



**SOFT SKILLS OF TVET GRADUATES TO MEET THE CHALLENGES OF IR4:
NEEDS, SUPPORTS, AND READINESS**

RESEARCH REPORT

Research Team Leader:
Shakila Rahman
Attached Officer (ICT Cell)
Directorate of Technical Education

Research Team Member:
Abida Sultana
Attached Officer (Training Cell)
Directorate of Technical Education

Research Team Member:
Mohammed Mahbub Alam
Chief Instructor (Tech/Computer)
Cumilla Polytechnic Institute

-

Advisor
Dr. Jakir Hossain
Professor
Institute of Bangladesh Studies
Rajshahi University



Research Initiatives & Supported by:
Directorate of Technical Education
Technical and Madrasah Division
Ministry of Education
April 2023

Executive Summary

Technological advancements of industrial revolution 4.0 (IR4) is changing the world fast. The nature of jobs and job responsibilities are being modified due to technological progress. In the present scenario our workforce need to be ready to accept and adopt with these changes. They require to shift to new types of work.

Today, the majority of our population working age is between the ages of 15 and 64. Right now, population is a resource, not a problem. To take the highest benefit of this demographic dividend, Bangladesh need to take measures to produce skilled manpower in accordance with the skills required by the job market.

Technical Vocational Education and Training (TVET) has been globally recognized as a means of addressing the present and future skill demands of the job market. In this modern age both soft skills and hands-on training is necessary for the TVET graduates. To match with the technological advancement they have to adapt something new almost daily.

Soft skills are the mix of social and interpersonal skills, character traits, and professional attitudes that all jobs require. All jobs require a combination of soft skills, which include social and interpersonal abilities, personal qualities and professional attitudes.

Teamwork, leadership, time management, problem solving, critical thinking, creativity, workplace safety and communication are example of soft skills that will be required for the future jobs.

The aim of this study is to find out necessity, support and readiness of soft skill level of TVET graduates to meet the challenges of IR4. We have considered the existing students of polytechnic institutes, Diploma graduates and other stake holders as our primary source of data and available literature as secondary source of data. Survey, FGD and KII were conducted to collect data. In this we analyzed the collected data if our student's actually need acquire soft skills; their awareness; available support and if our TVET graduates are capable enough to cope with the challenges of IR4.0.

BTEB has been working on developing 4th Industrial-Revolution-based curriculum to prove its worth in line with the demands of the changing labor market. The new 2022 course structure has scope for incorporating soft skills. Strong monitoring and supervision on the implementation of this curriculum is required.

Soft skills can be incorporated as generic skill modules in the diploma engineering courses. Some foundation courses can be introduced in the diploma course to develop interpersonal skills, manner antique, management skills, workplace ethics, etc.

Teaching delivery method need to be updated and teachers need to be trained in project based learning, blended education and pedagogy. Teachers should made aware of new technologies, challenge and benefits of IR4.

Strong Alumni associations can be built for real-world experience sharing with the current students and alumni's. They need to be encouraged to participate in extracurricular activities. Debate competition, quiz competition on general knowledge can be organized with other cultural competitions. To develop their responsibilities and leadership, students can be involved in social activities and event management.

Funding/ should be provided to encourage Students develop innovative projects. Study tour, excursion, field visit, industry visits, guest speaker, seminar and workshop can be organized. To give support in innovative works, innovation club, science club or programming clubs can be established and patronized.

We found that there is a difference between job market demand for soft skills and current level of TVET graduates' soft skills. Our graduates face challenges that need to be resolved. Students counseling officer should be added for carrier guidance purpose of the students. Job market survey, local demand need to be assessed in regular basis.

The implications of this research will play significant role to increase quality and employability of the TVET graduates and contribute in achieving self-reliance and becoming developed country by 2041.

Acknowledgements

All praises belongs to Almighty Allah, the most merciful, the most beneficent and the most kind for giving us the opportunity, courage and enough energy to carry out and complete the entire research work.

We are extremely grateful to the Director General (Additional Secretary) Dr. Md. Omar Faruque, Directorate of Technical Education for his kind approval, additional effort and support to complete the study.

We would like to take the opportunity to express my gratitude to Engr. Md. Akhtaruzzaman, Director (Planning and Development), Directorate of Technical Education for his valuable advice, encouragement and support to conduct the study. We also convey our thanks to the Engr. Md. Jaynal Abden, Director (Admin), Directorate of Technical Education for his support and suggestions for this research work. We convey our gratitude to the members of the Research & Knowledge Management Cell of DTE for their constructive support and guidance. Our heartfelt gratitude also goes to Dr. Jakir Hossain, Professor, Institute of Bangladesh Studies, Rajshahi University for all his efforts, guidance, experience sharing and supervision for conducting this research and correcting the manuscript.

This is our great pleasure that we got valuable feedback from renowned industries, representatives from Bangladesh Technical Education Board (BTEB) and Directorate of Technical Education (DTE). Finally, we would like to convey gratitude to the respondents and key informants for their great contribution and expert opinion. We are also thankful to our family members for their moral support and our friends who have been constantly inspiring us for completing the study.

CONTENTS

EXECUTIVE SUMMARY	II
ACKNOWLEDGEMENT	IV
TABLE OF CONTENTS	V
LIST OF FIGURES	VII
LIST OF TABLES	VIII
ACRONYMS AND ABBREVIATION	IX
Chapter 1: Introduction	10
1.1 Problem Statement	10
1.2 Rationale of the study.....	10
1.3 General Objectives of the study.....	11
1.4 Scope of the Research.....	11
1.5 Research Questions	12
1.6 Research Methodology	12
1.7 Conceptual Framework of the Research.....	14
1.8 Outline of the Report	18
Chapter 2: Soft skills Needs	19
2.1 Core skills of TVET graduates	21
2.2 Needs for Employability Skills.....	23
2.3 Changes of Equipment and Tools.....	25
2.4 Vacancy Character and Recruitment Factors.....	26
2.5 Introducing of 4IR into Industries of Bangladesh	27
2.6 Labor Market Factors of Bangladesh.....	28
2.7 Challenges to incorporate IR4.0.....	29
Chapter 3: Supports of Soft skills	31
3.1 Policy for 4IR.....	31
3.2 Curriculum.....	32
3.3 Networking.....	33
3.4 Resources.....	34
3.5 Funding.....	35
3.6 Industry linkage.....	35
3.7 Support from Institutes.....	36
3.8 Support from Employers	37

Chapter 4: Readiness	39
4.1 Current Skills.....	39
4.2 Future Skills	41
4.3 Challenges.....	42
4.4 Current Initiatives	44
4.5 Research/survey done on Demand & Supply.....	45
4.6 Strategic Planning	48
4.7 Stake holder feedback	49
Chapter 5: Conclusion	52
5.1 Key Questions.....	52
5.2 Summary of findings.....	52
5.3 Contributions to Knowledge	54
5.4 Implications.....	54
5.5 Limitations.....	56
5.6 Future Scope.....	57
5.7 SWOT Analysis.....	58
APPENDIX A	62
APPENDIX B	65
REFERENCES	68

LIST OF FIGURES

1.1	Conceptual framework of the research	15
1.2	Elements of an industry 4.0 working environment	16
1.3	Chronology of the industrial revolution	17
2.1	Needs of soft skills chart	20
2.2	Soft skills priority	22
3.1	Student's participation in co- curricular activities	36
3.2	Activities supported by the polytechnic institute	37
3.3	Workplace responsibilities of TVET graduates	37
4.1	Current skill level of TVET students	39
4.2	Current skill level of TVET graduates.....	40
4.3	Skills areas polytechnic graduates need to improve	41
4.4	Skills for the future	42
4.5	Challenges faced by the TVET graduate in the workplace	43
4.6	Percentage of skills in Diploma Engineering (Curriculum, 2022)	44
4.7	Current status of the Diploma graduates	47
4.8	Employment types of the Diploma graduates	48

LIST OF TABLES

1.1	Sample size & Technique	13
3.1	Response of students in activities along with academic course	36
4.1	Constrains in achieving soft skills.....	43

Acronyms and Abbreviation

IR4.0	Industrial Revolution 4.0
TMED	Technical and Madrasah Education Division
DTE	Directorate of Technical Education
BTEB	Bangladesh Technical Education Board
BNQF	Bangladesh National Qualifications Framework
TVET	Technical and Vocational Education and Training
NTVQF	National Technical Vocational Qualification Framework
NSDP	National Skill Development Policy
A2i	Aspire to Innovate Project
FGD	Focus Group Discussion
KII	Key Informant Interview

Chapter 1: Introduction

Presently Bangladesh is a youth-dependent country, which has the advantage of Demographic Dividend. Bangladesh has been continuously moving towards progress for the past decade. We have the possibility of becoming developing country by 2041. Bangladesh is playing a leading role in achieving sustainable development goals. To survive as a developing country with skills and to realize a developed Bangladesh in 2041, it is necessary to create sector-wise skilled workers and managers in our country.

Unfortunately, employer's feedback in many occasions shows that our Technical Education and Vocational and Training (TVET) graduates' productivity and efficiency fall short of what is desired from them. This is affecting proper placement and decent job facilities of the TVET graduates. One major reason for this may be lack of soft skills.

Also the rise of Industrial Revolution 4.0 (IR4), soft skills like communication skills, emotional intelligence, creativity, empathy, problem-solving, and workplace safety are more important than ever. The World Economic Forum has identified the top10 skills required in the future which is mostly soft skills (Future of Jobs Report. 20...).

TVET has been proven globally as the most effective tool for increasing employment and poverty reduction. Technical education is one of the priority sectors of the present Government of Bangladesh. According to the National Education Policy, 2010 objectives of technical and vocational education are as follows: (i) rapid expansion of quality and skilled manpower at various levels in various fields including information technology, taking into account the needs of the country and abroad, (ii) Creating opportunities for economic development and increasing the dignity of labor. Rapid generation of skilled manpower through education and (iii) Creation of massive employment opportunities through export of skilled manpower and increase the country's earnings in foreign exchange.

1.1 Problem Statement:

The Fourth Industrial Revolution (4IR) is expected to change how we live, work, and communicate; It is also likely to change the things we value and the way we value them in the future. Presently, we can already see changing business models and employment trends. According to The World Economic Forum, an estimated 65% of kids enrolling in primary education today will end up working in jobs that haven't been created yet. Robotic technology, Internet of Things (IoT), artificial intelligence (AI), analytical data, image processing, software, mobile communication systems, three-dimensional (3D) printing, cyber security,

simulation, and digital system integration are the new components that will replace job roles and existing structures.

Bangladesh Technical Education Board (BTEB) is formulating a 4th Industrial Revolution based curriculum to prove its worth in line with the demands of the changing labor market. TVET system need to ensure that TVET graduates are well equipped not only with the requisite skills for the job market but also capable to meet the challenges of IR 4.0

At present, the production and service sector of Bangladesh has an average demand of about 10 lakh workers every year. (BIDS-SEIP Skills gap analysis study, 2017)

Finding the challenges to adopt competent graduate supply from the TVET institutions (polytechnic) to meet the labor skill demand locally and globally is the main rational of the study.

