industrial Revolution (4IR): Paradoxical or Parallel?

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Abstract

Fourth Industrial Revolution (4IR) and Sustainable Development Goals (SDGs) are concurrent. Both are global issues equally important to every country and interconnected in many ways. This study is qualitative and performed both content and contextual analysis to address how the 4IR could contribute and/or restrain to achieve the SDGs, particularly in Bangladesh. The papers were first sorted and scrutinized to identify the links between 4IR and the SDGs. That Paper revealed that 4IR is a great enabler to achieve SDGs, outweighing the negatives of 4IR. Further research could quantitatively address the nexus between SDGs and 4IR to draw specific research implications. It is also suggested to consider a particular country and/or industry for looking closely. Hopefully, the study will be proven helpful for decision-makers of businesses and governments to understand and adopt the right strategies to attain SDGs and exploit 4IR.

Keywords: Industry 4.0, Sustainable Development Goals, Sustainability, 4IR, SDGs

JEL classification: O14, O33

1. Introduction

Sustainability has gained significant research interest in the last few decades (Sadhukhan *et al.*, 2020; Stahel, 2007). The trend has been further propelled because of the global environmental protection, carbon neutrality, and waste mitigation policies (Fuso Nerini *et al.*, 2019; Zhang *et al.*, 2019). In the wake of the successful accomplishment of the MDGs, the UN agreed to set up a Sustainable Development Agenda with 17 goals, along with 169 targets to ensure people's well-being and a safer and more sustainable world for all members (Pollitzer, 2018; Rosa, 2017). Sustainable

approaches and strategies aim to address the critical problems of our society. When considering these things; creativity is a prerequisite for sustainable development (Silvestre & Țircă, 2019).

The fourth industrial revolution has arrived on our doorstep for the time being. These advanced technologies would continue to speed up the evolution of new products and processes. The issue is tied to the SDG targets in general, especially in industrial development (Hidayatno *et al.*, 2019; Schroeder *et al.*, 2019). Digitalization can increase the wealth and stability of the world. However, there is the problem

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of expediting economic growth when implementing e-Waste mitigation technologies: fewer jobs could be needed due to the upcoming new digital economy.

The SDGs began worldwide in 2016 and are referred to as "localizing SDGs" afterward, commitment to technology and internet access for the SDGs was critical. The UN agency asked for Internet access as a fundamental prerequisite for attaining the 17 Sustainable Development Goals by 2020. For Broadband Commissions, "connecting everybody" means not leaving anybody behind in the post-covid world. The Asia and the Pacific SDG Progress Report 2017 claims that medium and high-tech companies will not reach the SDGs of doubling their growth rate by 2030. Thus, it stresses the value of technologies and infrastructure in achieving the SDG objective (UNESCAP, 2020). Adams et al., (2018) explore blockchain's approach of market models both for the economy and society to help the SDGs accomplish their objectives. Van der Sanden and Foing (2018) have sought to comprehensively chart the use of space technologies in 17 SDGs, all of which are related to sustainability. As a result, the need to modernize to attain the SDG is emphasized (Imaz & Sheinbaum, 2017). Changes in manufacturing and other technologies have completely changed the previous scenario, resulting in a positive shift to industrialization. Expert forecasts predict that the fourth industrial revolution is ongoing in the global sense the changing industries, economies, as well as any field of study, and because of a convergence of new technologies, including the digital biological, that connects the physical, digital and biological spheres (Schwab & Zahidi, 2020). The increased need for technical advancement furthermore spurs the degradation of the ecosystem. Few studies have attempted to investigate the impact of 4IR technologies on specific SDGs, but despite multiple approaches to addressing both phenomena concurrently, there is currently a common understanding that the long-term impacts of Industry 4.0 on each SDG are still unknown. With all these potential benefits and problems involved in SDG implementation using 4IR technologies, the present study aspires to explore the actual scenario by examining the relationship between 4IR and SDG implementation.

2. Methodology

The study is qualitative in nature and done solely on secondary data. For accomplishing the research question, the study used content analysis. Content analysis is a highly flexible research tool that has been widely used across disciplines with varying research objectives and goals. This research method is applied to qualitative, quantitative, and even mixed moods of research frameworks. It employs various analytical techniques to generate findings and put them into context (White & Marsh, 2006). Krippendorff (2004) defined content analysis as a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use.

