

# DIGITIZATION OF THE EMERGING ECONOMY: AN EXPLORATORY AND EXPLANATORY CASE STUDY

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## Abstract

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Digitization has transformed societies and economies throughout the world. This exploratory and explanatory research has been performed in the context of digitization of Bangladesh economy. The research question is whether the transformation of Bangladesh towards the digital economy can act effectively and efficiently for the benefits of the society and the economy. Quantitative and qualitative analysis was conducted. Sixteen hypotheses were tested based on the Chi-square test. The time period of the study was from April 1, 2019, to December 31, 2019. The Chi-square test findings were significant for the following null hypotheses: Internet of Things will not bring benefits of the human beings; robots are not needed for industries; big data cannot be used for the business intelligence; artificial intelligence (AI) is not effective; bitcoin transactions should not be allowed; the banking sector is not relatively digitalized; chatbots do not need to be used in banks; drones cannot be used for commercial purpose; robots cannot be used for education purpose; farmers must not learn to yield wirelessly. Another six null hypotheses were rejected. Fear of losing employment was the key obstruction to execute the 4<sup>th</sup> Industrial Revolution (4IR) in the country as revealed from the study. Proper information and communication technology (ICT) based education, preparation and knowledge were required. Good governance and regulation should be established with the help of digitization in Bangladesh. The study is suggested to answer the research question, if the benefit from transforming the society to the digital economy may outweigh negative impacts and turn threats into opportunities, reduce demand for labor and disguised unemployment and narrow down the scope of creating new employment opportunities in the country. The potential unlocking system in the global market is feasible through ensuring digitization of Bangladesh society.

**Keywords:** Bangladesh, Digitization, Digital Economy, Labor Demand, Technological Changes, Telecommunications, Fourth Industrial Revolution, Artificial Intelligence

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## 1. INTRODUCTION

Digitization of the production and distribution gradually has taken over every sector of the global economies. Digital production accompanies the

continuous innovation and creativity process. Attractive digitization is helping to grow with information and communication technology. As Bangladesh is a part and parcel of the global system, digitization may help to synchronize all

systems in a substantial manner to attain economic progress. Digital financial services assist in inclusion of indispensable economic activities as well as help to advance through arranging knowledge solutions, electronic fund transfer and bill-payment connected services. The Fourth Industrial Revolution is integrated with the physical, digital, and biological spheres with the realm of new technical knowhow and free flow of information dissemination through technical support. Big data is enormous information to process by using a conventional database and software procedure. In most enterprises, setting the volume of data is too huge as it moves too fast or it exceeds existing processing ability. Brynjolfsson and Collis (2019) opined on how to regulate technology, how much to subsidize digital infrastructure, and even what sorts of new digital offerings to entrepreneurs to facilitate the true benefits derived from the digital economy and how it could help to generate more-accurate estimates of the benefits associated with changes in nonmarket and public goods, such as air quality, health care, and infrastructure.

Artificial intelligence based tools can connect consumers as well as producers to provide tailor-made goods and services. The farmers can utilize AI-based techniques. However, in Bangladesh the farmers are yet to get appropriate knowledge, skill, and experience to operate the AI technology. Therefore, capacity building for the utilization of AI-based techniques is necessary. Unemployment is gradually increasing in Bangladesh. Job opportunities in Bangladesh are challenging to transfer workers from lower-to-higher productivity sectors (ADB, 2016). The year 2021 is earmarked as "Digital Bangladesh" to achieve Bangladesh Vision-2021 for the country. In Bangladesh, the present government has been telling that employment opportunities in digital jobs will include the inclusion of young people into creative, innovative, and decent work practices and will increase the efficiency of business enterprises. Sustainable Development Goal 4 (SDG 4) deals with the education aiming at inclusive and equitable excellence in education and endorse lifetime education prospects for all while SDG 8 depicted continued, inclusive and sustainable economic expansion, engaged and innovative employment and decent work being intended for everyone. This may be possible by arranging improvement of quality, industry need based education, online education supported by proper proctor based examination system through distance guarding system using devices and lab-based improved teaching facilities.

We know that the 1st Industrial Revolution began in the United Kingdom in the 18th century while the 2nd Industrial Revolution refers to the 'Technological Revolution'. However, the 3rd Industrial Revolution includes utilization of the Internet, green electricity, and 3D printing, etc. accompanied by the gradual transformation from the capitalistic structure to a mixed economy and then moving towards a free market economy. The 4IR is blending with technologies, i.e., the physical, digital, self-determination of the transportations, nanotechnologies, materials sciences, energy savings, computing, organic bubbles, and cyber-virtual world. Glotko et al. (2020) opined that the need to develop theoretical principles and

practical recommendations for improving the process of the government regulation of the particular industry in the context of its transformation into the digital economy determines the relevance of the study. Bangladesh was found on the list of 'Top Movers' in Huawei Global Connectivity Index 2019 for its significant growth in the digital economy more than the last four years while further three countries were Ukraine, South Africa and Algeria ("Bangladesh among top four", 2019).

Blockchain technology refers to the record-keeping tool and applying public ledger through a decentralized process that benefits the masses in different sectors of the economy. The digital economy can facilitate to attain efficient financial arrangements and payment systems between producers and consumers. It may be used to act as an intermediary to create employment through enterprises and sustain all over the world where big data, AI, and dynamics of the economic progress can be achieved for the communities. Innovations index (0-100) for Bangladesh during the period of 2011 to 2019 was 24.42 points; while in 2019 score was 23.3 (TheGlobalEconomy.com, 2020). Bangladesh being a labor surplus country, must send workers abroad who are well conversant with the 4IR. Sampath (2018) cautioned that in the absence of capabilities to produce diverse forms of industrial outputs, countries will find it difficult to benefit directly from the boom in e-commerce as a fundamental force for any kind of transformation.