1.2 Rationale of the study:

As a result of transitioning Bangladesh as a developing country, it will have to compete in various fields from 2026 onwards. At the same time, the challenges of the fourth industrial revolution and the new normal post-Covid-19 have to be met with various demands. Even with all the roles played by TVET in creating jobs it is still evident that unemployment rate is still high.

The following are some of the reasons for promoting soft skills in TVET:

- The leaps to new ideas that drive the need for new behaviors are happening globally. Whether it is a new application or a new way to learn, everyone have to adapt to the 'new' almost daily.
- Students need to be equipped with soft skills because employers in the workplace globally demand them.
- If Bangladesh wants to prosper and achieve the goals of SDG (Sustainable Development Goals), it must put emphasis on TVET student's efficiency, and productivity. TVET graduates must acquire knowledge and develop skills to cope with the demands of modern workplace.

1.3 General Objectives of the study:

The main objective of this research is to find gaps between level of soft skills of TVET graduates at present and what is expected from them to benefit them meeting the challenges of IR4. We tried to find the support & policies available in this regard and provide some recommendations to improve based upon the findings.

Specific objectives of the study:

The general objective can be segregated into following specific objectives:

- To identify the need for soft skills of the TVET graduates,
- To identify the institutional support to provide soft skills, and
- To identify the readiness of TVET graduates to meet the challenge of IR4.

1.4 Scope of the Research:

The scope of this study can encompass various aspects. There are some potential areas of investigation: soft skills assessment of TVET graduates, integration of soft skills into TVET curriculum, effective teaching and learning strategies for developing soft skills in TVET programs, collaborative efforts between TVET institutions and industries to foster the development of soft skills in graduates, conducting longitudinal studies to track the career trajectories of TVET graduates in IR 4.0 industries and best practices and case studies of TVET institutions or organizations that have successfully integrated soft skills development into their programs. Hence the principal scope of this study is to mitigate the gap between TVET institutions (polytechnic) graduate and industrial soft skill demand. This research will be a document to improve the quality of TVET graduates. This study will assist to take measures to incorporate soft skills in the traditional institutional delivery process.

Overall, the aim of this research to provide evidence-based insights, practical recommendations, and actionable strategies that can enhance the preparation and competitiveness of graduates in the evolving job market

1.5 Research Question:

The followings research questions are considered for our research:

- A. What is the need for soft skills of the TVET graduates?
- B. What kind of institutional support are TVET graduates receiving for their soft skill development?
- C. What is the level of readiness of TVET graduates to face the challenges of IR4?

1.6 Research Methodology:

This research is to identify the relativity of soft skill for TVET graduates to face the challenges of IR 4.0 in Bangladesh besides skill demand. It will also state the challenges for the students to become competent in their job market. For this research the study considered Diploma Engineers as TVET graduates.

By nature this research is a qualitative social survey. The study conducted in Dhaka Division for convenience. To ensure better participation the study selected equal six number of Government and private polytechnic institutes from five districts of Dhaka division- Dhaka, Faridpur, Tangail, Kishoreganj and Narsingdi.

For primary data collection, the study gathered feedback form both current students and passed out graduates of the total twelve selected polytechnic institutes through survey questionnaires. FGDs and KIIs were done with Principals, employers, industry representatives and representatives of the concern agencies including DTE and BTEB.

For secondary data collection this study reviewed various national policies, Diploma engineering curriculum, syllabus, course structure, related journals and articles.

Target Population & Sampling:

This study chosen Convenient Sampling as our Sampling technique. Focus group discussion with different industries were conducted. For data collection three technology from each polytechnic institute were considered. Three students and six passed out graduates of each technology from each institute were targeted for survey. Civil, Electrical, Computer science, Electronics, Food, Refrigeration & Air Conditioning, Mechanical, Power and Textile Technologies were considered as different disciplines of diploma engineering.

Table 1.1: Sample size & Technique

Data Source	Sample Size	Sampling Technique	Tools Used
Diploma students	109	Conveniently	Survey questionnaires
Diploma graduates	196	Snowball	Survey questionnaires
Polytechnic Institute faculty	60	Conveniently	FGD
Head of polytechnic institute	12	Conveniently	KII
Employers	6	Conveniently	KII
Industry Representatives	30	Conveniently	FGD
BTEB Representatives	5	Conveniently	FGD
Officials of DTE	10	Conveniently	FGD

Tools of Data collection: We have used Survey questionnaires, focus group discussion (FGD) and Key Informative interview (KII) were conducted as data collection tools.

Separate survey questionnaires were developed for collecting data from the current students and graduates. Each questionnaire contains three sections.

First section gives the consent and introductory information of the population like name, gender, status etc. Second section contains the need assessment for soft skills, support & challenges and intuitional gaps. The last section will explain the solution of the problems that sampled population has mentioned in the second section. For collecting data from graduates, a Google form containing the survey questionnaire were developed. Sample survey questions are attached with this report.

The study organized FGD with Faculties of polytechnic institutes, representatives of different industries, related personal of Bangladesh Technical Education Board (BTEB) and Directorate of Technical education (DTE). KIIs were conducted with officials of DTE, BTEB and employers.

Method of Data Analysis:

SPSS (Statistical Packages for Social Scientist) method is applied for data analysis of this study. Analyzing through SPSS will help to know the rank of challenges to acquire soft skills besides competencies for TVET students. Findings will be presented in tabular form. Different types of chart or bar diagram can be used to present the analysis.

1.7 Conceptual Framework of the Research:

This is a social qualitative research conducted with an objective to find the Soft skills gap and readiness of the TVET graduates to meet challenge of 4IR. By analyzing the subject, the research considered three dimensions - soft skills need, existing supports and readiness of TVET graduates with respect to the challenge of 4IR.

To address the problem, the study has gone through both primary and secondary data source. The Polytechnic graduates, students, faculties, Principals, employers, industry representatives and representatives of the concern agencies including DTE and BTEB were considered as primary data source. For secondary data source Diploma in Engineering curriculum, course structure, different national policy papers and related research and survey papers were reviewed.

The conceptual framework was developed as shown in Figure 1.1 to begin the study. Some related literatures were reviewed to gather initial knowledge. Data collection tools for conducting survey, FGD and KIIs were designed. Separate questionnaire was designed for current students and graduates survey. Different FGD checklist were prepared for different stakeholders from DTE, BTEB, polytechnic teachers and industry representatives.

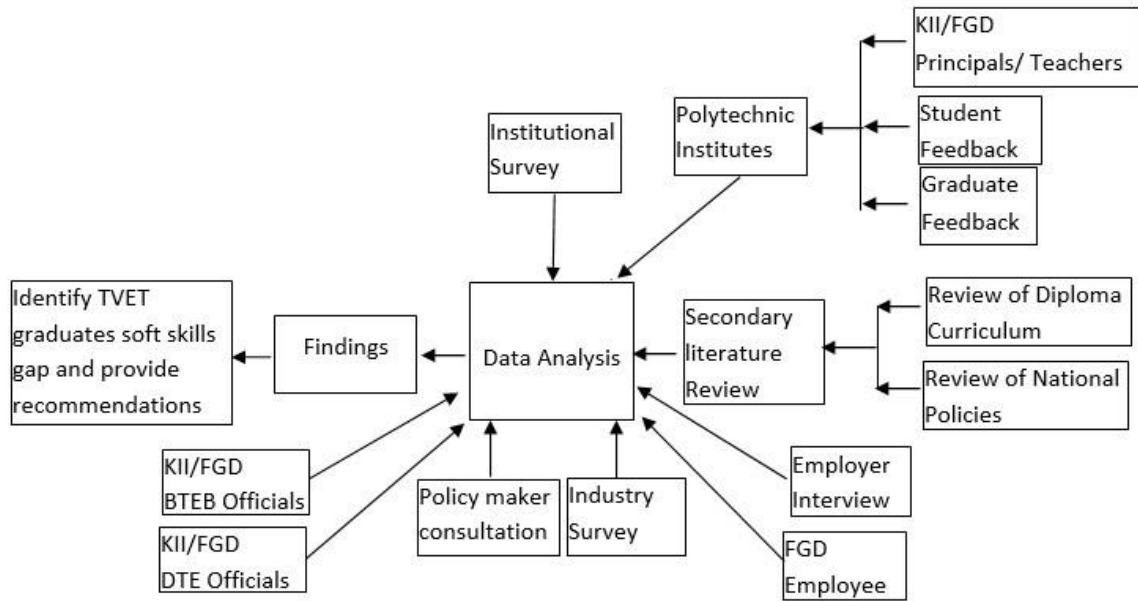


Figure 1.1: Conceptual framework of the research

Different polytechnic institutes were visited physically to collect the student feedback and to conduct the FGDs with the faculties & Principals. For collecting the graduate feedback, we took help of Google form to reach them. The passed out graduates were tracked with the help of the respective head of the departments using social media and other communication Medias.

Some industries were visited to get their feedback and conducted online zoom meetings to conduct FGD with BTEB & DTE officials. KIIs were done face to face with the high officials and employers.

After the data collection, the data was posted into SPSS software for statistical analysis.

Hard Skills and Soft Skills:

There are two distinct-yet-interrelated types of skills embedded in human capital that are key for the success of any given labor market, namely: hard skills and soft skills (Balcar, 2016). Hard skills, also known as technical skills (Shmatko and Volkova, 2020), refer to specific knowledge related to practical subjects based on scientific principles and capabilities to perform a particular job (Cimatti, 2016; PwC EU Services, 2020).

In contrast, soft skills as a term can overlap or be used interchangeably with other similar concepts, such as nontechnical skills, non-cognitive skills, socio-emotional skills, transversal competences, social competences, and life skills (Calero López and Rodríguez-López, 2020; Cinque et al., 2021). For example, Elfadil and Ibrahim (2022) state that “soft skills are non-technical abilities that

enable us to maintain self-control and have positive interactions with others.” Therefore, soft skills are learnt behaviors based on individual’s predispositions that can be acquired from psychological traits, preferences, experience, and background, which makes their development slower and more complex than hard skills (Balcar, 2016).