The study employs content analysis to increase the study's flexibility and suitability since the content analysis transforms a large amount of text into a highly organized and concise set of critical findings (Erlingsson & Brysiewicz, 2017). The content analysis assumes that texts are comprehensive data sources with a high potential for revealing useful information about specific phenomena (Kondracki *et al.*, 2002). It is a well-known data analysis method that has evolved in handling textual data. By isolating small pieces of data, content analysis is a method for identifying and interpreting meaning in recorded forms of communication.

The method entails key concepts before applying or developing a framework to organize the pieces in a way that can be used to describe or explain a phenomenon (Kolbe & Burnett, 1991). It necessitates two contemporaneous but widespread phenomena, namely 4IR and SDGs. Many studies attempted to investigate them individually, but we must deal with many studies concurrently to compare them. In that sense, content analysis is appropriate because the technique is useful in situations where there is a large amount of unanalyzed textual data. It is a simple, reliable qualitative data analysis method that can produce rigorous results. Content analysis is appropriate because it can develop a deeper understanding of a particular phenomenon by ensuring conformity in

a large amount of textual data through a systematic process interpretation (Kleinheksel *et al.*, 2020). The study uses the flexibility of content analysis to visualize how the Fourth Industrial Revolution interacts with the Sustainable Development Goals (SDGs).

3. Analysis and Discussion

Sustainable Development goals (SDGs), which can allude to Global goals, comprise seventeen correlative goals that are contemplated for protecting the earth's life-support system and flourishing living conditions of all (Griggs *et al.*, 2013). And the critical mechanism for attaining these goals is "Innovation" which can be elucidated as the generation, acceptance, and implementation of neoteric ideas, processes, products, and services (Nixon, 1987; Thompson, 1965). One hundred ninety-five nations consentient with the United Nations in 2015 intended to change the world for the better. Aligning with it, the United Nations General Assembly set out 17 SDGs to be achieved by 2030 (OECD, 2015). The study will illustrate an outline for achieving the 17 SDGs using 4IR technologies and related means. By reviewing related studies, cases, and events, the study tried to summarize how the 4IR help or constraints achieve each SDG goal. The findings are summarized as below:

3.1 SDG 1: No poverty

The main objective of achieving SDG 1 is to finale extreme poverty by 2030 from the world.

The poverty ratio has been declined from 60% (1990) to 29% by 2015. However, the number of poor people is still significant, around 50 million (Rio+20, 2012). By providing timely and accurate information services to ensure equal rights to economic resources, ICT creates possibilities for improving productivity among millions of people to have better income and livelihood. It promotes work and financial inclusion by enabling services such as mobile banking and micro-crediting and by giving access to markets for small producers and their products. In the last 15 years, with limited resources, Bangladesh has witnessed one of the fastest reductions in poverty anywhere in the world. The country has met the target of reducing the

population below the national poverty line, currently 22.4% (Doyle & Stiglitz, 2014).

3.1.1 Relationship Status: Parallel

Information and communication technology, another gift of industry 4.0, has gradually been integrated into the manufacturing and service industries which create employment opportunities, offer luxury for personal and social life, create value for owners and customers as well as 4IR ultimately reduces poverty by uplifting people's productivity and job opportunity (Appiah-Otoo & Song, 2021).

3.2 SDG 2: Zero Hunger

Sustainable Development Goal 2 states that individuals ought to accomplish food security by ending starvation and all shapes of malnutrition through promoting sustainable agriculture by 2030. It is one of the 17th Sustainable Development Goals established by the United Nations in 2015 to achieve "zero hunger." Current estimates exposed that nearly 690 million people, or 8.9% of the world population, remain hungry. According to the world food program report, about 135 million people suffer from acute hunger mainly because of human-made conflicts, climate fluctuations, and economic downturns. So, it is crucial to extend agricultural productivity and economical food production to achieve zero hunger goals. In manufacturing, circular global supply chains could be more quickly realized utilizing the 'Industrial Internet of Things (IIoT) coupled with AI, robotics, virtual reality, drones, and advanced materials' (Schwab, 2016b). ICTs can give farmers direct access to market information, weather forecasts, logistics, and storage to increase agricultural yield, restore soil, reduce waste and improve productivity (Crawford, 2017).

