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**THE IMPACT OF THE FOURTH INDUSTRIAL AGE (I4.0) ON HIGHER EDUCATION (HE4.0): IN THE PERSPECTIVE OF BANGLADESH**

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**ABSTRACT**

Higher education in the fourth industrial revolution (HE 4.0) is a complex, dialectical and exciting opportunity which can potentially transform society for the better. The fourth industrial revolution is powered by artificial intelligence and it will transform the workplace from tasks-based characteristics to the human centered characteristics. Because of the convergence of man and machine, it will reduce the subject distance between humanities and social science as well as science and technology. This will necessarily require much more interdisciplinary teaching, research and innovation. This paper explores the impact of HE 4.0 on the mission of a university which is teaching, research (including innovation) and service in the perspective of Bangladesh.

**KEYWORDS:** Fourth Industrial Age (I4.0), Higher Education (HE4.0), Bangladesh

**1. INTRODUCTION**

The Fourth Industrial Revolution (FIR) is a concept widely discussed at venues such as the World Economic Forum at Davos and within business leadership. Recent white papers describe how the FIR will “shape the future of education, gender and work” (World Economic Forum 2017) and how the FIR will require “accelerating workforce reskilling” (World Economic Forum 2017). A full exposition of the schema and framework of the FIR has been presented in book form, and includes an inventory of some of the emerging technologies that are thought to drive the Fourth Industrial Revolution (FIR) and some societal implications for this Revolution (K. Schwab 2016).

Nowadays all graduates face a world transformed by technology, in which the Internet, cloud computing, and social media had created different opportunities and challenges for formal education systems. As students consider life after graduation, universities are facing questions about their own destiny especially employment. Different technologies powered by artificial intelligence are so much transforming the world that social concepts such as “post-work” are more and more defining the

present period. This period requires certain skills that are not exactly the same as the skills that were required in the third industrial revolution where information technology was the key driver. These skills are critical thinking, people management, emotional intelligence, judgment, negotiation, cognitive flexibility, as well as knowledge production and management. Our education system is stuck in the Second Industrial Revolution.

The current system fails to inspire abilities to question, criticize and analyze. It assumes that memorizing information in textbooks is enough. We confuse information for knowledge, but information is everywhere today. Knowledge is one's ability to synthesize information and act responsibly. Emerging technology and the shortcomings of the education system will create mass unemployment and lead to enormous social and political chaos. Something which has gone unnoticed by policymakers today. The World Economic Forum identifies 10 skills that will be crucial to survive in 4IR, such as emotional intelligence and cognitive flexibility, creativity, critical thinking and collaboration. This is a mindset that will give one the skills to “synthesize” information and act responsibly while continuously enabling them to re-skill themselves. The future of skilled and value-driven youth as entrepreneurs and entrepreneurs will sketch the landscape of our economic growth that needs to be inclusive of all (Saif Kamal, 2017). Bangladesh has obtained unprecedented technological advancement through the ruling party's Digital Bangladesh manifesto. Bangladesh has grown accustomed to viewing education as a way for job creation producing managers and not thinkers or problem solvers. Bangladeshi universities must break out of the homogeneity in education options that limit youth to silo learning for traditional professions.

## 2. LITERATURE REVIEW

### 2.1 Fourth generation industry

According to Drath & Horch(2014) the term “Industrie 4.0” first appeared at the Hannover Messe in April 2011 In Germany. Since then, it began to attract more and more attention after it officially became one of the ten projects within the “High-Tech Strategy 2020” action plan in March 2012 (Liao et al., 2017). It aims to develop cutting-edge technologies for securing the future of German the manufacturing industry. The final report of the “Industrie 4.0” Working Group (National Academy of Science and Engineering, 2013) was published in April 2013, providing the vision, integration features, and priority areas for action and example applications for the fourth industrial revolution. The fourth industrial revolution integrates IT systems with physical systems to get a cyber-physical system that brings the real world in a virtual reality. There are also several opposing opinions. The current industrial revolution is characterized by the collaboration of intelligent machines, storage systems, and production systems into intelligent networks, merging the real and virtual worlds in cyber-physical systems (CPS).