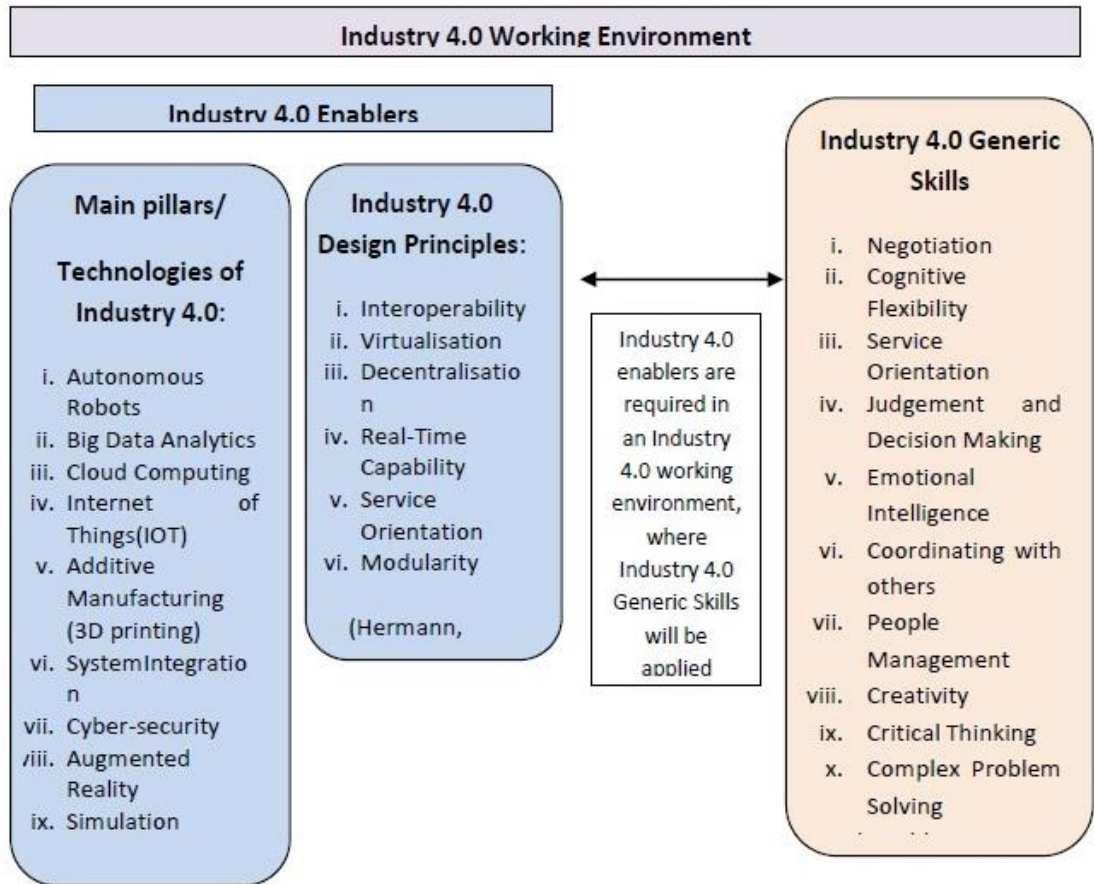


Figure 1.2: Elements of an industry 4.0 working environment

According to the World Economic Forum report, the future Jobs will need 10 skills for the fourth industrial revolution; complex problem solving,, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgment and decision making, service orientation, negotiation and cognitive flexibility.

Industrial Revolution 4.0:

The Industrial Revolution was the transition from creating goods by hand to using machines. The first industrial revolution gave us the steam engine, second industrial revolution brought electricity & mass production and third industrial revolution gifted rise of digital technology. Each of these three

advancements transformed our modern society. Industry 4.0 is based on ICT & automation. It is revolutionizing the way companies manufacture, improve and distribute their products.

Manufacturers are integrating new technologies, including robotics, internet of things (IoT), cloud computing and data analytics, and artificial intelligence and machine learning into their production facilities and throughout their operations. Introduction of Industry 4.0 has enabled the companies to use more complex, worldwide supply chains and data networks in their operations.

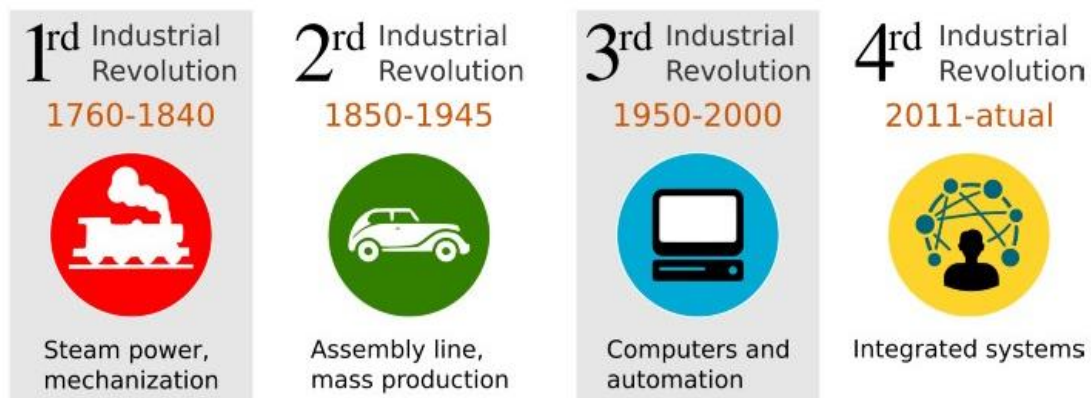


Figure 1.3: Chronology of the industrial revolution, Source: [Cherri \(2018\)](#)

These technologies can be used in various fields including traffic management, product supply, medicine, industry, banking, agriculture, education. A large number of current jobs in the world will be lost by 2030 due to automation technology. At the same time, scope of technology based new jobs will be created. Naturally, labor-intensive economies like ours will be at risk. So we need to focus on future skills.

Technical and Vocational Education and Training (TVET): TVET means the kind of education, training and skills development that is related to technology, practical subjects and livelihoods. Practical knowledge, skills and understanding about different occupations can be acquired through TVET. To ensure employment short-medium-long term education- hands-on training is provided to the TVET students.

Directorate of Technical Education (DTE) was established in 1960 with the aim of creating skilled human resources through the expansion and improvement of technical education. The main functions of DTE are-Human resource management, conducting development activities, supervising academic activities and liaising with local and international organizations concerned with technical education.

The Bangladesh Technical Education Board (BTEB) was established in 1967 to manage, supervise, regulate and develop the TVET institutes, conduct examinations, regulate and award certificates. BTEB is formulating a 4th Industrial-Revolution-based curriculum to prove its worth in line with the demands of the changing labor market. According to the curriculum prepared by BTEB there are 4 levels of TVET are - 1. Short course, 2. Certificate course 3. Diploma stage, and 4. Degree stage.

Courses in Diploma in Textiles, Diploma in Fisheries and Diploma in Agriculture Technology including Diploma in Engineering are running in various government and non-government institutions.

Diploma in Engineering: 4 year long Diploma in engineering courses under BTEB are offered by 50 Government polytechnic institutes and 511 private polytechnic institutes. A total of 34 technologies are taught in Diploma engineering, namely- Automobile, Power, Mechanical, Architecture and Interior Design, Computer science, Telecommunication, Ceramics, Chemical, Civil, Electrical, Electronics, Electro medical, Food, Environmental, Refrigeration & air Conditioning, Surveying, etc.

1.8 Outline of the report:

This report consist of total five chapters. The outline of the following chapters are given below.

Needs of soft skills: In the 2nd chapter of this report the necessity for soft skills is depicted in. Both primary and secondary sources of data was analyzed to find answer of our 1st research question. Core skills, need of employability skills, labor market factors, recruitment issues, challenges faced by the industry to introduce IR4 are some issues discussed here.

Supports of Soft skill: It reveal the existing institutional support for achieving soft skills in terms of scope in curriculum, initiatives taken by the institute and experience of TVET graduates.

Readiness: The readiness of the TVET graduates to cope with challenge of IR4 is discussed in this chapter. Here the survey results regarding the current level of soft skill of graduate's and expected level is presented; challenges the graduates face in actual workplace; the obstacle for achieving soft skill; ongoing activities; strategic planning; future plan for adopting soft skills; available survey on demand & supply.

Conclusion: This is the last chapter of this research report. Our findings, contribution to the knowledge, implications of this research, limitation and future scope for research is discussed here.

Chapter 2: Soft skills Needs

The Fourth Industrial Revolution (IR 4.0) has brought about significant changes in the way businesses operate, and the demands on the workforce have changed as well. With the advent of advanced technologies such as artificial intelligence, robotics, and the Internet of Things, the ability to master soft skills has become crucial for individuals to succeed in their careers. TVET play a crucial role in preparing individuals for the workforce. With the advent of the Fourth Industrial Revolution (IR 4.0), the demands on TVET graduates have changed. Today, more than ever, the ability to master soft skills is crucial for TVET graduates to succeed in their careers.

"Appropriate soft skills play an important role in a successful career as well as during social interactions in the society. Also Reviews These skills are highly sought after by employers recruiting fresh graduates " [1]. According to a report by the World Economic Forum (WEF)[2], the top ten skills required for success in the workplace in 2025 include soft skills such as problem-solving, critical thinking, creativity, leadership, and emotional intelligence. These skills are essential for adapting to changes brought about by IR 4.0, as automation and artificial intelligence have disrupted traditional jobs. The WEF report further highlights that, soft skills are becoming more critical than ever before, with the demand for skills such as active learning, resilience, stress tolerance, and flexibility set to increase by 2025. The report predicts that employers will need to invest in training their employees in these skills to remain competitive.

A survey by LinkedIn [3] found that the top three skills that employers are looking for in 2021 are creativity, persuasion, and collaboration, all of which are soft skills. The survey also found that soft skills such as communication, adaptability, and time management are highly valued by employers. The importance of soft skills in IR 4.0 is also reflected in the job market. A report by Burning Glass Technologies found that jobs that require soft skills such as communication, teamwork, and problem-solving have grown by 83% since 2010, while jobs that require only technical skills have grown by only 42%.

¹ Suryo Hartanto, Syahron Lubis and Fahmi Rizal, Need and analysis of soft skills for students of the mechanical engineering department of vocational high school, Received: 23 Aug. 2016, Revised: 13 Dec 2016, Accepted: 13 Jan. 2017.

² Future of Jobs report 2020, World Economic Forum. Available Online: <https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/>

Most In-Demand Skills: Learn the skills companies need most, LinkedIn 2023, February 20, 2023

³ LinkedIn 2023 Most In-Demand Skills: Learn the skills companies need most, February 20, 2023
<https://www.linkedin.com/business/learning/blog/top-skills-and-courses/most-in-demand-skills>

A study conducted by the International Labor Organization (ILO) [4] found that employers in industries such as manufacturing, construction, and transportation value soft skills as much as technical skills. The study highlights the importance of soft skills such as communication, teamwork, and problem-solving in the workplace. Another study by the Organization for Economic Cooperation and Development (OECD) [5] found that soft skills such as creativity, critical thinking, and social skills are becoming increasingly important for TVET graduates. The study highlights that the ability to adapt to changes and work collaboratively with others is essential in the digital economy. The importance of soft skills for TVET graduates is also reflected in the job market. A report by the Asia-Pacific Economic Cooperation (APEC) found that soft skills are becoming more important than technical skills in the workplace. The report further highlights that employers are looking for TVET graduates who possess skills such as communication, problem-solving, and teamwork.

Based on the analysis of our obtained data shown in the **Figure 2.1**, 94.3% sample said that soft skills are needed and only 3.8% sample said soft skills are not needed. On the other hand, 99.05% sample agreed that soft skills are important for technical jobs, only 0.95% did not agree with this statement. We also find, from 109 samples, 95.2% samples said that they need to enhance their soft skill.