3.2.1 Relationship Status: Parallel

The journey between 4th IR and SDGs are strongly parallel here since the major components of industry 4.0 including the internet of things (IoT), information and communication technology (ICT), robotics, drone, and virtual reality combinedly promote sustainability and productivity of agricultural systems that help make the world hunger free (Mabkhot *et al.*, 2021).

3.3 SDG 3: Good Health and Well-being

The main objective of SDG 3 is to ensure healthy lives and promote well-being for all ages through the decrease of maternal mortality, ending all preventable passing beneath five years of age, and advancing mental well-being (UNDP, 2020). Recently, the COVID-19 pandemic has brought out issues relating to the developing and developed countries' healthcare systems capacity. It has been observed that the nations are lagging, and there should be an exertion to expand healthcare infrastructure, eldercare, childcare, and innovation to overcome the fardel of both the pandemic and future healthcare needs (Schwab & Zahidi, 2020). Network and computerized advances are near to making a worldwide healthcare biological system. With the help of information and communication technology, healthcare specialists can be connected to health information and diagnostic services. Analytics can help healthcare professionals make disease projections and patient knowledge and attitudes and empower the viable and ceaseless administration of infections and health practices (Crawford, 2017).

3.3.1 Relationship status: Parallel

Major ingredients of industry 4.0 make the entire healthcare system around the world more and more strong that is even proved in the period of COVID-19 endemic. So, it can be undoubtedly concluded that 4IR moves together with SDGs (Demong *et al.*, 2021).

3.4 SDG 4: Quality Education

Sustainable Development Goal 4 aims to enable comprehensive and impartial quality education and promote long-lasting learning opportunities for all by giving children and youthful individuals quality and effectively accessible education with other learning opportunities. Significant progress has been made for boys and girls regarding access to education, particularly at the primary school level. The number of children out of school has nearly halved from 112 million (in 1997) to 60 million (in 2014). In terms of progress, global tertiary education enrollment reached 224 million in 2018, representing a gross enrollment ratio of 38% (UNESCO, 2020). Hence, Approximately 617 million children in primary

and secondary schools cannot achieve minimum reading proficiency, highlighting the lack of quality education for environmental awareness (Sinha *et al.*, 2020). Such a lack of educational attainment reduces environmental awareness and impedes a country's research and development efforts (Zafar *et al.*, 2020). Information and communication technologies can make education more accessible to underserved populations, and better educational opportunities lead to better economic opportunities (Crawford, 2017). In phases, the government is providing computers in schools as part of its "Digital Bangladesh" campaign to modernize education and prepare children as citizens of a future technological world (Rio+20, 2012). In 2009, educational institutions began publishing results of the Secondary School Certificate (SSC) and Higher Secondary School Certificate (HSC) on their websites, SMS, and email. Students would no longer have to wait for the results to arrive at their schools. All primary and secondary school students in the country receive free textbooks. Beginning in early 2012, the government started uploading textbooks to the website.

3.4.1 Relationship status: Parallel

ICT, IoT, Robotics, and many other weapons of industry 4.0 create an amazing and enjoyable education system around the globe where students and teachers could easily join in an interactive learning system and share solutions as well problems with each other by connecting virtually from different parts of the world. So, quality education is not too hard to catch because of the 4th IR that ultimately emphasizes the promotion of SDGs.

3.5 SDG 5: Gender Equality

The Sustainable Development Goal 5 objectives are to achieve gender equality by enabling equal rights and opportunities for women and girls to live free from discrimination, including workplace harassment and bigotry. Women's representation in the national Parliament reached 25% in 2020, up slightly from 22% in 2015 (UNESCO, 2020). Based on data from 133 countries and areas, women now have better access to decision-making positions at the local level, with 36% of elected seats in local deliberative bodies. While

female genital mutilation and cutting are becoming less common, at least 200 million girls and women worldwide is still affected by harmful practices (UNICEF, 2020). However, women and girls aged 15 and up continue to be victims of various forms of violence perpetrated by their current or former intimate partners, as well as by strangers (Alam, 2019). By allowing everyone access to the same online resources and opportunities, ICTs can help achieve gender equality. They will also enable women to have a more powerful voice in their communities, governments, and on a global scale. Connectivity with technologies will also give them information to help their productive, reproductive, and community roles (Crawford, 2017). In recent years, Bangladesh has made significant progress in achieving SDG 5. In Bangladesh, gender parity in primary and secondary education has been reached (UNHR, 2020). Bangladesh is the only country in South Asia to be ranked (48th) under 100 in women empowerment.