In case of CRI Index 2018, Bangladesh's position is 148 out of 157 countries. Spending on health, education and social protection is 146 out of 157; progressivity of tax policy is 103 out of 157 and Bangladesh's position regarding labor rights and minimum wages is 148 out of 157 (Centre for Research and Information, 2017). On May 11, 2018, Bangladesh launched Bangabandhu Satellite-1. UNFPA Bangladesh (2020) described that in Bangladesh young people between the ages of 15 and 24 make up nearly 20% of the population; with the total population of Bangladesh expected to reach 220 million by the year 2050. As the job creation rate is very limited but jobseekers number is very high, optimal utilization of resource allocation is required in the country to create the atmosphere of demand for labor with a high gross domestic product (GDP) growth rate. In a labor surplus country, like Bangladesh, labor-skill should complement capital, with no trade-off between capital and labor. As a garment sector gets mechanized and skills-based psychology but to retain traditional female assistance in the readymade garments (RMG) sector who are relatively low educated there is a need to get technological skills. Continuous innovation, research, and development for increasing GDP and employment are a big challenge for Bangladesh. Word of mouth and social media can disseminate information to provide better job opportunities for a large number of unemployed, in both the formal and informal sectors.

Digital Bangladesh started through the introduction of the fourth generation (4G) mobile Internet on February 19, 2018 ("Bangladesh enters 4G era", 2018). Sung (2018) described that 4IR can help farmers to determine weather conditions,

moisture, and quantity of daylight to cultivation in agricultural farms, through mobile devices. Bangladesh is gradually introducing telemedicine centers and satellite clinics in rural areas. Online services for home delivery of goods are rising in the country. However, Bangladesh requires synchronizing the advanced technological changes at all stages in the pyramid. Bangladesh Association of Software and Information Services (BASIS) has been functioning for disseminating information and communication expertise along with access to information (A2I).

The digital economy should not work like "Water-Diamond Paradox" as who can receive digital benefits to the marginal utility of digitization is higher, but to those who are lagging behind due to the digital divide, their marginal utility will be zero, and to them total utility from digitization will also be zero which needs to be assessed by the policy makers. Therefore, it is necessary to ensure transformation towards the digital economy effectively and efficiently, where benefits outweigh the negative impacts and turning threats of unemployment and disguised unemployment into challenges of creation of new employment opportunities accompanied by the economic development and progress of the country.

The key research question of the study is whether the transformation of Bangladesh towards the digital economy can act effectively and efficiently for the benefits of the society and the economy.

This study will 1) review the present status of the digitization of Bangladesh; 2) assess whether transformation towards the digital economy can be helpful for the society and the economy; 3) explore how Bangladesh can create demand for labor in the era of 4IR, AI, big data and blockchain technology; and 4) provide policy implications of the study.

This paper is structured as follows: Section 2 reviews the relevant literature, Section 3 provides the present scenario, Section 4 consists of the methodology of the study, Section 5 deals with the analysis of the findings, Section 6 depicts discussion while Section 7 describes conclusion.

## 2. LITERATURE REVIEW

Enterprise resource planning (ERP) system in the business process requires integrating practical functional and organizational information in enhancing the place of the organization to alter its business processes (Haas & Waldenberger, 2005). The field of linguistics shares an interest in the theory of grammars and languages with AI (Patterson, 2005). Costa (2009) argued that the livelihood method responds to a crisis in an adaptive technique by performing three multifaceted responsibilities: 1) prototype acknowledgment in images and sounds, 2) language processing, and 3) act preparation and forecasting. Effective familiarities and well-equipped skills are required to implement the digital economy (Ali, 2010). Knowledge, skills, and aptitude in five areas are required (Gallagher, 2010). Therefore, managers can intend and control process arrangement and procedure drives to progress the routine of any business progression (Anupindi, Chopra, Deshmukh, Van Mieghem, & Zemel, 2014).

Varian (2014) observed that machine learning methods may be applicable through decision trees, support vector equipment, neural nets, and deep learning to prepare complex model relations. Zwitter (2014) argued that big-data might strengthened persuade to change the customary postulation of ethics regarding individualism, liberated determination, and influence. Goldfarb, Greenstein, and Tucker (2015) opined that since digital equipment is required to expand in impetus and significance, this has turned obviously into digitization which has a facial appearance that does not fit well into the conventional economic replica. Maune (2015) argued that the most excellent place of the competitive intelligence (CI) function is wherever it can offer straight sustain to decision making even though there appears to be a move missing from merely inside CI purpose towards outsourcing of the CI function. Therefore, for the transformation process to be successful, we need global benchmarking as a reference point (Summers, 2015). Graham (2016) recommended that the appearance of free digital tools would have a positive transformation of manufacture, sponsorship, and distribution. The information environment is comparatively a stronger driving force than research to develop AI applications, as seen from digitization of the electronic banking sector (Pan, 2016; Ali, 2017). Chua and Chua (2017) observed that e-leadership is based on the following seven core factors, which are readiness, practices, strategies, support, culture, needs, and obstacles and ought to support by validity and reliability.

In Bangladesh, the probability of big data set up is a difficult task (Mahmud, 2017). Tan, Ji, Lim, and Tseng (2017) suggested that it is essential to detect the cause of excursion, to reduce troubleshooting time, and improve production. Therefore, understanding the 4IR and its new technologies and their threats is critical for all the nations (Dimitrieska, Stankovska, & Efremova, 2018). The beginning of robots is useful in automation along with worldwide supply chains and has universal employment effects of offshoring (Ernst, Merola, & Samaan, 2018). Grove, Clouse, and Georg Schaffner (2018) advised accelerating the digital learning process. Hopkins and Hawking (2018) talked that enhancement of using and routing has the possibility to decrease traffic jamming, which is to blame for losses in productivity, extra fuel consumption, air pollution and noise, and can incite strain, hostility, irritation and hazardous behaviors of the drivers. Lu, Li, Chen, Kim, and Serikawa (2018) commented that plan to build up an able learning model called "Brain Intelligence (BI)" that create the mental ability of innovative thoughts regarding actions with no understanding through using artificial being is an inventive purpose. Memedi et al. (2018) depicted that selecting color blind-friendly palettes could supplementary assist to better understanding of the information in visualizations and undertaking the many varieties of colorblindness and would be attractive to examine dissimilarities in intending necessities of the interface among patients on normal functioning (On phase) and rigorously impaired (Off phase) situations. Sakata (2018) viewed that the digital revolution will persist on rapid applicability, technical abilities to move faster, and look deeper

towards a planet fueled by data – a globe utilizing artificial intelligence and go through machine learning processes. Ali (2017) opined that fund management of the banking sector of the country needs to be fully digitized so that default culture and money laundering process cannot be patronized by the banking system in Bangladesh.