However, The Fourth Industrial Revolution often is described as the result of integration and compounding effects of multiple “exponential technologies”, such as Artificial Intelligence,

biotechnologies, and nanomaterials. One example of the emerging reality within the FIR might be the development of synthetic organisms (life from DNA created within computers and “bio-printed”) manufactured using robotic assembly lines, where Nano-materials provide immense improvements in the efficiency of production. A survey of 800 high tech experts and executives determined a series of dates by which tipping points would be reached. Examples include implantable cell phones by 2025, 80% of people with a “digital presence” by 2023, 10% of reading glasses connected to the internet by 2023, 10% of people wearing internet connected clothes by 2022, 90% of the world population with access to the internet by 2024, 90% of the population using smartphones by 2023, 1 trillion sensors connected to the internet by 2022, over 50% of internet traffic directed to homes and appliances by 2024, driverless cars making 10% of all cars in the US by 2026, and many other members of the board of directors, auditors and robotic pharmacists, proliferation of bitcoin in the economy, 3D printed cars by 2022, transplants of 3Dprinted organs such as livers by 2024, and several others(World Economic Forum 2015).Services of fourth industrial revolution are-

**2.1.1 Open Innovation:** Open innovation, refers to the combination of humans and computers to form distributed systems for the purpose of accomplishing innovative tasks.

**2.1.2 Evolutionary & Revolutionary Innovations:** Under higher education in the fourth industrial age, a country’s higher education system should put innovation, both evolutionary and revolutionary, high on its agenda. In general, innovations based on existing technologies are so-called evolutionary type; while revolutionary type of innovations focuses are inventions of new technologies.

**2.1.3 New Technological Advancement Driven Research and Development:** New technological advancements are often ranked as the most important driving force for R&D. Technology-driven R&D comes in many forms and it can mean employing mobile capabilities to improve data acquisition accuracy; using advanced big-data analytics to spot hidden statistical patterns; harnessing artificial intelligence techniques to retool information search, collection, organization, and knowledge discovery, to name just a few.

**2.1.4 University-as-a-Platform (UaaP):** In Service 4.0, the ongoing transformation to platform-based competition is led by many forces: educational activities; global computing and Internet of things both within and outside campus and the demanding students in terms of customized learning. University-as-a-Platform (UaaP) gives the current higher education system an opportunity to direct their bread-and-butter businesses towards platform businesses for a better service performance.

**2.1.5 Education-as-a-Service (EaaS):** At the heart of EaaS is the belief that students’ needs should be met effectively. Therefore, when a higher education institution sets out to attract a potential student as a customer, it needs to create an all-round education experience that is genuinely capable of satisfying the customer’s needs, although, this process is not as simple as it may seem. EaaS is not the creation of pseudo differences via a change in logo, location, or making vague promises with empty

sounding words. Furthermore, higher education institutions are accountable to a host of stakeholders such as governments, accrediting agencies, the public and private funding sources, academics, management, support staff, and students.

## **2.2 Fourth generation education**

The FIR curriculum needs to respond to the political and social dimensions that will accompany the increasing centralization of wealth and political influence. As described in one of the WEF reports, the political effects of expansion and convergence of the physical, digital and biological worlds will be profound. This development will “enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authorities. Simultaneously, governments will gain new technological powers to increase their control over populations (K. Schwab, 2016). The impact of the Fourth Industrial Revolution (4IR) is the turning point for the future education. It will be faster than previous ones. The invention of new technology like the physical, digital and biological worlds will redesign our lives. Unruly technologies such as robotics and artificial intelligence (AI) are already changing our workplaces. The Higher Education in the Fourth Industrial Age (HE 4.0) is important for nations to understand the impact of these changes to all areas of our lives including higher education (Marwala, 2010). Teaching in the Fourth Industrial Revolution (Teaching 4.0) is:

**2.2.1 Embrace massive open online courses (MOOCs):** Teaching has long been constrained by the following scenario: students needed to gather in a lecture hall to hear the professor or sit around a table to discuss with peer fellows. Technology innovation is relaxing those constraints, however, and bringing radical change to higher education. Massive open online courses, or MOOCs, is a form of education that provides stand-alone instruction online (Xing, 2015).