3.5.1 Relationship status: Parallel

In most cases, with the help of social media and other virtual platforms, females are continuously raising their voice to protect rights and to save from any sort of discrimination may be in personal or professional life as well as they are upgrading themselves in touch with ICT, internet of thing and virtual reality. That's why the journey between 4IR and SDGs is rationally parallel.

3.6 SDG 6: Clean Water and Sanitation

Sustainable Development Goal 6 aims to ensure access to clean water and sanitation facilities for all by 2030. More than 2 billion people worldwide do not have access to safe drinking water (WHO, 2014). As of 2017, roughly 60% of people worldwide had basic handwashing facilities at home, including soap and water whereas, only 38% of people in the least developed countries had such facilities, implying that about 3 billion people still do not have access to basic handwashing facilities at home (UNESCO, 2019). Smart water management can be enabled with the help of technologies, which is critical to increasing access to water and sanitation and determining infrastructure location, providing better and lower-cost maintenance, optimizing operations, and improving customer service

quality (Crawford, 2017). The dense population of Bangladesh is the most significant obstacle to safe water and sanitation. Water pollution, the lack of a wastewater management strategy, and the enforcement of existing laws and regulations are other issues.

3.6.1 Relationship status: Parallel

Smart water management in association with technology enables clean water and sanitation systems around the world that proves the parallel journey between industry 4.0 and SDGs.

3.7 SDG 7: Affordable and Clean Energy

Sustainable Development Goal 7 aims to ensure universal access to affordable, reliable, sustainable and modern energy services". From 1.2 billion in 2010, the global population lacking access to energy reduced to about 840 million in 2017 (IEA, 2019). According to a study released in 2019, the planet is making strides toward reaching SDG 7, but at the current pace of progress, the goals will not be met by 2030. Climate change mitigation (SDG 13) and (SDG 7) are closely linked and complementary, and for fulfilling the long-term climate targets, the planet must devote more money to renewable energies. The advent of green technology has become a vital parameter for developing renewable energy (Sinha *et al.*, 2020). Today's global energy and materials industries are individualized by significant shifts with newer trends and technologies and gradually changing how energy is produced, delivered, and consumed. The Platform for Shaping the Future of Energy and Materials is focused on accelerating the transition to a more sustainable, secure, and affordable energy system while optimizing the net social and economic value delivered by materials. Some of the platform's major work in recent years is in the field of low-carbon emitting technologies (LCETs). Despite a reduction in CO₂ emissions, the chemical industry will not fulfill its climate goals without adopting new LCETs, as the optimization of current production processes has technical limitations (WEF, 2020a). One of the significant 4IR innovation challenges for energy is technology breakthroughs to enable a next-generation clean distributed grid with virtual power plants aggregating millions. And soon,

billions of emerging renewable sources, all optimized by AI and machine learning with blockchain and IoT enabled peer-to-peer trading (Schwab, 2016a).

Bangladesh is making steady progress in ensuring that all poor households have electricity by 2021. Access to electricity for Bangladeshi people has been reached 96%, with the commitment to provide electricity to every household by 2021, which was only 55.26 percent in 2010 (UNHR, 2020). As of 2019, the percentage of people who had access to renewable fuels and cooking technologies rose to 19.0%. The combined effect of a slow increase in renewable energy and a fast rise in non-renewable energy is the main reason for the low share of renewable energy in the total final energy consumption. However, the situation is improving gradually (Alam, 2019).

3.7.1 Relationship status: Parallel

The production, distribution & consumption of clean, affordable, and reliable energy are now easily accessible to the citizens of most of the countries because of high-tech-based power plants, renewable energy, and technological breakthroughs. So hereby concluded that the journey between the fourth IR and SDGs are parallel (Chen *et al.*, 2021).