Digitization will revolutionize and transform the agriculture sector with the application of high-tech industries, attached to AI and big data (Sung, 2018). Ray (2018) remarked that the IoT has the potentiality to utilize an additional use of a fresh move into the Internet through facilitating communications between objects and human beings, creation of a smarter and able world. Therefore, ethical regulation of the use of AI is a complex but necessary task, as any alternative method may lead to devaluation of individual rights and social values, rejection of AI-based innovation, and to improve individual wellbeing and social wellbeing (Taddeo & Floridi, 2018). Athey and Luca (2019) argued that technology stands encompassed with fresh markets and original customs to obtain information, economists have approached to the participants progressively to involve in a more central role in tech-based organizations-tackling trouble shootings such as platform design, plan, pricing, and procedure. Further, the digital marketplace allows participants to make joint investments in shared infrastructure and digital public utilities without assigning market power to a platform operator, and are characterized by increased competition, lower barriers to entry, and a lower privacy risk (Catalini & Gans, 2019).

Calvão and Thara (2019) argued that in India, there is a challenge of organizing labor in the digital economy and transforming it into a meaningful activity to fulfill potential objectives of social, equality and justice. Still, the default culture in the country is creating a negative role in the financial institutions of the country. Nascimento and Bellini (2019) argued that huge prospects are present for research on AI technologies, the development of human skills, and the latest organizational configuration. Ponte, Gereffi, and Raj-Reichert (2019) argued that the social science stream: the interdisciplinary body of research variously referred to as global commodity chains, global production networks, and global value chains, which has been pursued by like-minded social scientists. Bieze, Kruszewski, Carrez, and Duriez (2020) commented that a closed-loop control strategy is being executed to account for the discrepancies between the model and the robot. Bilozubenko, Yatchuk, Wolanin, Serediuk, and Korneyev (2020) discussed the digital economy (DE) development parameters in the European Union (EU) countries which in common allow: “1) improving control effectiveness by focusing efforts and resources on priority parameters; 2) identifying targets for strategic management; 3) evaluating the digital divide patterns, the prerequisites for changing countries’ positions and the effectiveness of post factum management; 4) considering the pro files of individual countries, determining their road map for developing DE and evaluating convergence problems at the EU level; 5) highlighting the points and drivers DE growth in the European economy; and 6) based

on a set of key indicators, setting priority measures to develop DE” (p. 215)

Brainard (2020) opined that the opening of big-tech and fin-tech into payments may introduce competition, boost product assistances, and lower transactions costs which also has the possibility to augment financial inclusion by growing the numeral and diversity of habits people add the right to entry in financial services and by generating additional consumer gracious assistance. Prior to the market, AI application may lead to inflating safe transactions law by blockchain-based market movements which might interrupt prospects and forces at an excessive cost (Hughes, 2020). Kostka, Zhang, and Shin (2020) found that in China, they have to add in the form, diversity, and superiority of ecological information as well as mobile apps tracking with the environmental situation, factory pollution discharges, and individual carbon footprints which are currently to attain at the majority of the populace. Businesses are required to use big data to include occurrence of the refurbishment of their business replica or extend fresh ones, this gives an impetus to an increase in the occurrence of the big data in business (Wiener, Saunders, & Marabelli, 2020). Connections and variations are linking networks and ecosystems to attain spotlight on modularity and complementarily at the front of inter-organizational explore though inspirational ecosystems’ scholarship with methodical relevance of network systematic apparatus to plan the prototype of module interdependencies (Shipilov & Gawer, 2020).

However, most of the research-based articles were written in the perspective of developed nations but studies related to Bangladesh are almost absent and very much insignificant. As such this study intends to be exploratory and explanatory to answer the research question.

### 3. PRESENT SCENARIO

The diverse nature of the Bangladesh economy in the international economic sphere has impacted the domestic economy along with society, cultural heritage, environment with the demography-based transformation of the youth. Multifarious schemes are being introduced due to the digital process and economic psychoanalysis is getting importance. Both advanced and developing countries’ governments are gradually moving towards data-driven innovation. Katz and Koutroumpis (2012) commented that digitization appears to have a multiplying factor that captures the enhancement capacity that leads to an impact on a developed technologies eco-system. Digital Bangladesh is happening as in 5,275 union digital centers – 10,000 entrepreneurs are involved with these centers. More than 100 simplified public services, e-procurement and small health e-cards are helping towards the 4IR path. Nearly, 8,500 post offices, from across the nation, have e-centers for spreading IT service to the rural areas. The case of Rini and Rakib is popular in Bangladesh who manufactured a 3D concrete printing robot and exported 11 robots to South Korea in 2018. Masud (2019) depicted that it is time for the country to adopt strict educational policies to transform the young population into productive human capital and to encourage

technology-driven occupations in Bangladesh; otherwise the 4IR will be a curse instead of a blessing.

In January 2019, mobile phone users increased by 0.555 million to 150 million while the total Internet users stood at 90.1 million in Bangladesh. The government of Bangladesh is considering bringing overseas teachers to adopt the 4th Industrial Revolution in the country. In the meantime, developed nations are facing problems through passing out of the students who completed their program by the traditional method as a change in the course curricula has occurred through the inclusion of big data, artificial intelligence, 4IR, and blockchain. Digitization of the education system in Bangladesh is yet fully functional. Referring to the large population of youths in Bangladesh, only 16% of the Bangladesh population was undertaking technical and vocational education and training and skill development programs are under the government and still waiting to receive dividend benefits. Khan, Howlader, and Islam (2020) observed that despite an important enhance in the hospital facility in 2005-15 and a 57 % increase in the number of doctors in the same time, the healthcare structure in Bangladesh and Dhaka Division in exacting, might not be ready to switch the COVID-19 disaster. Actually during the pandemic situation health sector does not prove efficient through providing telemedicine or e-health services to the patients for which patients were undergone through disaster to get proper treatment.