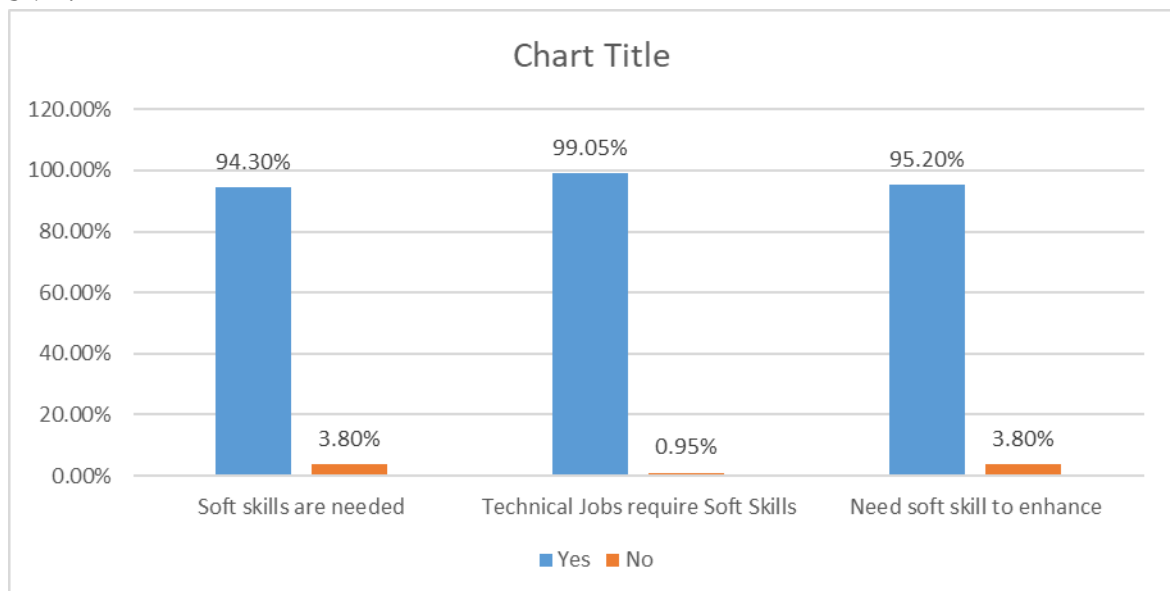


Figure 2.1 :Needs of soft skills chart

⁴ Soft skills improve the employability of youth and job seekers, ILO, News | Jakarta, Indonesia | 17 March 2021

https://www.ilo.org/jakarta/info/public/pr/WCMS_776501/lang--en/index.htm

⁵ John P. Martin, Skills for the 21st century: findings and policy lessons from the oecd survey of adult skills OECD education, Working Paper No. 166

There are some different opinions regarding this issue. As for example: A beyond survey of 954 job seekers august 6 to august 15, 2014 [6] shows that 69% of HR professionals say they evaluate a candidate's hard skills before looking at their soft skills. Besides this, many IT professionals often place emphasis on hard skills.

Though there are some different opinions, recent data supports the importance of soft skills in meeting the challenges of IR 4.0. As the demands of the workforce continue to change with the advent of advanced technologies, individuals must possess a set of soft skills that can enable them to adapt to changes, work collaboratively with others, and communicate effectively.

2.1 Core skills of TVET graduates:

TVET is an essential part of education that provides practical skills and knowledge to prepare students for the workforce. With the advent of the Fourth Industrial Revolution (IR 4.0), the job market is undergoing rapid changes that require a new set of skills from graduates. Therefore, it is important to identify the core skills needed by TVET graduates to meet the challenges of IR 4.0. This portion aims to analyze recent data on the core skills required by TVET graduates to succeed in the modern job market.

IR 4.0 is characterized by the fusion of technologies that blur the lines between physical, digital, and biological systems. The emergence of new technologies such as artificial intelligence, robotics, the Internet of Things (IoT), and 3D printing has led to new business models and job roles. This revolution is transforming the workplace and creating new opportunities and challenges for TVET graduates.

The Fourth Industrial Revolution (IR 4.0) is characterized by the integration of advanced technologies, such as artificial intelligence, the Internet of Things (IoT), robotics, and big data analysis into manufacturing and production processes. To meet the challenges of IR 4.0, TVET graduates need to develop a range of core skills, including: Digital literacy, Critical thinking, Creativity, Problem-solving, Technical skills, Adaptability, Communication, Collaboration etc.

In addition to these core skills, TVET graduates need to be committed to lifelong learning and continuous professional development to stay up-to-date with the latest trends and technologies in their field.

⁶ **Willing to know more about Soft Skills?**, Aayush Thapa (HR Assistant at AskMe Management),

A 2018 survey of more than 650 employers and over 1500 college students [7] the top skills today's employers are looking for in candidates include: listening skills (74%), attention to detail and attentiveness (70%), effective communication (69%), critical thinking (67%), interpersonal skills (65%), active learning/learning new skills (65%). Another Survey [8] Shows the soft skills employers looking for new hires communication skills (98%), positive attitude (97%), teamwork skills (92%), global perceptiveness (40%), ability to work virtually (29%) and years of experience (28%). Based on research from LinkedIn learning [9] the top five soft skills companies need most are creativity, persuasion, collaboration, adaptability and time management.

This research found that, the respondents prioritize the soft skills as shown in Figure 2.2.

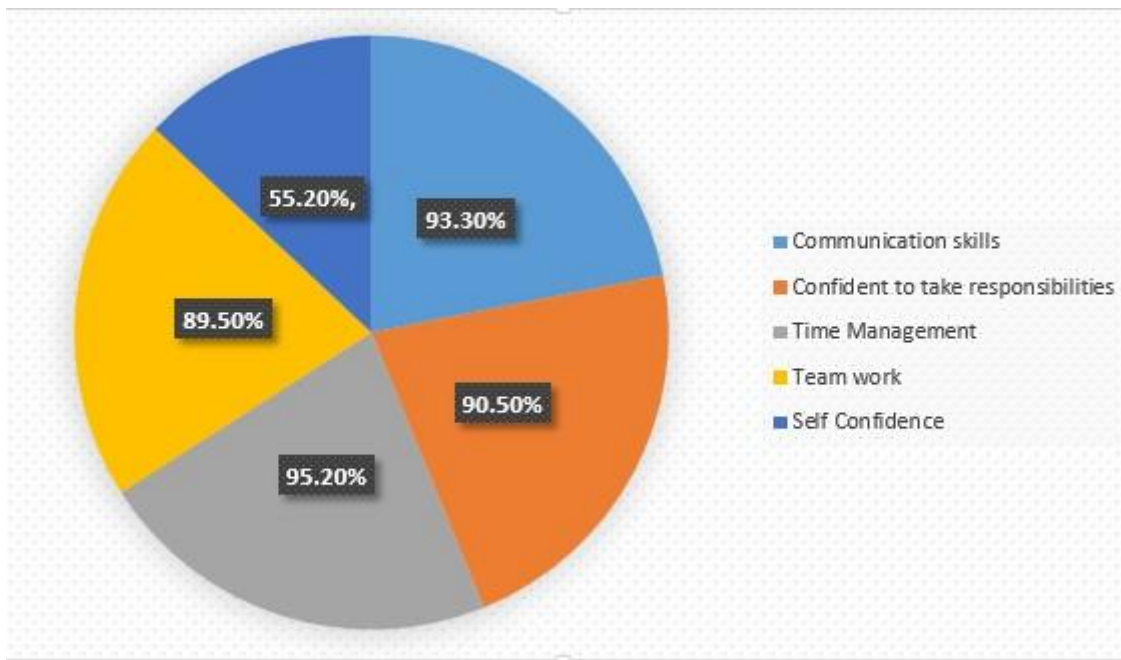


Figure 2.2: Soft skills priority

In conclusion, TVET graduates need a new set of core skills to succeed in the IR 4.0 job market. Digital literacy, problem-solving and critical thinking, creativity and innovation, interpersonal skills, and lifelong learning are essential skills for TVET graduates to meet the challenges of the Fourth Industrial Revolution. The education system must adapt to provide students with the skills

⁷ <http://www.prnewswire.com/news-releases/new-survey-demand-for-uniquely-human-skills-increases-even-as-technology-and-automation-replace-some-jobs-300779214.html>

⁸ <https://elearninginfographics.com/soft-skills-vs-hard-skills-infographic/>

⁹ <https://europeansting.com/2019/01/16/these-are-the-10-most-in-demand-skills-of-2019-according-to-linkedin/>

and knowledge needed to succeed in the modern job market. The findings of this research paper can guide policymakers, educators, and employers in designing training programs that equip TVET graduates with the necessary skills to thrive in the IR 4.0 era.

2.2 Needs for Employability Skills

The Fourth Industrial Revolution (IR 4.0) has transformed the way work is done. The current job rules for TVET graduates may not adequately prepare them for the challenges of IR 4.0. To address this issue, job rules for TVET graduates may need to be updated to reflect the changing technological landscape. This could include incorporating training in areas such as automation, data analytics, and cyber security into existing TVET programs. Additionally, employers may need to re-evaluate their job requirements to ensure that they are attracting and retaining qualified workers who possess the necessary skills for IR 4.0. Furthermore, there may also be a need for greater collaboration between TVET institutions, industry associations, and government bodies to identify emerging trends and prioritize the development of relevant skills. This could include initiatives such as apprenticeships, work-integrated learning programs, and industry-academic partnerships. Overall, job rule changes for TVET graduates will be crucial in ensuring that they are equipped with the skills and knowledge required to meet the demands of IR 4.0. This will not only benefit individual graduates but also help to drive economic growth and innovation.

TVET graduates need to develop a growth mindset and a willingness to learn new things. They need to embrace the idea of lifelong learning and be open to new ideas and technologies. The changes brought about by IR 4.0 require a shift in mindset for TVET graduates. A growth mindset is essential for success in the modern workplace. Individuals with a growth mindset believe that their abilities can be developed through hard work, dedication, and persistence [10]. This mindset enables individuals to embrace challenges, learn from failure, and seek out opportunities for growth and development.

TVET graduates need to acquire new skills to operate and maintain advanced manufacturing and production technologies, such as robotics, automation, and big data analytics. They need to develop skills in areas such as computer programming, data analysis, and digital design.

TVET graduates need to be able to re skill themselves to work with new technologies, tools, and processes. For example, they may need to learn how to program a robot or use a new software application.

The World Economic Forum (WEF) reports [11] that by 2025, 85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labor between humans, machines, and algorithms. This shift in the job market highlights the need for individuals to up skill and deskill to remain competitive. The WEF report also identifies the top 10 skills that will be in demand in the job market by 2025. The list includes critical thinking and analysis, problem-solving, creativity, leadership and social influence, technology use and monitoring, resilience, stress tolerance and flexibility, emotional intelligence, reasoning, and complex problem-solving. These skills require individuals to up skill and re skill regularly to keep up with the rapidly changing job market. A survey by **LinkedIn (2020)** found that 69% of professionals believe that skills will become more important than degrees in the job market. The survey also found that professionals who up skilled and re skilled were more likely to find new job opportunities and earn higher salaries than those who did not. In Malaysia, a survey by the **Department of Statistics (2021)** found that 62.7% of employed individuals aged 15-64 had engaged in some form of training or education in the past 12 months. The most common forms of training were job-related training (41.3%), computer skills training (33.4%), and management and leadership skills training (25.8%). The survey highlights the importance of up skilling and re skilling in response to the changes brought about by IR 4.0. From another survey by talent lms [12] described that, 42% of companies stepped up their up skilling/re skilling efforts after the corona virus outbreak. 42% of employees have pursued training on their own after the corona virus outbreak. 68% of companies invested in re-skilling/up-skilling training to handle changes within the organization and another 65% to train employees on new technologies. 50% of employers target both hard and soft skills through their up skilling/re skilling initiative. Companies believe that employees are lacking communication/collaboration, leadership, and proactive thinking skills. 91% of companies and 81% of employees say up skilling/re skilling training has boosted productivity at work. 62% of employees hoped that re skilling and up skilling training would positively affect their job level and/or salary. However, only 33% and 35%, respectively say there's been a significant change in compensation and growth within the company. 74% of employees think their managers need re skilling and up skilling training. 66% of employees ranked the joy of learning new things and developing new skills as the

¹¹ <https://www.weforum.org/reports/the-future-of-jobs-report-2020/in-full/infographics-e4e69e4de7/>
https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

¹² <https://www.talentlms.com/blog/reskilling-upskilling-training-statistics/>

top up skilling motivator. 80% of employees say that up skilling/re skilling training has boosted their confidence.