3.8 SDG 8: Decent Work and Economic Growth

Goal 8 of the Sustainable Development Goals seeks to provide both men and women with complete and stable jobs and good work by 2030. In 2018, the global growth rate of real GDP per capita was 2%, while the least developed countries' economies have grown at an average annual rate of 4.3 % a year over the last five years (United Nations, 2020). In 2019, 22% of the world's young people were unemployed, illiterate, or untrained, a statistic that has remained stable since 2005. In 2018, women accounted for 48% of the labor force, while men accounted for 75% (UNDP, 2018). The emergence of digital innovations is transforming day-to-day corporate operations in both conventional and emerging industries. Many jobs in the twenty-first century need ICT skills. A 10% growth in ICT capital services equals at least a 0.9 % rise in GDP (Crawford,

2017). Today, robotics is adapted to repetitive, low-dexterity operations (Akileswaran & Hutchinson, 2019). While automation is progressing the work of industrial manufacturing, it also contributes to job losses in services and other fields, deepening societal inequity (Schwab, 2016a). For example, though robots have yet to impact overall jobs substantially, anecdotal data suggests they are already displacing low-skilled labor in China and Bangladesh (Akileswaran & Hutchinson, 2019). Bangladesh has fulfilled all three criteria for graduation to a developing country in March 2018. The annual growth rate of real GDP per employed person and manufacturing value-added as a GDP proportion has crossed the target set for 2020 (United Nations, 2020). The estimated unemployment rate in Bangladesh, on the other hand, has been closer to 4.0% for a long time. A recent GED (General Economic Division) survey revealed that the country's unemployment rate is 3.1% as of 2018 (Alam, 2019). Low-income countries are unlikely to have the same technologically savvy expertise and inputs as high-income countries. It means that implementing 4IR technology in low-income countries would be more incremental. Even if these countries implement these technologies, the lack of required skills and inputs can restrict their use. However, if technology manufacturers help low-income countries acquire these skills, the slower penetration rate will be offset. While the field of opportunities is vast, and emerging innovations have the potential to speed progress toward the Targets, significant obstacles and threats remain. Multiple obstacles will obstruct the scaling of new solutions, including a lack of basic infrastructure, expertise, records, appropriate business incentives, and confidence, efficiency, and security issues. Furthermore, if these innovations are not scaled intelligently and sustainably, they may intensify problems for people and the world, placing additional pressures on our society and climate.

3.8.1 Relationship status: Parallel

ICT-centered jobs are creating platforms of new openings for skilled job seekers and ensuring economic growth by uplifting GDP as well as it makes a significant number of unskilled people jobless. That's

why the journey between industry 4.0 and SDGs are both parallel and paradoxical in this domain.

3.9 SDG 09: Industry, Innovation, and Infrastructure

The 9th goal of the United Nations under SDG relates to industry, innovation, and infrastructure that mainly focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. On the other hand, Fourth Industrial Revolution (4IR) predicts the prospects that arise by emphasizing inventors and marketplaces, artificial intellect (AI), technics as well as dominions (synthesis), robotics, and the Internet. A close attachment exists between Goal-9 and Fourth Industrial Revelation (4IR). 4IR and its components are crucial to ensure the continuous enhancement of the infrastructural facilities of the university and other institutions. And to resolve infrastructural challenges, the confidentiality of data safety settings, to implement the insolent and digital network system, to implement policies within government and other institutions (Nkosi *et al.*, 2020). Being more than “technology-driven change” and motorized by influencing innovation, Fourth Industrial Revelation (4IR) ultimately affects essential industry infrastructures, innovation, and subdivisions like education, health, and commercial relating to their physical structures (Schwab, 2015). The progress of innovation and industry development of infrastructures are now mentionable in Bangladesh with the flow of 4IR, despite facing many natural calamities like floods, droughts, cyclones; with political instability, corruption, terrorism, etc. as usual problems of this country (Fan *et al.*, 2018).

3.9.1 Relationship Status: Parallel

4IR and its components are crucial to ensure the continuous enhancement of the infrastructural facilities of the university and other institutions. And to resolve infrastructural challenges, the confidentiality of data safety settings, to implement the insolent and digital network system, to implement policies within government and other institutions (Nkosi *et al.*, 2020).