The digital economy refers to the financial arrangement supported by digital computing skills. Real-time gross settlement in most of the banks in Bangladesh has been working. Comparatively in the financial and the banking sectors, electronic banking and digitization were introduced. However, the cost of e-banking is much higher for lower- and middle-income segments of the society. Bangladesh will start to introduce 5G between 2020 and 2025 in three phases. Nine universities in Bangladesh have been moving to implement advanced ICT education funded by ADB with the help of University Grants Commission (UGC) of Bangladesh. ACI has two apps - Khamari (farming) and Fosali (cropping) for the agriculture sector; through these apps need to be more user-friendly and there should be synchronization between the agricultural production processes to marketing - each stage of these may be more popular. However, government apps on Krishok (farmer) may help to boost up the transparency of the government buying and selling in the agricultural sector. DESHIZ ("Top 8 digital wallets", 2018) pointed out top 8 digital wallets to go cashless in Bangladesh: bKash, iPay, Rocket, NexusPay, Upay, GPAY, Easy.com.bd, Dmoney. Further, 'Digital Haat' was introduced in 2020, as the first digital cattle market in Dhaka city. Food for Nation was started by the government of Bangladesh in the year 2020 as the first market for agriculture.

In the banking sector especially foreign remittance proceeds are repatriated by digitization. But other sectors are relatively in a backward position for the use of digitization. The National

Data Centre (Tier 4), which is one of the biggest, has been built at the Kaliakoir Hi-Tech Park in Gazipur in Bangladesh. However, the country is yet to utilize the facility and adopt it to the digital economy and e-marketplaces. Excess dependence on technology may limit the use of human labor and turn to boost up autonomous process rather than manual labor which is currently observed in the RMG sector of the country and return to the original situation where empowerment of women through employment opportunities of women was earlier dominant than the male counterpart. Hassan (2020) argued that digitalism's business model is mainly dependent on advertising, and it is somewhat recognized that algorithmic tracking by Google, Facebook, Uber, Amazon, etc. is the way through which technology based businesses remain "interactivity" available on diversified circumstances.

The use of digitization in marketing and financial activities in Bangladesh has been on the rise, however, in the production process, its implementation is behind other sectors. Bangladesh is committed to reducing inequality. The third-wave Technology Limited is assisting Bangladesh postal services to set up postal banking services through 'Nagad' for deposits, withdrawals, sending money, recharging mobile and making bill payments ("Nagad' set to complete", 2020). Hasan (2020) reported that Nagad provided mobile financial services for an interim six months' period. Fintech is a solution provider of quick services but receiving such services does not necessarily imply the financial inclusion of people (Hossain, 2020). Yet micro-savings and micro-investment processes need to be included in the digital transaction. In the year 2016, the Central Bank of Bangladesh was hacked for US \$101 million which implies that cybersecurity is one of the key challenges for digitization, especially in the financial sector. In the year 2020 due to COVID-19 farmers in Bangladesh face problems with paddy harvesting and a shortage of agricultural laborers due to social distancing which was solved by the use of crop-reapers and harvesting machines. Further, educational institutions are also closed and have taken up technology-assisted delivery of classes by Zoom, meet Google and Television channels.

#### 4. METHODOLOGY OF THE STUDY

This study used both quantitative and qualitative data under exploratory and explanatory research work. The theoretical framework of the study was shown in Figure 1. For qualitative analysis, the study is based on discussion of secondary sources. A survey was conducted based on random sampling through preparing a closed-ended questionnaire which consists of a total of 16 items, in the structured questions using binary data, i.e., yes/no, and demographic questions. These items were included in the structured part of the questions regarding preparedness of ICT skills for the digital economy as listed in Table 1.

The hypotheses that will be tested are listed in Table 1.

**Table 1.** Hypotheses and Chi-square test

<i>Null hypothesis</i>	<i>Alternative hypothesis</i>
No preparedness of ICT skills for the digital economy is being required.	Preparedness of ICT skills for the digital economy is being required.
Employment will not reduce due to 4IR Implementation.	Employment will reduce due to 4IR implementation.
Internet of Thinking will not bring benefits of the human beings.	Internet of Thinking will bring benefits of the human beings.
Robots are not being needed for industries.	Robots are being needed for industries.
Big data cannot be used for the business intelligence.	Big data can be used for the business intelligence.
AI is not effective.	AI is effective.
Bitcoin transactions should not be allowed.	Bitcoin transactions should be allowed.
Banking sector is not relatively digitalized.	Banking sector is relatively digitalized.
Chatbots do not need to be used in banks.	Chatbots need to be used in banks.
Blockchain technology is not needed in the health sector.	Blockchain technology is needed in the health sector.
Medical assistance robots are not needed.	Medical assistance robots are needed.
Drones cannot be used for commercial purposes.	Drones can be used for commercial purposes.
Digital education is not lacking.	Digital education is lacking.
Robots cannot be used for education purposes.	Robots can be used for education purposes.
Farmers must not learn to yield wirelessly.	Farmers must learn to yield wirelessly.
Household robots are not necessary.	Household robots are necessary.

Source: Author's elaboration.