**2.2.2 Cultivating Innovative Talent:** Most developing or under-developed countries lack innovative talent, especially at the high end. To fully grasp the opportunity of another wave of industrialization, a country’s higher education system should not only focus on training knowledge-based skilled person, but have a good look at cultivating innovative talent, especially high-level scientists and technologists. These scientists must be trained in an interdisciplinary environment where technologists should understand humanities and social science and vice versa.

**2.2.3 Generalize Blended Learning:** We believe a generalized blended learning (i.e., mixed e-learning and face-to-face learning methodology) may contribute to this. It is well-known that virtual environments offer great educational value in the process of information transmission and interactive participation, either in real time (e.g., video conferences), or non-simultaneous participants involvement (e.g., forums and chats). In such process, the face-to-face teaching and evaluation can be used to develop analytical expressions and problem-solving capabilities related to mathematical

matters. Lecturers at this stage can get physical feedback about the effectiveness of their knowledge transmission to students. Then the understanding of some specific conceptual issues are further assessed and reinforced via online graphic representations and multiple choice test questions and this offers students an advantage of reviewing their results immediately.

### **2.3 The Fourth industrial revolution and fourth generation education in the perspective of Bangladesh**

Bangladesh has long been a story of the aspiration, resilience and innovation of millions of young women and men across villages and towns. In our brief, five-decade history, the country has constantly battled against natural and man-made disasters, and yet has sustained high economic growth. Today Bangladesh is one of the fastest-growing economies globally, expanding at over 7% annually. By 2030, around half of Bangladesh will be living in urban areas. These people will demand all kind of goods and services that we cannot predict today. There is no point in debating whether the Fourth Industrial Revolution is good or bad, or whether it will benefit Bangladesh or not. It's not something for us to accept, reject or regulate. It is time that we join hands with everyone to embrace the 4IR robustly. (World Economic Forum, 2018).

Developing country like Bangladesh is focusing on Fourth Industrial Revolution in Education sector. According to Islam and et.al, (2018) it has been found that the elements of Industry 4.0 have been established for the manufacturing settings which is not only indispensable to increase the production of units, but also to reduce the production costs. It has also been found that investment of technologies that is integrated to humans for the development of the production level. Still lack of empirical research reveals the prospects of Industry 4.0 in Bangladesh, which is projected to be the twenty-eighth largest economy in the world by 2030. In Bangladesh few researches have been conducted but still there are some challenges including poor infrastructure, availability of cheaper labor, and expensive installation of technologies, lack of government supports and lack of knowledge Islam and et.al, (2018). But in Bangladesh our education experts and practitioners are trying to promote I4.0 in the upcoming days as it is believed that the fourth industrial revolution will revolutionize industries so substantially, especially in education sector that much of the work that exists today will not exist in next 50 years (Marwala et al., 2006).

**3. Objectives of the Research:** The objective of the study is to explore the impact of fourth (4th) industrial revolution on higher education system.