3.10 SDG 10: Reduced Inequalities

That goal states to diminish inequalities in income and age, sex, origin, disability, race, ethnicity, religion, or economic status within a country and among countries. And it includes those related to representation, migration, and development assistance (United Nations, 2017). At the same time, 4IR focuses on several technological and socio-economic drivers for ensuring the overall development with a paradoxical relationship with Goal-10 of SDG. In countries like France, the United Kingdom, Spain, income inequality is multiplying. It will grow more rapidly for the consequences of the Fourth Industrial Revolution since new technologies replace low-skilled workers' jobs with high-skilled workers (Kuzmenko & Roienko, 2017). Uddin (2020) reported that socio-economic drivers of 4IR and factors affecting globalization, including long-term FDI, Import, Export, remittance, are deteriorating income distribution conditions in Bangladesh.

3.10.1 Relationship Status: Paradoxical

Resilient infrastructure, inclusive innovation, and modern technology create job opportunities for high-skilled workers but reduce this opportunity for low-skilled workers which creates inequalities in the economic status and income of society's people. So here, components of industry 4.0 have a paradoxical journey with SDGs Goal-10.

3.11 SDG 11: Sustainable Cities and Communities

Goal-10 draws a clear picture of how safe, affordable, and complete green housing can be ensured for all urban citizens. This goal of the UN emphasizes building modern, sustainable cities, creating an intelligent urban module that provides safe, affordable, and resilient cities with green and culturally attracting living conditions (GGO, 2020). PWC assistant director Ben Combes outlined Environment Analyst the findings from a climate action viewpoint: "Present-day technology applications are already having a significant impact on sustainable cities and communities SDG-11 (Environment Analyst Global,

2020). In Asia, thousands of megacities use modern technologies associated with AI, ICT equipment, IoT, radio-frequency identification (RFID), wireless networks, and social media to detect and warn about natural disasters (De Amorim et al., 2019). Rana (2011) indicated that sustainable cities and communities are a growing phenomenon in Bangladesh, which is steady but affects urban sustainability from the application of technological drivers of 4IR, including AI, IoT, ICT equipment, etc.

3.11.1 Relationship Status: Parallel

The journey between industry 4.0 has a parallel attachment with SDGs Goal-11. Major components such as AI, ICT equipment, IoT, and wireless networks are utilized to create sustainable cities where citizens have the opportunity to enjoy safe, affordable, and green housing (Rahmayanti et al., 2019).

3.12 SDG 12: Responsible Consumption and Production

This goal is characterized by eliminating food waste reducing excessive production and consumption to ensure corporate sustainability strategies in case of production and consumption around the globe. In recent research, 4IR technologies are being used in data centers to boost renewable resources, such as fuel cell utilization, cooling purposes, and energy conservation (Hoosain et al., 2020). The fourth industrial revolution (4IR) technologies like sensors, IoT platforms, artificial intelligence (AI), robotics, etc., give new opportunities to develop a more efficient, more sustainable customer-driven supply chain. They are ultimately reducing the total consumption and reducing the level of production wastage (Ruohomaa et al., 2020). A clear statement is expressed through this debate about the parallel relationship between Goal-12 and 4IR. Farrelly (2018) found that the application of drivers of 4IR like smart buildings, smart water management, robotics, artificial intelligence (AI), intelligent transport systems, and new efficiencies has already achieved success in energy consumption and waste management.

Innovations in science and technology and the cooperation of government bodies, stakeholders, and citizens must constantly be appreciated to enforce a sustainable pattern of responsible consumption and production in Bangladesh (Majid, 2018).

3.12.1 Relationship Status: Parallel

Farrelly (2018) found that the application of drivers of 4IR like smart buildings, smart water management, robotics, artificial intelligence (AI), intelligent transport systems, and new efficiencies has already achieved success in energy consumption and waste management. In brief, it can be concluded that the SDGs Goal-12 goes together with the application of the major components of the fourth industrial revolution (Fatimah et al., 2020).

3.13 SDG 13: Climate Action

Goal-13 focuses on targeting and strengthening resilience and adaptive capacity to combat climate change, its impacts, and natural disasters in all countries and integrating national policies, strategies, and planning into climate change measures. 4IR technologies like Robotic trees, parasitic drones, air-cleaning buses, air separation plants, autonomous vehicles, green commercial vehicle fleets, usage of virtual and augmented reality, green commercial vehicle fleets are now worldwide used to tackle the environmental challenges associated with air pollution and global warming (Corfe, 2020). The Fourth Industrial Revolution (4IR) was significant for enhancing overall management and quality governance of environmental sustainability and fostering the systems change needed to create clean, resource-secure economies and address global warming issues (WEF, 2020b). Today 3D printing, Artificial Intelligence (AI), Blockchain, Augmented Reality (AR), Virtual Reality (VR), Geospatial technologies, Drones, etc., of 4IR technologies, used just like a weapon to control the negative effect of climate change and it's impacting (Tawfik, 2020).