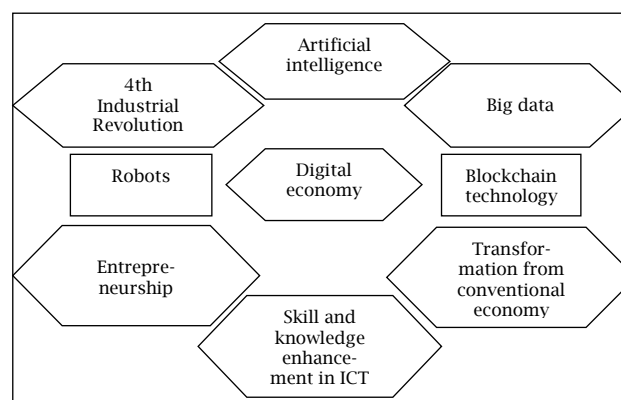
The questionnaire was distributed among 250 participants of diversified nature - starting from the farmers to the policymakers in the Dhaka district. The "Dhaka district" was chosen for collecting data being the capital of the country and it represents all sorts of use of high-tech facilities in the country. The study received 222 respondents replies out of which 217 were complete surveys with no missing data. The diverse nature of participants was identified based on occupation and gender as seen in Table 2, out of whom 116 were male while 101 were female. Cronbach's alpha determined the internal consistency of the scale all above 0.70 and acceptable. Further, the Chi-square test will be done at a significance level 0.01 to see whether the corresponding item is related to the gender and the result will be summarized in Table 3.

**Table 2.** Diverse nature of respondents

<i>Occupation of the respondents</i>	<i>Male</i>	<i>Female</i>
Agricultural farmers	29	0
Poultry owners	4	1
Livestock entrepreneurs	3	5
Fish cultivators	2	6
Small and medium entrepreneurs	5	4
Cottage entrepreneurs	2	6
Social workers	4	5
NGO owners	5	4
RMG owners	3	4
Bankers	6	8
Packaging industry owners	3	1
Internet service providers	4	0
Lawmakers	5	3
Personnel of the Ministry of Post, Telecommunication & Information Technology	5	4
Politicians (lawmakers are not counted)	8	7
Computer scientists	6	7
Academics of robotics and mechatronics engineering	3	4
Printing industrialists	2	1
Representatives of different Chambers of commerce	4	3
Doctors	6	5
Brothers and nurses	2	7
Journalists	4	5
Housewives	0	9
Human rights activists	1	2

Source: Author's elaboration.

Based on the literature review, the research gap is recognized, and the theoretical model is proposed in Figure 1, indicating the relationship in the digital economy. This indicated that the digital economy is related to the 4th Industrial Revolution, artificial intelligence, big data, the transformation from conventional economy, robots, blockchain technology, skills, and knowledge enhancement. These factors are also accelerating the entrepreneurship process and helping toward the behavioral pattern of the market-driven economy towards techno-based procedures. The time period of the study was from April 1, 2019, to December 31, 2019. A preliminary version of the paper was presented in the international research conference 2019 of Rangsit University, Thailand on April 26, 2019, entitled "Transformation Towards Digital Economy" and feedback from the conference is used to improve the quality of the paper, as well as formalizing the methodology based on audiences feedback and also preparing questionnaire based on suggestions from the keynote speakers. Secondary information was also used from the internal sources of Bangladesh, published books, journals, newspapers, the Internet, and government report.

**Figure 1.** Proposed theoretical model of digital economy and relationship

Source: Author's elaboration.

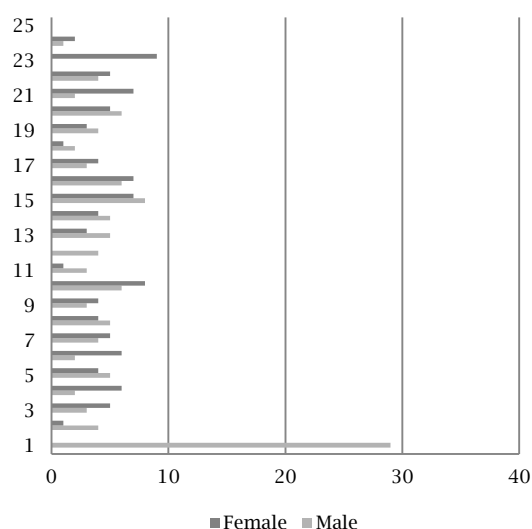
Though in Bangladesh there are sixty-four districts, this study considers only Dhaka district as it is the capital city that mostly represents all the available features of the digitization of the country.

One of the limitations of the study was that the regional cities were not included to study to assess the impact of digitization process and adaptation due to limitation of time and grant money. Currently, the study has done Chi-square tests based on gender only. However, in the future, another study can be conducted by testing hypotheses considering the educational qualifications. The study did a general focus but did not focus on the impact of digitization on a specific sector of the economy in the country of the Dhaka district. In the future, a specific industry oriented study may be done.

### 5. ANALYSIS OF THE FINDINGS

The results for Cronbach's alpha test were 0.851 which means that the 16 items are internally consistent. The Figure 2 below demonstrates the diverse nature of the respondents the study involved.

Figure 2. Occupation of the respondents



Source: Drawn based on survey data.

Figure 2 indicated that out of 25 occupations of the respondents 185 respondents thought that employment will be reduced due to the implementation of the 4IR. But the idea that the Internet will bring benefits was supported by 154 participants while the opinion that big data could be used for business intelligence was supported by 147 participants. The point that the banking sector was relatively digitalized was supported by 199 participants, while the idea that the blockchain technology is needed in the health sector was supported by 193 participants. More chatbots are needed to be used in banks were viewed by 111 respondents. The thought that the farmers must learn to yield wirelessly was opined by 178 respondents. The point that household robots were necessary was commented by 114 persons while 105 respondents agreed that medical assistance robots were needed. 139 respondents agreed that drones could be used for commercial purposes, while 115 agreed that artificial intelligence was effective to use. The point of view that bitcoin transactions should be allowed was supported

by 71 respondents only. The idea that robots were needed for industries was supported by 91 persons. However, only 22 respondents thought that robots could be used for education purposes. The opinion that digital education was lacking in Bangladesh was supported by 125 respondents. Preparedness of ICT skills for the digital economy was supported by 53 respondents.