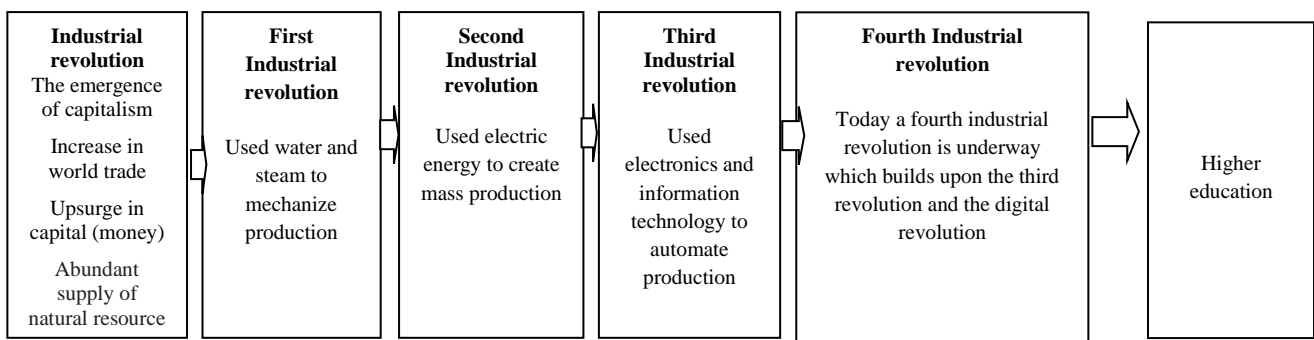
### **4. Methodology of the Research**

The aim of this study was to carry out the current phenomena. Thus, through the phenomenology design Industry 4.0 is considered here as a phenomenon, which allures researchers to explore it relating to the perspective of Bangladesh. Hence, the present study has been designed as an explorative study and researchers have been able to triangulate current phenomena of Bangladeshi context after reviewing relevant literature. Eventually comprehensive pertinent literature has been collected through

experience, knowledge and document analysis based on the topic area because through this study researchers have been focused to the implications on adaptable learning programmes, better learning experience, and lifelong learning attitude in education sector. Even this study has been carried out about the journey towards global competition in the higher education to put a huge amount of effort into research and development (R&D).

### 5. Conceptual framework

From the study the conceptual framework is\_



The first industrial revolution (I1.0) was catalyzed by Newton when he formulated his laws of motion. Because from then onwards motion was better understood and quantified, it was possible to design steam engines that mechanized much of the work that was traditionally done by humans. Mass extraction of coal along with the invention of the steam engine created a new type of energy that trusted forward all processes and acceleration of economic, human and material exchanges. Other major inventions such as forging and new know-how in metal shaping gradually drew up the blueprints for the first factories and cities as we know them today.

The Second Industrial Revolution is generally based in the period from 1860-1900, and is associated with new manufacturing technologies based on electricity (Schurr 1960), which itself triggered additional changes launching what some have described as a “new economy” (Atkeson 2007). An expansion of access to higher education and the proliferation of multiple types of higher education institutions in the United States and Europe gave rise to a surge in discovery and helped consolidate and accelerate the growth brought about by the powerful new technologies.

The third industrial revolution (I3.0) was catalyzed by the discovery of a transistor which accompanied the electronic age that gave us computers and internet. Third Industrial Revolution, which is generally attributed to computerization and web-based interconnectivity developed in the 1980’s and 1990’s, is only now having its rippling effects upon society, politics, economics and education. Besides, one of the largest ripples from the Third Industrial Revolution was the move toward online education, which culminated in the “Year of the MOOC” during 2012 as massive online open courses offered to

completely displace traditional in-person higher education, and expand access to university education to millions of previously unserved students across the world.

According to Kurzweil (2005), when digital exponential technologies are combined with other similarly rapidly expanding technologies –biotechnology, nanotechnology, and artificial intelligence, the combination of multiple exponentially developing technologies compounds and multiples the pace of change. Some have described the convergence of these “exponential” technologies as providing a “Singularity”–which will provide untold benefits to humanity, as humans “transcend biology” according to some authors. This fourth revolution with exponential expansion is characterized by merging technology that blurs the lines between the physical, digital and biological spheres to completely uproot industries all over the world. The extent and depth of these changes is a sign of transformations to entire production, management and governance systems and education systems.