The study uses a qualitative approach, including a literature review and interviews with industry experts. The findings indicate that TVET graduates need to develop a growth mindset, up skill and re skill regularly to stay competitive, and be open to changing job roles.

2.3 Changes of Equipment and Tools:

The Fourth Industrial Revolution (IR 4.0) has brought about significant changes in the nature of work, with the increasing use of automation, artificial intelligence, and other digital technologies. These changes have led to increased productivity, efficiency, and competitiveness, but they also present challenges for institutes and industries. One of these challenges is updating their equipment and tools to keep up with the changes in technology. As a result, institutes and industries need to update their equipment and tools to remain competitive in the era of IR 4.0. In this section we are trying to identify the changes in equipment and tools at the institute or industry level necessary to meet the challenges of IR 4.0 based on recent data.

The study utilized both primary and secondary sources of data to gather information on the changes in equipment and tools at the institute or industry level. Primary data was collected through interviews with managers and engineers from various institutes and industries. The interviews focused on the changes in equipment and tools, the benefits of these changes, and the challenges in implementing them. Secondary data was collected through literature review of recent studies and reports on the changes in equipment and tools in the era of IR 4.0.

The findings of the study show that institutes and industries need to update their equipment and tools to keep up with the changes in technology. This includes adopting new technologies such as robotics, 3D printing, and the Internet of Things (IoT) to increase efficiency and productivity. Additionally, institutes and industries need to invest in cyber security measures to protect their equipment and tools from cyber threats.

The benefits of these changes are numerous, including increased productivity, efficiency, and competitiveness. For example, robotics and automation can perform repetitive and dangerous tasks more accurately and quickly than humans, leading to a safer and more efficient workplace. 3D printing allows for faster prototyping and customization of products, reducing time to market and increasing customer satisfaction. IoT technology can improve supply

chain management and asset tracking, leading to more efficient inventory management.

However, there are also challenges in implementing these changes. One major challenge is the cost of adopting new technologies, which can be high. Additionally, there may be a lack of skilled workers who can operate and maintain these new technologies, leading to a need for up skilling and re skilling of the workforce. There may also be resistance to change from employees who are accustomed to traditional ways of working.

In conclusion, institutes and industries need to update their equipment and tools to keep up with the changes in technology brought about by IR 4.0. The findings of the study show that adopting new technologies such as robotics, 3D printing, and IoT can lead to increased productivity, efficiency, and competitiveness. However, there are also challenges in implementing these changes, including the cost of adoption, lack of skilled workers, and resistance to change. As such, institutes and industries should prioritize these changes in their strategic planning and work to overcome these challenges to remain competitive in the era of IR 4.0.

2.4 Vacancy characteristics and Recruitment Factors:

The 4IR has led to new challenges in recruitment and retention of employees for institutes and industries. In this part we will try to identify the vacancy characteristics and recruitment factors at the institute or industry level that are necessary to meet the challenges of IR 4.0 based on recent data.

We tried to collect the data through the literature review of recent studies and reports on vacancy characteristics and recruitment factors, interviews with managers and human resources personnel from various institutes and industries. The interviews focused on the characteristics of job vacancies, the factors affecting recruitment, and the strategies used to attract and retain employees.

With the increasing use of automation and digital technologies, many jobs require new skills and competencies. As such, institutes and industries need to provide opportunities for training and development to help employees acquire the necessary skills to adapt to the changes in their jobs.

Another important factor affecting recruitment is the availability of remote work opportunities. The COVID-19 pandemic has accelerated the adoption of remote work, and many employees now prefer the flexibility and work-life balance that comes with it. Institutes and industries that offer remote work opportunities are more attractive to job seekers, especially those with families or other commitments.

Creating a positive work culture is also essential for attracting and retaining employees in the era of IR 4.0. This includes fostering a sense of community, promoting work-life balance, and providing opportunities for career growth and advancement. Employees who feel valued and supported are more likely to remain with an organization, leading to lower turnover rates and higher job satisfaction.

In conclusion, institutes and industries need to focus on up skilling and re skilling their workforce, providing opportunities for remote work, and creating a positive work culture to meet the challenges of IR 4.0. Institutes and industries should prioritize these factors in their recruitment and retention strategies to ensure that they have the skilled and motivated workforce necessary to succeed in the era of IR 4.0.

2.5 Introducing of 4IR into Industries of Bangladesh:

In recent years, Bangladesh, being a developing country, has been gradually introducing 4IR technologies into various sectors. The government has set up various initiatives to promote and facilitate the adoption of 4IR technologies. For instance, the government has established an Information and Communication Technology (ICT) division to provide training and support for the use of ICT and related technologies. The government has also set up the Bangladesh Hi-Tech Park Authority (BHTPA), which provides incentives for firms to invest in and use 4IR technologies. The introduction of 4IR technologies into industries has the potential to significantly improve productivity and competitiveness. The use of artificial intelligence and big data analytics, for instance, can help firms make better decisions and optimize their operations. The use of IoT can enable better tracking of goods and services, while robotics can help automate processes and reduce the need for human labor.

To understand the extent to which 4IR has been introduced into industries in Bangladesh, a survey [13] was conducted among firms in various sectors. The survey aimed to understand the current use of 4IR technologies and the barriers that firms face in adopting these technologies. The survey was conducted online, and a total of 100 firms from various sectors, including manufacturing, healthcare, and agriculture, participated in the survey.

¹³ Maruf Hasan Rumi¹, Md. Harunur Rashid^{2*}, Niaz Makhdum¹, and Nesur Uddin Nahid¹, Fourth Industrial Revolution in Bangladesh: Prospects and Challenges

https://www.researchgate.net/publication/344444672_Fourth_Industrial_Revolution_in_Bangladesh_Prospects_and_Challenges

The survey results indicate that the adoption of 4IR technologies is still in its early stages in Bangladesh. Only a small percentage of firms reported using artificial intelligence, big data analytics, IoT, or robotics. However, many firms expressed interest in adopting these technologies in the future. The primary barriers to adoption were found to be a lack of skilled labor and limited access to financing. The government can play a crucial role in addressing these barriers by providing training and incentives for firms to invest in these technologies. In conclusion, the introduction of 4IR technologies in Bangladesh has the potential to transform the industries and improve the country's overall economic performance. However, the adoption of these technologies is still in its early stages, and several challenges need to be addressed. The government, private sector, and academia need to work together to address these challenges and promote the adoption of 4IR technologies in Bangladesh.

2.6 Labor Market Factors of Bangladesh:

The Fourth Industrial Revolution (IR 4.0) is rapidly transforming the global labor market, and Bangladesh is no exception. The country faces significant challenges in adapting to the changing nature of work and employment, including the displacement of workers due to automation, a shortage of skilled labor, and the need for retraining and up skilling. In this section we tried to understand the current state of the labor market in Bangladesh and identify the challenges and opportunities presented by IR 4.0.

According to the Bangladesh Bureau of Statistics, the unemployment rate in the country was 4.1% in 2020. However, this figure does not take into account the large number of workers in the informal sector, where working conditions are often poor, wages are low, and job security is uncertain. The labor force participation rate in Bangladesh is also low, particularly among women, with only 36% of women participating in the labor force compared to 80% of men.

IR 4.0 presents significant challenges to the labor market in Bangladesh, including the displacement of workers due to automation, a shortage of skilled labor, and the need for retraining and up skilling. However, IR 4.0 also presents significant opportunities, including the potential for increased productivity and competitiveness, new job opportunities in the tech sector, and the ability to leverage the country's large pool of young, tech-savvy workers.

To meet these challenges and leverage these opportunities, policymakers, businesses, and workers must take proactive measures to adapt to the changing nature of work and employment. By investing in training and up skilling programs, promoting the development of new skills, and supporting the development of local tech ecosystems, Bangladesh can position itself as a leader in the digital economy and ensure that its workers are well-equipped to thrive in the Fourth Industrial Revolution.

2.7 Challenges to incorporate IR 4.0

IR 4.0 represents a new era of technological advancement that is disrupting traditional industries and transforming the way businesses operate. The adoption of IR 4.0 technologies has the potential to significantly increase productivity, efficiency, and competitiveness. However, Bangladesh faces significant challenges in adopting IR 4.0 technologies, including a lack of infrastructure, low levels of digital literacy, and a shortage of skilled labor.

One of the most significant challenges facing the industry in Bangladesh is a lack of infrastructure. This includes inadequate access to electricity, limited internet connectivity, and a shortage of advanced manufacturing facilities. These infrastructure challenges make it difficult for businesses to adopt IR 4.0 technologies, as they require a reliable and stable infrastructure to operate effectively.

Another challenge facing the industry in Bangladesh is low levels of digital literacy among the workforce. Many workers lack the necessary skills to operate and maintain IR 4.0 technologies, such as artificial intelligence and robotics. This presents a significant obstacle to the adoption of these technologies and limits their potential impact on productivity and competitiveness.

The shortage of skilled labor is another significant challenge facing the industry in Bangladesh. Many businesses struggle to find workers with the necessary skills to operate and maintain IR 4.0 technologies. This shortage of skilled labor is particularly acute in the technology sector, where demand for highly skilled workers is high.

To overcome these challenges, policymakers and businesses must take proactive measures to improve infrastructure, invest in digital literacy, and develop skilled labor. By doing so, Bangladesh can position itself as a leader in the digital economy and reap the benefits of the Fourth Industrial Revolution.

In Summary, the Fourth Industrial Revolution (IR 4.0) is rapidly transforming the global labor market. Bangladesh faces significant challenges in adopting IR 4.0 technologies, including a lack of infrastructure, low levels of digital literacy, and a shortage of skilled labor. The findings suggest that TVET institutions need to focus on developing soft skills in addition to technical skills to produce well-rounded graduates. TVET graduates must learn how to effectively communicate, collaborate, think critically, and be adaptable in the changing work environment. Developing these skills will not only enhance their employability but also contribute to their personal and professional growth.