In Bangladesh, with the application of 4IR, factors such as frequent natural disasters lack infrastructure negatively decrease the vulnerability to changing climatic conditions (Wikipedia, 2020).

3.13.1 Relationship Status: Parallel

Climate change management focusing on a sustainable environment has been confirmed with the application of robotic trees, green commercial vehicle fleets, air-cleaning buses, air separation plants, and green commercial vehicle fleets which are major components of industry 4.0. It is strongly stated that the journey between the 4th IR and SDGs is parallel.

3.14 SDG 14: Life Below Water

This goal is connected to ensuring sustainable use and development of resources related to seas, oceans, and marine. By 2030, Sustainable Development Goal-14 has ten targets to be achieved, and one indicator is being used to measure the performance of each goal separately. Edge Innovations, a US engineering firm, is developing a robotic dolphin using 4IR technological driver artificial intelligence (AI) to entertain crowds and replace real animals in captivity (Hoosain *et al.*, 2020). The application of 4IR enables AI-enabled data platforms to monitor and manage fishing activity, and compliance is now widespread. Robotics for fishery process automation, marine pollution management technologies, AR/VR training, information for marine industries (fishing, shipping) are gaining importance. Alternative financing mechanisms for sustainable fisheries and ocean conservation (e.g., cryptocurrency, mobile money, reward platforms, and microfinance), 3D-printed coral reef structure for a marine restoration, platforms for managing biological assets (e.g., fishing and shipping) are trendy. Including IoT, AI analytics, and blockchain help to sustainable use of the oceans, seas, and marine resources for sustainable development (WEF, 2020b).

In Bangladesh, government officials try to implement technological drivers like digital information systems for marine industries of 4IR to control and address the effects of ocean acidification, including through enhanced technical cooperation at all levels.

3.14.1 Relationship Status: Parallel

Especially, artificial intelligence (AI) and the internet of things (IoT) are major facilitators to ensure sustainable development by emphasizing on sustainable use of oceans, seas, and marine resources. That's why the SDGs Goal-14 walk on the same path with the fourth industrial revolution.

3.15 SDG 15: Life on Land

Goal-15 Protects restores and promotes sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss. This goal mainly addresses problems of climate change through the sustainable management of forests and halting deforestation to conserve and restore the use of terrestrial ecosystems such as forests, wetlands, drylands, and mountains by 2020. As part of the implication of drivers of 4IR, advancement of technology and an understanding of biology and biomimicry improves and unlocks natural assets. A fundamental alteration happened in the way people understand and interact with their natural environment through applying the Fourth Industrial Revolution (4IR) (Nkosi *et al.*, 2020). To ensure sustainability, the Fourth Industrial Revolution (4IR) drivers like automation of work and digitalization stimulate the organization to adopt innovations in the production and process with extensive integration of eco-friendly practices. Saudi *et al.* (2019) denoted that the results of a study conducted in Malaysia stated that there had a positive and significant impact on project innovation (PRI) of green product innovation and green process innovation (GPI).

Hassan & Nazem (2016) conducted a significant study in Chittagong city. The study found rapid urbanization resulted from 4IR and severe threats of further encroachment. And the degradation had faced by the vegetated hills near urban development areas.

3.15.1 Relationship Status: Parallel and Paradoxical

To ensure sustainability, the Fourth Industrial Revolution (4IR) drivers like automation of work and digitalization stimulate the organization to adopt

innovations in the production and process with extensive integration of eco-friendly practices. In this case, facilitators of the 4IR also endanger the internal ecosystem and biodiversity of the natural environment. It is denoted finally that the journey between 4th IR and SDGs Goal-15 are both parallel and paradoxical.