Table 3. Summary of Chi-square test results as per gender-wise viewpoint

Items	Chi-square stat.	p-value	Comment
No preparedness of ICT skills for the digital economy is being required.	0.7807	0.376934	Insigt at p < 0.01
Employment will not reduce due to 4IR implementation.	4.3535	0.036934	Insigt at p < 0.01
Internet of Thinking will not bring benefits of the human beings.	38.4354	< 0.00001	Sigt at p < 0.01
Robots are not being needed for industries.	29.5333	< 0.00001	Sigt at p < 0.01
Big data cannot be used for the business intelligence.	25.7187	< 0.00001	Sigt at p < 0.01
AI is not effective.	22.8368	< 0.00001	Sigt at p < 0.01
Bitcoin transactions should not be allowed.	21.5891	< 0.00001	Sigt at p < 0.01
Banking sector is not relatively digitalized.	8.7645	0.003071	Sigt at p < 0.01
Chatbots do not need to be used in banks.	25.3057	< 0.00001	Sigt at p < 0.01
Blockchain technology are not needed in the health sector.	4.2965	0.03819.	Insigt at p < 0.01
Medical assistance robots are not needed.	2.7782	0.095556	Insigt at p < 0.01
Drones cannot be used for commercial purpose.	9.2028	0.002416	Sigt at p < 0.01
Digital education is not lacking.	0.0117	0.913958	Insigt at p < 0.01
Robot cannot be used for education purpose.	69.0768	< 0.00001	Sigt at p < 0.01
Farmers must not learn to yield wirelessly .	12.5698	0.000392	Sigt at p < 0.01
Household robots are not necessary.	1.4426	0.229727	Insigt at p < 0.01

Source: Computed by the author

The study observed that (see Table 3) for no preparedness of ICT skills for the digital economy is being required was not accepted at the 99% confidence interval, i.e., 0.01 level of significance which means that the study accepted alternative hypothesis indicating that preparedness of ICT skills for the digital economy is being required. This implied that Bangladesh needs to prepare for ICT skills. Null hypothesis on employment will not reduce due to the 4IR implementation was not accepted at the 99% confidence interval, i.e., 0.01 level of significance which means that the study accepted alternative hypothesis indicating that employment will reduce due to the 4IR implementation. Internet of Thinking will not bring benefits of the human beings was accepted at the 99% confidence interval, i.e., 0.01 level of significance which means that the study accepted null hypothesis. Robots are not being needed for

industries are significant which implied that in a labor surplus country like Bangladesh more dependence on robotics may create an acute situation of unemployment. Big data cannot be used for the business intelligence was accepted which implied that Bangladesh should move forward slowly in the arena of using big data. AI is not effective was found significant. Bitcoin transactions should not be allowed was significant. Banking sector is not relatively digitalized was found significant which implied that the banking sector ought to be more digitalized. Chatbots do not need to be used in banks was found significant which implied that more dependence on human resources in the banking sector is being needed. Blockchain technology is not needed in the health sector was found insignificant which implied that in the health sector, blockchain technologies need to be used. Medical assistance robots are not needed were found insignificant which implied that medical assistance robots are being needed. Drones cannot be used for commercial purposes were found significant. Digital education is not lacking is insignificant which implied that after COVID-19 students are gradually accustomed to digital education. Robots cannot be used for education purposes was found significant which implied that respondents preferred to have a proper teacher-learner education system. Farmers must not learn to yield wirelessly was found significant. Household robots are not necessary was found insignificant which implied that household robots are necessary were accepted.

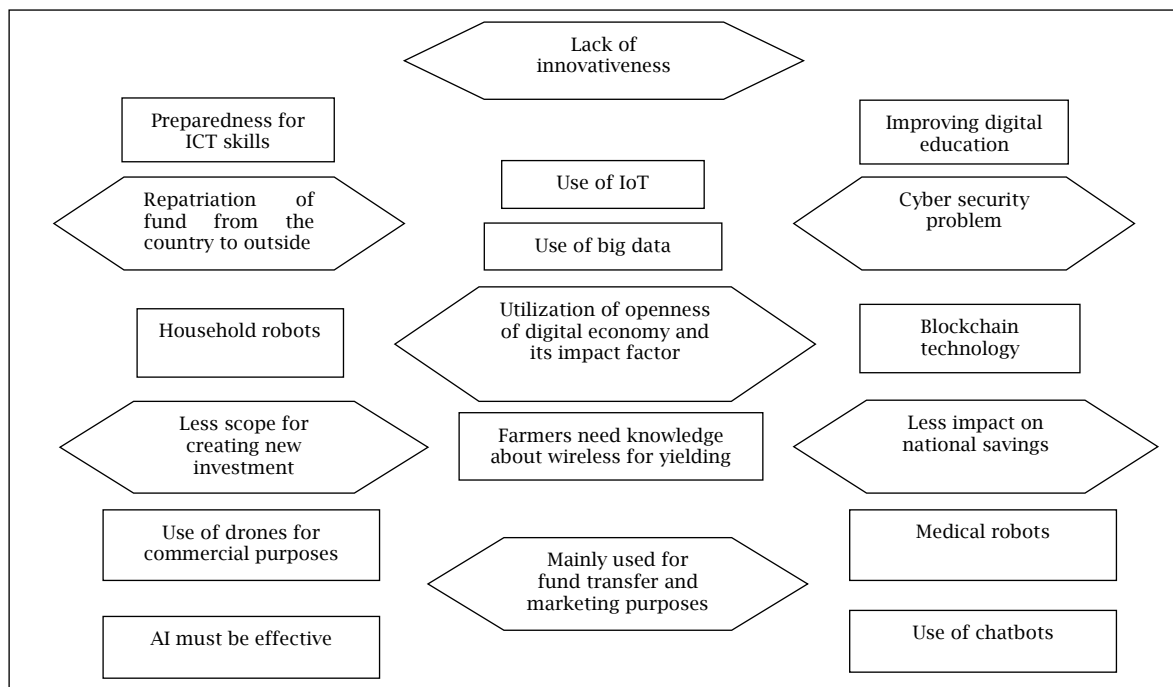
A large amount of information can be accumulated by big data which needs to be analyzed, recognized and help to attain consumer surplus and to attain economic benefits of the masses though Bangladesh is in a primitive stage of use of big data. The suggestion of Wiener et al. (2020) regarding big data for the business activities

may be applied. Machine learning and artificial intelligence can transform to interconnect both producers and customers through technological progression. Looking upon the inference of the 4<sup>th</sup> Industrial Revolution and employable skills need to be recognized. A high-quality number of lines of effort that contain a comprehensive viewpoint need to be assisted by the innovative and creative production extremely quick to implement.