## **5.1 Impact of Industrial revolution on Higher Education**

**5.1.1 Teaching:** One of the principal tasks of every university is to educate the youth. Therefore, it is necessary to implement appropriate teaching strategies and to organize work in a way that fosters learning. This has implications on adaptable learning programmes, better learning experience, and lifelong learning attitude. Now a day’s industrial revolution has impact on our Higher Education like online teaching, curriculum, digital classroom, Google classroom etc.

**5.1.2 Research:** The journey towards global competition in the higher education requires institutions to put a huge amount of effort into research and development (R&D). Experts believe these forces range from new technology deployment to global cooperation and collaboration. New technology has expanded our teaching and research method in our education system.

**5.1.3 Service:** To sustain the competitive position among world higher education system, we need to radically improve educational services. In particular, we need to drive much greater innovation and competition into education. On the other hand Teaching has long been constrained by the following scenario: students needed to gather in a lecture hall to hear the professor or sit around a table to discuss with peer fellows. Technology innovation is relaxing those constraints, however, and bringing radical change to higher education. Massive open online courses, or MOOCs, is a form of education that provides stand-alone instruction online (Xing, 2015).

## **6. Findings of the study**

From the discussion we can find out some impacts of on higher education. Firstly, Online and tech-enhanced the teaching and researching activities for the students. Secondly, it helps to teacher to open up campuses to a more global community of both faculty and students. Thirdly, the 4IR often is described as the multiple exponential technologies that impact on higher education. Fifth, the most familiar exponential technology is the exponential increase in computer power and decreasing cost in storage. The need for higher education to respond is urgent as the power of 4IR technologies for either

positive social impacts or devastating environmental damage. Sixth, Wearable Assisted Teaching, Learning, and Training the plurality of wearable devices produced indicate an early sign of another technology. Education establishments have to act now to realize wearable's huge potential to revolutionize the way we teach and train students that impact on higher education in Bangladesh. (Marwala et al., 2017; Marwala, 2012; Marwala, 2010).

## 7. RECOMMENDATIONS

To enable faculty to be able to maintain current knowledge, more active and creative forms of faculty development will also be required, and the campus must become a constantly renewing collaborative hub of activity to maintain itself within the fast-paced FIR environment of the future in Bangladesh. To enable students to comprehend both the individual technologies in detail but to be able to thoughtfully analyze and predict the evolution of networked systems of technology, environment and political systems. Blended instruction and optimization of the “flipped” class, and online courses will make more efficient learning environments for students that can adapt for diversity in preparation within students. So it should be updated for the students learning.[Source: The Fourth Industrial Revolution and Higher Education –B.E. Penprase].The FIR curriculum needs to respond to the political and social dimensions that will accompany the increasing centralization of wealth and political influence. The government should engage to develop the new technological powers for increasing new teaching methodology of the students in our Bangladesh (K. Schwab 2016). New frameworks should be changed in case of collaboration between government, industry, and higher education institutions that prevent covering behind in this fast changing environment. The radical technological shifts should maintain in a proper way to expand the frontline of higher education in Bangladesh. The curriculum should change from time to time for the students to develop and shape the use of today's most rapidly emerging technologies. Pathways for students to re-engage with their institutions after graduation. The young students and faculty can engage with the rapidly changing realities within the industrial and corporate sector.

## 8. CONCLUSION

Higher education needs to recognize the necessity of adapting these new FIR forms of education to assure the sustainability of our environment and economy, as well as to sustain the relevance of higher education as a responsive and vital component of society's response to the FIR. The fourth industrial revolution, a new form of a university is emerging that does teaching, research and service in a different manner. The first three Industrial Revolutions provided evidence for the profound shifts in society, the economy and in education which resulted in a proliferation of curricular innovation and the establishment of new educational institutions. As in the previous Industrial Revolutions, the most profound effects of this Fourth Industrial Revolution on our society will not be realized for many decades. The impacts of the emerging FIR technology in economic and environmental terms alone will require a drastic reconsideration of the curriculum within higher education, to enable students to comprehend both the individual technologies in detail but to be able to thoughtfully analyze and predict the evolution of networked systems of technology, environment and political systems.



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