3.16 SDG 16: Peace, Justice and Strong Institutions

This goal Promotes peaceful and inclusive societies for sustainable development, provides access to justice for all, and builds effective, accountable, inclusive institutions at all levels. It is wholly related to ensuring peace, justice, and accountability for all in society. Goal-16 focuses on sustainable development through implementing the rule of law to accelerate peace, security, stability, prosperity, human rights, and effective governance. In partnering with civil society in the design, deployment, and use of technology, a multi-stakeholder platform like technology and social justice initiative for driving stakeholder responsibility for peace, prosperity, accountability, and social justice is being used to tackle inequality among citizens. Another study conducted by Kagawa & Sithole (2020) in Africa entitled “The Concept of a Just Transition is as Relevant to the Fourth Industrial Revolution as it is for the Move towards a Low Carbon Economy” found that 4IR ensured organized laborers who were in a just transitional and justice position to protect their interest relating to work and prevailing industries.

3.16.1 Relationship Status: Parallel

The efficient use of 4IR technologies such as Blockchain can enable stronger, more independent, and transparent institutions.

3.18 SDG 17: Partnership for the Goals

Goal-17 and the last goal of SDG's 17th goal set strengthen implementation and revitalize the global partnership for sustainable development. This goal mainly focuses on cross-sectoral partnerships that recognize the crucial links between social and environmental issues that are key to a better future. During the COVID-19 pandemic, the findings of many studies have presented

unprecedented challenges, reversed decades of development, and caused a deep global recession. A discussion paper entitled “Implications of the Fourth Industrial Revolution for the Development Agenda in the Indo-Pacific Region” stated that in planning and responding, 4IR promotes collective action among countries in the development community's partnerships, collaboration, and knowledge creation and learning. In Bangladesh, Honorable PM Sheikh Hasina continuously promotes peace, cooperation, pluralism, and global partnership under her foresighted supervision and pragmatic leadership. This country rigorously promoted relationships based on region and economy and multilateralism, peace, and cooperation on the international stage. In the international issues and humanitarian causes, Bangladesh Prime Minister Sheikh Hasina's engagement has also indicated her acclaim and recognition from various quarters across the globe (CRI Report, 2020).

3.18.1 Relationship Status: Parallel

It is undoubtedly explained that the main theme of industry 4.0 promotes cross-sectional partnership, collaboration, knowledge creation, and sharing among the country's agreement toward sustainable development with the support of ICT, IoT, Robotics, Drone, Virtual Reality, etc. It can be transparently explained that the fourth industrial revolution has a parallel attachment with SDGs last goal.

4. Conclusion

Although these recent technologies and innovations carry promise for humanity's issues, they might not be a magic bullet for all those problems. However, they have the potential to be a powerful tool for SDGs (Chui et al., 2018). In a recent study, Vinuesa et al. (2020) stated that these technologies had a 79 percent positive effect on the SDGs, while 35 percent showed a negative impact across all the targets. The overall goal of the 2030 Plan for Sustainable Development is to include equitable economies, personal and national security, public safety, and environmental sustainability. 4IR is a significant factor in accelerating sustainable development goals (SDGs). However, applying 4IR technology to the workforce could lead to a 1.8 million

job loss to two billion job losses by 2020. Capacity in national and global innovation networks would be vital in meeting the SDGs in the age of 4IR. Competition must play a significant role in product and process improvement to help companies and organizations achieve the SDGs.

To meet the SDGs, the availability, accessibility, and applicability of 4IR technologies would be crucial in LDCs. For instance, to use different technologies, accessibility is required by two primary principles. In addition, it is much more difficult for the LDCs to obtain applicable inventions since patents are concentrated in a few countries. Even if 4IR innovations are available, customers cannot afford to use them. As a result, individuals, and companies in the LDCs that cannot afford them can remain outside the market. Access and affordability must be maintained for businesses and individuals for 4IR technology to be helpful. Application is a national level depends on two vital variables: abilities and regulations exploitation of innovation opportunities of 4IR technology. Bangladesh needs to refocus its strategies and policies in essential sectors like industry, trade, commerce, and fiscal regime. Once the nation has an innovation economy ready to use as fuel, the challenges of attaining SDGs will diminish. There should be no doubt that issues associated with a shift of direction can be rectified. Harnessing the 4IR's technology provides an excellent opportunity to reach SDGs and creates higher-than-average employment for an increasing number of graduates. Thus, the above debate demonstrates that 4IR is here to remain, and it is in the LDCs's best interests to accept these technologies if they want to use them for their development goals.

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