It might lead to an invention, revision of an invention procedure or a business with commercialization. Science-technology-innovation and creative use of 4IR tools and applications are transforming the lives of individuals, companies, countries across the world from entertainment to education and employment. In Bangladesh, the health sector suffers tremendously due to inefficient healthcare management. As such medical assistant robots are required and through using big data and blockchain technology proper health management facilities may be created. The suggestion of Bieze et al. (2020) to use robots can also be applied in Bangladesh. Though numbers of mobile users have been raised it does not imply that for the digitization, the telecommunication sector is providing rightful services. Through developing a mobile app under the pandemic situation in Bangladesh, it can be found out if any beds are available in dedicated hospitals for COVID-19 patients beforehand, so that patients and a patient party can easily find the hospital by seeing the virtual situation of the dedicated hospital beds, isolation center, intensive care unit (ICU) and ventilation management system for hustle free treatment.

Figure 3 shows the utilization of openness of the digital economy and its impact based on aforesaid observations.

**Figure 3.** Utilization of openness of the digital economy and its impact



Source: Author's elaboration.



In Figure 3, the study shows that due to utilization of openness of the digital economy, there is a less impact on national savings, mainly used for fund transfer and marketing purposes, lack of innovativeness, cybersecurity problems, repatriation of fund from the country to outside, less scope for creating a new investment. Preparedness for ICT skills is most important that must be accompanied by the quality of digital education. Use of AI in an effective manner, application of IoT, utilization of big data, exercise of drones for commercial purposes, application of blockchain technology, use of chatbots, household robots and medical assistance of robots are being required - though all were not supported by the respondents.

## 6. DISCUSSION

Bangladesh needs to improve its innovative scenario through the continuous improvement process. Foreign direct investment and investment policy, along with outsourcing is becoming more user-friendly. Synchronizing the goals and targets will stimulate action amongst domestic, regional, and global economies considering human values and social welfare in an accurate manner. Behavioral economics is a technique of cost-effective analysis pertaining to emotional approaching into a person's behavior to clarify financial supervisory. Fear of losing employment is the main hindrance to implement the 4IR in the country as revealed from the survey. For industry-academia alliances each program of business /economics must have practical exposure through setting up economic incubator. Behavioral economics must work with the 4IR. Any sort of financial transactions will be meaningless if ultimately saving is not channeled with investment. Human beings and community progress with high moral values of the country should be enhanced.

The use of the 4IR is the need of the age of long-run sustainability through core competencies. Entrepreneurs need to be aware of the full utilization of the 4IR so that product quality, design can be improved and use it starting from the education sector to tourism, e-tender, health, paramedics, nursing, medical technologists, etc. Even developing apps to indicate where a patient can be admitted with a specific disease into the hospital and also pharmaceuticals, agricultural sector, financial sector, RMG, etc. can add value chain both in the domestic and global arena. The renovation of the digital economy will be helpful by establishing big data architecture. Big data may be used for establishing import substitution industrialization process in the country. Big data can also be used to identify the repatriation of funds from the country to abroad by a section of financial institutions' defaulters. Seed money, crowdfunding, angel investors and startup money for starting digital ventures can be started with proper activities and directions. There should be matching between saving and investment process through arranging digitization to get an effective and efficient competitive advantage. In case of agricultural entrepreneurship or seafood processing, digitization may be strengthened. Establishing a data center for entrepreneurial promotion with international standards and expanding access to economic activities can help both the community and the

government. For arranging better knowledgeable people, decreasing deficiency, and to provide inhabitants to work in the formal economy rather than the informal economy is the need of the hour. Bangladesh needs proper guidance to enter in the digital labor force so that white and blue-collar workers can prove their innovativeness.

To get benefits from the digital economy, the preparedness of ICT skills for the digital economy is still lacking as we observed from the study. Proper planning and a human-centric development approach accompanied by technological advancement and proper execution with the help of plan-do-check-act is needed. The transformation of the digital economy will be helpful by the big data architecture. Inference of the 4th Industrial Revolution and employable skills in a developing country need to be recognized with a high-quality number of lines of effort containing a comprehensive viewpoint to put up with the assisting by the innovative and creative production awfully needed. Through the Internet connectivity, the digital-divide gap can be eliminated both in rural and urban areas. However, mobile SIM operators in the country, in some cases illegally deduct from the loaded balances of the SIM number of the users which need to be brought under law and enforcement because when complaint lodged to the SIM operators they do nothing.

Entrepreneurship, innovation, and creativity can help to attain transformation into the digital economy. Electronic data interchange and electronic fund transfer both work complementary. Technology-driven innovation is foremost better to attain livelihood. As a result, competitive intelligence may need to rise. Digitization with synchronizing local economies needs to employ youth and provide funding to support the initiative. Digital media for marketing plans, products, and services, for sharing business plans, customer relationship management, news and events, video conferencing, advertisement, and research purposes need to be used in Bangladesh as Catalini and Gans (2019) depicted.

To sustain in the long run competencies, trained labor, and management of the labor process in a digitized manner are needed. Focused based development is the necessity for crafting in the worldwide interchanges. Human-ware, net-ware, software, and hardware should work in an integrated manner so that international benchmarking can work to attain the global transformation process and better utilization of human beings where resources are scarce but can be utilized optimally. A diversity of economy-wide occurrences is required to attain the digital economy of a country. At the regional level, Bangladesh can push for "BIMSTEC" regional organization to emphasize collaborative support for the 4IR and the use of artificial intelligence starting from ago-based industry to manufacturing and the service sectors, i.e., education, tourism, and hospitality management. However, the disputed issue of Rohiynga to send them to the neighboring country of Bangladesh by Myanmar should be stopped to effect BIMSTEC as a regional organization. Women need to get more access to the 4IR under the government patronage. The government needs to utilize data-driven innovation.