Chapter: Supports of soft skills

This chapter discusses the supports of soft skills. Soft skills are those non-technical competencies connected to one's personality, attitude, ability, and motivation to interact effectively with others (Cooke & Zaby, 2015; Stewart et al., 2016). Qualitative data was collected through in-depth interviews. There are many Private and Government polytechnic Institutes in Bangladesh. Every year a huge number of Diploma graduates pass out from those institutes.

The ability to interact, communicate and work together with a range of people, such as co-workers, clients and supervisors, is what makes up soft skills. These key skills that will help candidates face the wave of the fourth industrial revolution. Bangladesh is now increasingly investing in vocational education, but a glaring gap in this is the lack of focus on soft skills. Soft skills usually directly complement hard or technical skills. One of the main reasons why Bangladeshi fresh graduates have difficulty in getting jobs is the lack of soft skills they possess. Workshops and training for young professionals are usually last minute efforts in shaping individuals into becoming employable while soft skills usually need years to develop. This study is aimed to identify critical issues of soft skills development among TVET graduates through teaching in TVET institutes and the existing supports.

3.1 Policy for 4IR:

4IR is largely about digital technologies and how these technologies can be managed. A study found that automation will substitute 800 million unskilled workers worldwide by 2030 (World Economic Forum, 2020). A study conducted by A2i in Bangladesh (Future Skills, 2019) shows that almost two in five jobs face the risk of automation along with technological change in manufacturing and services, less educated women workers are more likely to be impacted, deeper sector based understanding and internal assessments will enable enterprises to benefit from automation, government and education and training providers have to be prepared for automation impacts. There need to be proper policies to govern the use and development of emerging technologies and pursue their benefits. Regrettably, Bangladesh is not in a position to formulate policies fast and use it for the future betterment in a short time. It takes years to formulate or revise policies. For the better responses to the challenges of 4IR, we will need policies that are developed to address the challenges that come with 4IR. The good news is that some policies have already been formulated, and some are being formulated. Bangladesh has adopted six strategies to foster the economy towards the fourth industrial revolution. The strategies cover areas including artificial

Intelligence, robotics, Internet of things (IoT), blockchain, microprocessors and cyber security. Still there is no policy regarding TVET in the context of 4IR. Respondents of the study during FGD and KII gave emphasis on establishing policy in this regard. From the analysis of the obtained data 144 graduates replied Yes to establishing a policy, 68 said No and 31 made no comments to facilitating improvement of soft skills.

3.2 Curriculum:

Charles M.M. Ondieki, Ndungu Kahihu, Sharleen Muthoni conducted a study named "Integration of soft skills Into The TVET curriculum in Kenya" published in 2019. The study explores failure of TVET institutions to provide life skills results in graduates who, even when they have the requisite technical skills, are not able to succeed at work or in developing their own business and lack the resilience to recover from inevitable setbacks. This has in turn led to employers who are usually deeply dissatisfied with the public TVET system. The objective of this research was to test the potential for integrating life skills curriculum in the public TVET system by introducing the module to a selected number of Vocational Training Centers in Kenya and assessing the impact on beneficiaries' learning and course completion outcomes against a chosen control group. Generally, there was a positive trend with the treatment group, which can be attributed to the life skills that had been offered to the students. The difference in proportion of change between the treatment and control groups was significant and the direction towards the predicted change indicated that the life skills training had a positive impact on the youth.

BTEB prescribes the courses of instruction and arranges for development of learning materials. Diploma engineering curriculum is well formed. The recently finalized curriculum is very well defined and effective. The course material in the diploma in engineering program is organized according to different technologies. The courses of each technology can be divided into two categories, technical subjects, and related subjects. This curriculum contains some courses that will help our students to develop soft skills besides hard skills. Recommendations often put pressure on developing countries to follow prescribed globalized curricula and educational directions (Mundy & Verger, 2015). There is a scope developing language and communication skills through courses like Bangla and English. There are also courses like economics, management, etc. For computer literacy computer office application is a completely practical course included in the curriculum. For professional development there is a course called innovation and entrepreneurship. Besides these, there are many co-curricular activities like, different national day celebrations, scout, English club, Debate club, Science club

etc. Bangladesh education Statistics, 2020 shows that the percentage of institutes with co- curricular activities is about 78.15%.

The total credit points allocated for the Diploma in Engineering are generally anticipated to be in the range of 150-160. About 10-15% for social skills, 15-17% for science and mathematics, 10-12% for related engineering, and 58-60% for core engineering subjects are allocated for each technology. 8th semester which is the final semester allocated for industrial attachment in industry and polytechnic campus. The students are assessed through mid-term exam, class test, quiz test, assignment, presentation and final exam for theory part. For the practical part students are assessed through practical experiment, report preparation and viva voce.

About industrial attachment feedback came from FGD that its scoring system can be brought online. Then it will be more effective and transparent. The teaching method is still traditional. Most of the participants said that the teaching method needs to be modernized. From the analysis of the data obtained, 86 running students said that their academic courses improve soft skills and 23 said no. Among graduates 95 said their academic courses match the requisite for 4IR and 68 said No, need to be modified. Some of the industrial experts said that Foundation courses can be included to provide knowledge about professional attitude. Frequent industry tours and classes with the industry experts will be very helpful. Officials from BTEB and DTE suggested the more effective application of the curriculum and strong monitoring.

According to UNESCO (2015), TVET is education, training and skill development involving a wide range of occupational fields, production, services and livelihoods. TVET as part of lifelong learning is for recipients to acquire awareness, knowledge, skills and attitudes necessary for occupations in various sectors of economic and social life. It is a job-oriented training that is designed to develop the appropriate knowledge, skills, attitude and understanding in all recipients.

3.3 Networking:

Institutional networking and internationalization is very important. Networking and internationalization develops competency, focusing on mobility, regional collaboration. The role of networking and internationalization in the context of TVET is very important for contributing to staff mobility, research, and technical and life skills development. Networking can change the TVET and unemployment scenario to a great extent. Through FGD and KII many respondents suggested formation of a national body to maintain a flawless networking at national and international level. Professional development of staff

means to upgrade all those skills required to execute a task of TVET staff in transferring knowledge, expanding networking and improving their competency in a particular area. It means that staff maintains, improves and broadens their knowledge and skills to develop their required competencies (Powar 2004).

3.4 Resources:

About available resources we get information from the Principal and Teachers through KII and FGD. Classrooms are available but still not sufficient and not all classrooms have multimedia and modern facilities. There is a shortage of teachers in the polytechnic Institutes. Government recruitment process for teacher vacancies is going on. In the meanwhile, some part time teachers are engaged by the institute authorities. Most of the part time teachers are not aware of the effects of the industrial revolution and the necessity of soft skills. For up-skilling the teachers' budgets have been allocated to the institutes for organizing in-house training. DTE has also taken steps for competency based occupational & pedagogical training for teachers through different projects.

Every institute needs to modernize its labs to meet the challenges of the fourth industrial revolution. The Directorate of Technical Education has taken initiatives for modernizing the lab facilities of the polytechnic institutes to address technological advancement of the fourth Industrial Revolution. Our graduate respondents expressed the need for quality textbooks and modern teaching techniques. BTEB has already taken measures for developing interactive text books for diploma technologies, which will help students to become proactive.

3.5 Funding:

A main focus in research on Public Private Partnerships (PPP) and TVET has been on logistics such as financing and infrastructure (Okoye & Chijioke 2013, Oviawe, 2018).

At present funding is provided for yearly cultural & sports competition, as well as National day celebration programs to the Polytechnic institutes. Institutes can organize debate competitions, essay competition, innovation fair, etc. and encourage students to participate. These programs will help students in developing soft skills.

Scouting activities are patronized in all the institutes. All the polytechnic institutes have established rover den and Rover Scout Leaders to operate scouting activities. Students who participate in rover scouting become disciplined and develop soft skills. In the 2022-23 financial year, total BDT-1,47,000,000/- (One hundred and forty-Seven core) has been allocated among 50 Government

Polytechnic Institutes under DTE for Lab/workshop modernization in response to the need for setting up IR4 responsive technologies. In the 2022-23 till April about 1900 teachers have been imparted pedagogy and other training. Also, the DTE has an allocation every financial year for in-house training of teachers. While there are training facilities for government institutions, training in private institutions is very inadequate.

Our respondents talked about direct funding for innovative project developments and experimental learning for the students to enhance their soft skills.

3.6 Industry Linkage:

The Directorate of Technical Education published their Annual Performance agreement which states that facilities and institutional capacity should be increased in order to spread quality technical education, skilled human resources with ethical values suitable for domestic and international labor markets should be created and every institute needs to modernize its labs to meet the challenges of the fourth industrial revolution.

TVET providers and industry can take forward the national economic growth by establishing linkage between them. The mutual understanding between the TVET providers and industries is strengthened through close collaboration and integration of resources aligned with the functional skills ecosystem. On one hand, a well-established Skills Training Provider is able to prepare a competent workforce; on the other hand, industries get skilled human resources resulting in decent employment and enhanced productivity. Besides, effective linkages can reduce the skills mismatches between skills supply and skills demand in the existing demand driven market. In addition, resilient and sustainable linkages among the TVET providers and industries have been persistently reinforced in the National Skill Development Policy (NSDP) 2020 to reap the advantages of the demographic dividend as well as to stay connected with the Fourth Industrial Revolution (4IR) and beyond. Further, National Skills Development Authority (NSDA), though dawdling, has taken several measures to strengthen the linkages among TVET providers and industries. However, through some proactive measures industry linkage with TVET providers could contribute to the accelerated growth in the Gross Domestic Product (GDP) as has been observed globally.

3.7 Support from Institutes:

Students get various assistance from the institute to develop their soft skills besides hard skills. The following tables show various data on assistance from the

institute for the students. From table 3.1 we have learned that many students participated in projects, group tasks and presentations, but not all of them.

Table 3.1: Response of students in activities along with academic course

Part of Academic Activity	Participate	Percentage
Term Projects/Assignments	77	70.6
Group Task	61	58
Give presentation	53	48.6

Figure 3.1 shows Student’s participation in co- curricular activities. From our respondent’s feedback, we have learned that not all the students are participating in co-curricular activities.

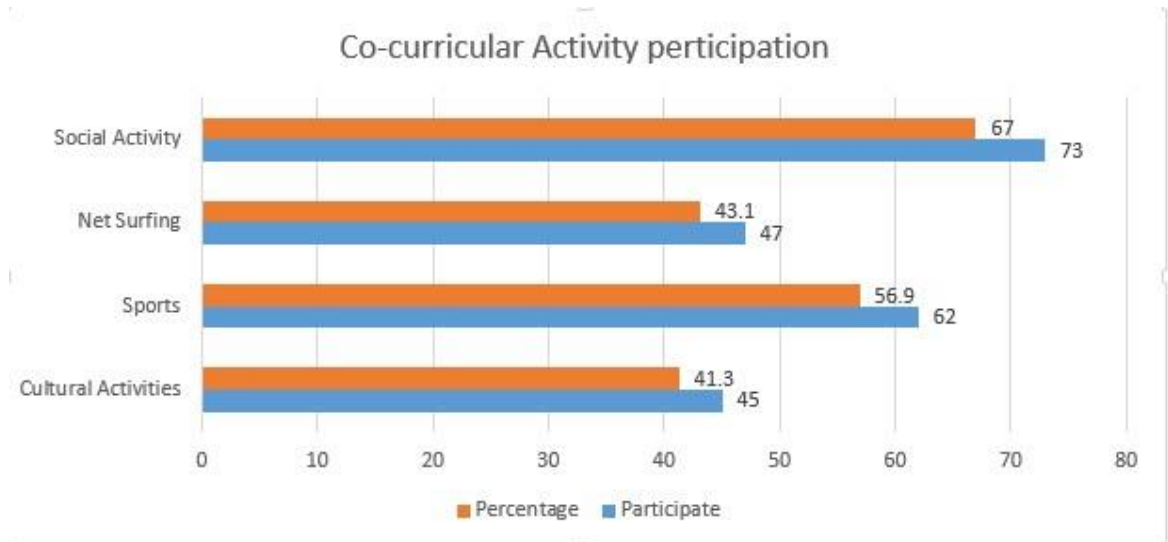


Figure 3.1: Student’s participation in co- curricular activities

Figure 3.2 illustrates the graduate’s response to the question about the supportive activities they got from their respective institutes during their study. It is seen that we can see the assistance is not reaching all the students.