Ethically sound and skilled human resources for digital transactions are being required. An amalgamation of international business, entrepreneurship, and deliberate management need

the intellectual and personal origins of the work for 'international new ventures' and 'international entrepreneurship' in the country with the help of digitization. Any sort of financial transactions will be meaningless if ultimately saving is not be channeled with investment. Greediness among some people of the society is rising in an alarming way which should be curtailed through continuous behavioral changes. Entrepreneurs need to be aware of full utilization of the 4IR so that product quality, design can be improved. The transformation of the digital economy will be helpfully driven by the big data architecture. Consumer wellbeing can be arranged by the digital economy in Bangladesh as suggested by Brynjolfsson and Collis (2019).

Profit oriented organizations in Bangladesh should come out with an ice breaking solution to utilize appropriate technology in a labour surplus country like Bangladesh, so that more jobs are created, accompanied with the 4IR. This can be done by arranging contemporary need-based training and capacity building. At the policy level, greater absorbing capacity is needed to provide formal education to females in the country. To attain the aforesaid policy, a public university of the country like Bangladesh Open University should come forward through designing course curricula to educate female laborers on digitization and basics of big data, how to use robots and fundamentals of artificial intelligence and elementary knowledge in blockchain technology. Moreover, at the undergraduate level courses on ICT, digital economy, big data, AI, blockchain technology, and robotics may be mandatory, irrespective of the students reading either at humanities or sciences or business programs or even in physicians educational sector at the undergraduate level. Entry strategies of the firms in the country may be reduced due to the digitization process.

Knowledge network must be accompanied by the improvement of labor-skill development. Value addition of the network from the grass-root level to the bottom-up approach and top-down approach towards lower level must coordinate to remove jobless growth by arranging contemporary training for both men and women of different income strata to cope with the changes, challenges and prospects of the 4IR. At the grass-root level, proper teaching and academic mentoring should be well trained. Technological changes in the short run should work to prepare people for the urgent changing environment and future jobs. However, those organizations that get grants from the government and divert money (corruption) in the name of skill enhancement must be made accountable and penalized. Procurement is another place where a huge amount of public fund was misappropriated. As such good governance and regulation should be established with the help of digitization so that public organizations can procure products at fair price and transparency, accountability should be established in both public and private sectors such as e-learning, e-banking, e-marketing, e-health and e-tender, etc. services to attain competitiveness.

The market economy of the country needs to be transformed so that accommodative change in the behavioral pattern is required. A chain reaction among producer-supplier and buyer-consumer is required through utilizing artificial intelligence so that new job prospects may be raised. Though the AI method, robots can be used for medical purposes,

domestic services, household robots and hospitality management. Use of artificial intelligence from the agro-based industry to all sorts of industries for which entrepreneurship development is required. Women need to get more access in the process of the 4IR. Household robots are very much required in the country to help especially middle-class families and disabled people. As such digital connectivity and digital entrepreneurship should work in a complementary and coherent manner.

## 7. CONCLUSION

Bangladesh must focus on skill advancement and modernize the education system to cope with the challenges of the 4IR. A potential unlocking structure in the global market is realistic through making certain arrangements of the digital economy. But the country must be aware of vices of the digital economy and try to overcome this problem as a disparity between rich and poor may not be reduced. The micro-investment process needs to be included in the digital process of transactions channeled with micro-savings by establishing societal banking. Electronic fund transfer must work for pro-people-centric activities and free from cybercrime. The positive spillover effect of the digitization all over the country in terms of technology, research and development must be spread out to all sectors so that people adopt technology and both the agricultural and industrial sectors adopt the multitasking benefits of the digital economy. The digital economy can try to reduce unemployment through social and human development combined with technological progress to encourage the ability to create new jobs. The safety procedure of digitization must be given more emphasis to prevent any fraudulent activities.

For practical and realistic learning, each educational institute must have a data center and learning should be aligned with the database. Machine learning should be used cautiously and ethically so that pitfalls can be driven out. Big data should be utilized for developing human beings. Talent enhancement must be done from the child age and morality must be ensured for using digitization. Every country of the world needs an integrated approach to create an innovative inclusive model where the government, mobile operators, payment service providers, banks, NGOs, and users will get a common platform to become more cautious to attain benefits of the 4IR.

A2I may work honestly and ethically to implement policies of the government in Bangladesh. The country should not just depend on a few business houses that maintain ethical practices. BASIS should be more proactive rather than to make gains for their own respective organization. Corruption and bribery jointly functioning to become rich by adopting digital technologies should be strongly discouraged so that real time-sharing information can be provided, and information symmetry can be ensured by each public and private organization. Internet service providers should refrain from greediness of high charging. Preparedness for ICT skills is more practically needed to be implemented. Demand for labor should not be contradicted with the digitization. The telecommunication sector should act as a driver to facilitate the transformation of

digitization in a true sense and removing the digital divide. Bangladesh Employment Policy-2022 should be prepared, keeping in mind digitization and increased demand for labor absorption capacity in the formal sectors. Bangladesh needs to prevent demographic disaster. In the area where a domestic helping hand is not available, household robots can innovate to manage daily life more efficiently by working women. For medical assistance, the pandemic situation of 2020 indicated that our study rightly found that robots and blockchain technologies are being needed in the health sector management of the country.

The study was explanatory and exploratory research-based and used both quantitative and qualitative analysis. The limitation of the study was that the survey was conducted in Dhaka district which is the capital city of the country, and the

random sampling technique was used due to time constraint and huge costs were involved. In the future a quantitative analysis supported by qualitative analysis may be done through collecting data from various factories of different districts in the country and assessing that how jobless employees can be turned into efficient productive human resources including entrepreneurs or self-employed, having basic knowledge of artificial intelligence, big data and application of blockchain technology in future. A priori multivariate model of research may be done in the future, through preparing an open-ended questionnaire and using snowball technique, classification and codification of the results may be collected from the respondents in detail with more in-depth discussion along with psychoanalysis.

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