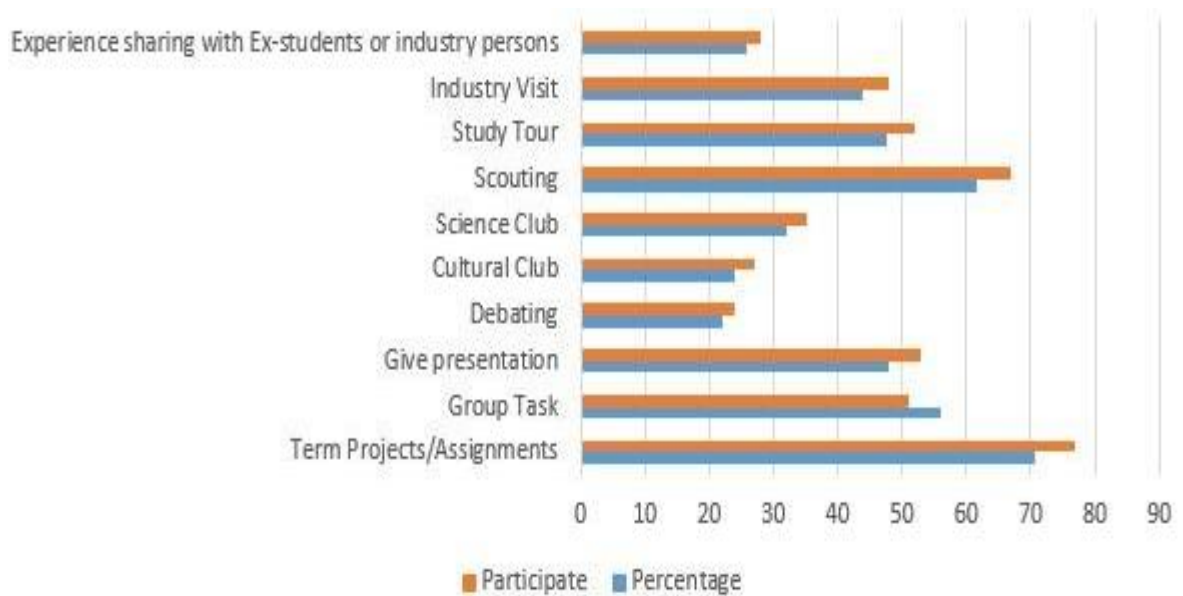


Figure 3.2: Activities supported by the polytechnic Institute

Institute should ensure assistance for all the students. Respondents said, job placement cell should not run by the teachers as additional responsibility. This responsibility should be given to a full time job placement officer.

3.8 Support from Employers:

TVET graduates gave their views on the facilities offered from employers, 106 of them said they got training after joining the job and 67 said they didn't get. The company has a policy of up-skilling and re-skilling for its employees 97 graduates said while 48 said no. In the field of higher education 97 graduates said available and another 46 said not available. The chart below shows the workplace responsibilities of TVET graduates. Usually they have to participate in group work, give feedback on problems, take suggestions and update projects and in this field soft skills are very important. During the FGD employers emphasized on a good foundation from the institute and training after joining the job.

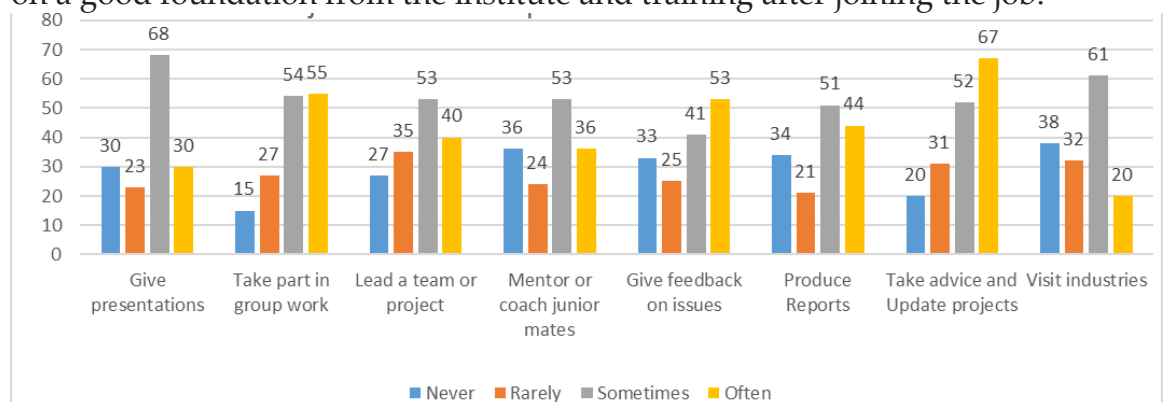


Figure 3.3: Workplace responsibilities of TVET graduates

The chart shown in Figure 3.3 the workplace responsibilities of the TVET graduates. Most commonly they have to take part in group work, give feedback on issues, take advice and update projects and in this regard soft skills are very important. During FGD the employers gave emphasis on a better foundation from the institute and training after joining the job.

In summary, 4IR is largely about digital technologies and how these technologies can be managed. Soft skills are very important in this era of 4IR. Curriculum and teaching methods should be modernized in order to improve soft skills among the TVET graduates.

Teachers should be provided more training on soft skill development among the students. Facilities and institutional capacity should be increased in order to spread quality technical education. Skilled human resources with ethical values suitable for domestic and international labor markets should be created and every institute needs to modernize its labs to meet the challenges of the fourth industrial revolution. In this purpose direct funding for support programs can play a very important role. TVET providers and industry are the two major allies that can take forward the national economic growth by establishing linkage between them. The mutual understanding between the TVET Providers and industries is strengthened through close collaboration and integration of resources. Institutional networking and internationalization is one of the institutional Key Performance Indicators (KPI). Students get various assistance from the institute to develop their soft skills besides hard skills.

Chapter 4: Readiness

This chapter reveals the readiness of graduate level, Institute/industry level and national level to meet the challenges of IR4. In this process, we assessed the current skill level of the TVET graduates, the skills required for the future, the ongoing activities to enhance soft skills, future plans for adopting soft skill, literature review on available survey/ research on demand & supply, strategic planning for incorporating soft skills and different stakeholder feedback.

4.1 Current Skills:

Wahida Akter conducted a survey ¹⁴ to represents the lacking of employability skills among business graduates of Bangladesh. She ranked them based on their frequency. By analyzing the questionnaires it is observed that there is a huge knowledge gap among recent business graduates about skill of cognitive flexibility, computer literacy. Teamwork and creative thinking and problems solving, 4% of business graduates do not know how to communicate effectively in a business climate.

Soft skills are becoming increasingly important for TVET graduates, as employers not only seek candidates with technical expertise but also with strong interpersonal skills like communication, creativity, problem solving and other managerial skills. To assess their achieved level of soft skills, the students were asked to rank and judge themselves according to own soft skill level. In this process, students judged their communication skills, negotiation leadership, empathy, time management, presentation skill, ability to work under pressure, and teamwork performance using a likert scale in the section 4 of the survey questionnaire.

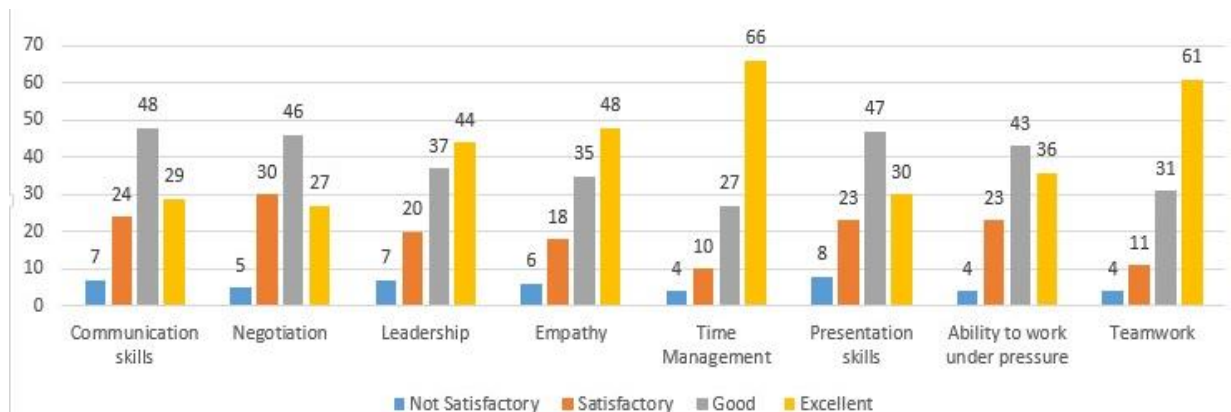


Figure 4.1: Current Skill level of TVET Students

¹⁴ Wahida Akhter

Figure 4.1 shows that the highest ranked skill is Time management and teamwork. The results also suggest that communication skills, negotiation, presentation skills and ability to work under pressure are the areas where students need to improve.

The passed out graduates were asked to rank their achieved skills on basis of communication skills, negotiation, self-confidence, leadership, situation handling, time management, machine operation, computer literacy, cyber security and safe use of social media. The graduates too ranked themselves using likert scale.

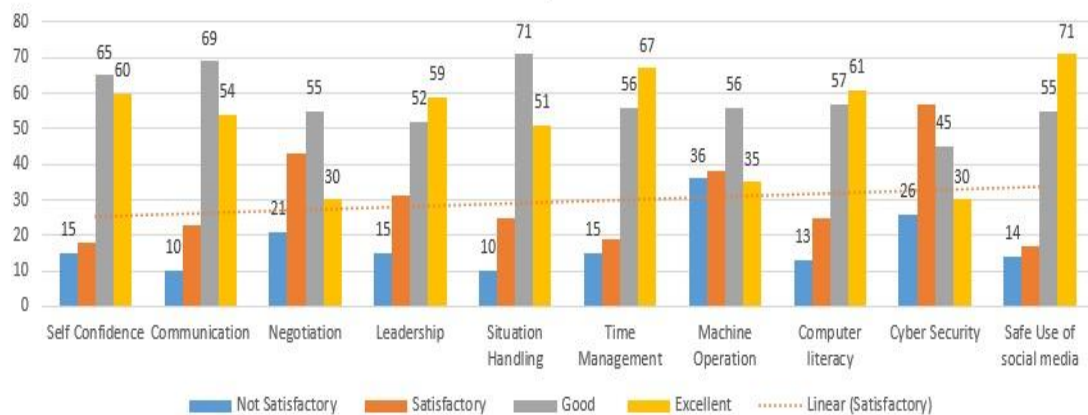


Figure 4.2: Skill level of TVET Graduates

The graduate’s self-assessment shown in figure 4.2 indicate that they are excellent in using the social media safely and Time management. They are good in situation handling, communication and self-confidence.

During the FGD with the industry representatives, the supervisors were asked to make comment on the current skill level of our TVET graduates. The supervisors stated that, in most cases TVET graduates are good in time management and sincerity. TVET graduates are generally motivated and obedient. But, their confidence level, communication skill, situation handling and skill on simple machine operation needs improvement.

The above discussion proves that the analysis of the results of the self-assessment carried out by the students and graduates are giving us appropriate indications.

As the results show that our pupil’s satisfactory level for negotiation, computer literacy, cyber security and machine operation are not up to the mark, these areas need to be focused. We should also take initiatives to flourish their leadership and communication skills.

4.2 Future Skills:

In a document designed to support VET providers’¹⁵ states that, Soft skills include all the qualities, skills and qualifications that enable both professional and personal success in addition to hard skills. They relate to personal competences, social skills and methodological competences necessary at the workplace.

Kamaruzaman¹⁶ mentioned in his paper “skills development and mastery are the most important elements to ensure that graduates are competitive in pursuing their career.”

Future of jobs report (2020)¹⁷ has ranked top 15 skills for 2025. The top ranked skills in the list are (1) analytical thinking and innovation, (2) active learning and learning strategies, (3) complex problem solving, (4) critical thinking and analysis, (5) creativity, originality and initiative, (6) leadership and social influence, (7) technology use, monitoring and control, (8) technology design and programming, (8) Emotional intelligence, (9) Resilience, stress tolerance and flexibility (10) Reasoning, problem solving and ideation.

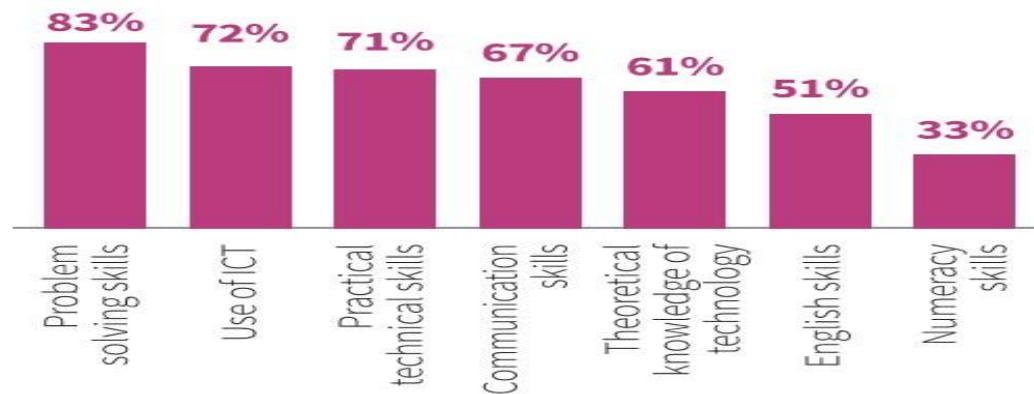


Figure 4.3: Skills areas polytechnic graduates need to improve employers' view

Source: world Bank tracking survey on Polytechnic Graduates (world bank)

World Bank’s skills survey report (March, 2018)¹⁸ shows that, critical thinking, problem solving, leadership, communication, work ethics, and team work are becoming essential and highly demanded by employers in Bangladesh. In the tracking survey from employers shows that, numeracy skills, English skills

¹⁵ SOFT SKILLS FRAMEWORK FOR THE VOCATIONAL EDUCATION & TRAINING, CO-CREATED BY MENTORTEC, ANESPO, BLICK, CECE, EFVET, PIT AND PIXEL, VET_GPS project

¹⁶ F. Mohd Kamaruzaman, R. Hamid, A.A. Mutalib, M.S. Rasul, COMPARISON OF ENGINEERING SKILLS WITH IR 4.0 SKILLS, *International Journal of Online and Biomedical Engineering (iJOE)* · June 2019

¹⁷ World Economic Forum, Future of jobs report, October 2020

¹⁸ BANGLADESH SKILLS FOR TOMORROW’S JOBS: PREPARING YOUTHS FOR A FAST-CHANGING ECONOMY, Education Global Practice The World Bank Group, March, 2018

of polytechnic graduates appear to be satisfactory and problem-solving skills and communication skills for workplace are area need to be developed.

In order to measure the future skills of our student respondents, we asked them to assess and rank their own skills considering, problem solving /situation handling, innovative idea, decision making health & workplace Safety, Simple machine operation, computer literacy and adaptability skills as the skills of future. Analysis of the findings of the survey questionnaire are presented in the f Figure 4.4.

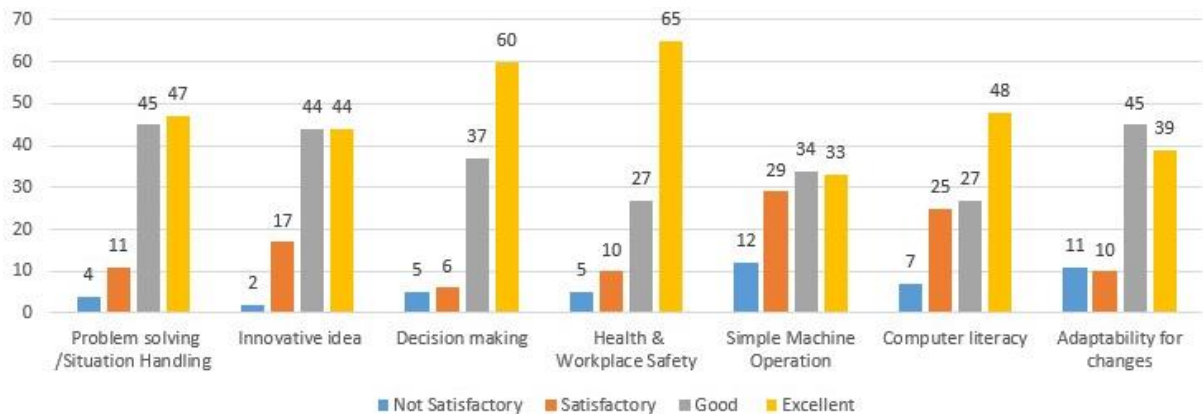


Figure 4.4: Skills for the future

The results show that the students are most confident about their health & workplace safety knowledge and decision making skill. But, they need to improve in the areas of simple machine operation, adaptability, innovative idea, problem solving skills and computer literacy.

4.3 Challenges:

According to Prof. Dr. Nick Van Dam (2017)¹⁹, many new technologies are disrupting the labor market. Advancement of technology and new business models are effecting existing and future jobs.

Similarly, according to a report of A2i 5.5 million people will lose their jobs in the next 10 years in Bangladesh due to changes caused by 4IR. To cope up with these changes, we need to prepare our future workforce with appropriate skills.

In our survey, TVET students were asked about the difficulties they face in achieving the soft skills. The summary results of their feedback given on the survey questionnaire are shown in the table 4.1

¹⁹ Prof. Dr. Nick Van Dam, 4tg Industrial Revolution & The Future of Jobs, 2017, Bookboon

Table 4.1: Constrains in achieving soft skills

No	Difficulties/ Constrains	Frequency
1	Lack of awareness	56
2	Lack of academic scope	48
3	Lack of teachers	45
4	Lack of institute initiatives	40

These results indicate that we need to increase the awareness among teachers, include soft skill enhancement activities in academic system. As other facts some of them mentioned scope of special programs and funding.

To understand the effects of fourth industrial revolution in the practical workplace, the graduates were asked to rank the challenges they face in their workplace using a scale of 1 to 4 with 4 being the most important challenge. We have considered knowledge of evolving technologies, adaptation of technological changes, automation, workplace safety, inequalities and access as the challenges.

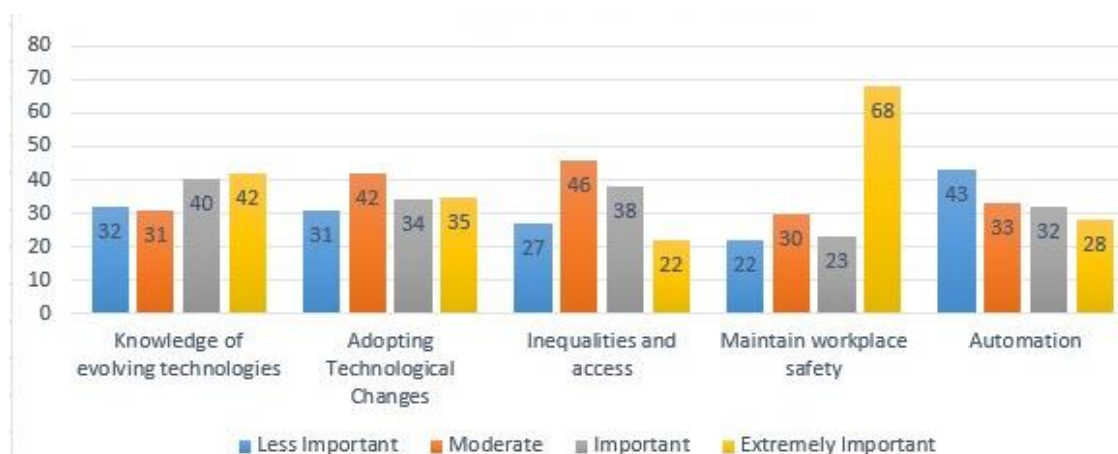


Figure 4.5: Challenges faced by the TVET graduate in the workplace

The results show that, TVET graduates ranked highest for workplace safety, followed by knowledge of evolving technologies and adaptation of technological changes. They have ranked challenge of automation as the least important.

During the KII & FGD with the industry representatives, they expressed that to handle the technological advancement caused by Industrial revolution 4 will reduce some laborious jobs but it will increase scope for new jobs related to technologies like machine learning, artificial intelligence, big data analysis. They mentioned funding, lack of training, lack of motivation and knowledge gap of the workers as their biggest challenges. Some of them mentioned work ethics and employee satisfaction as their challenges.

4.4 Current Initiatives:

Soft skills are those personal characteristics of people, which teach people to work well with others or through interaction. These skills are great for building relationships, and trust. These cannot be developed by reading textbooks.

There are five issues that can impact on soft skills of our target group:

1. Curriculum
2. Learning materials
3. Resource
4. Delivery method of education
5. Assessment & evaluation

To understand the ongoing activities to increase soft skills we reviewed the existing Diploma in Engineering curriculum, course structure, assessment criteria and evaluation system. Here, we discuss existing scopes and initiatives taken for soft skills development.

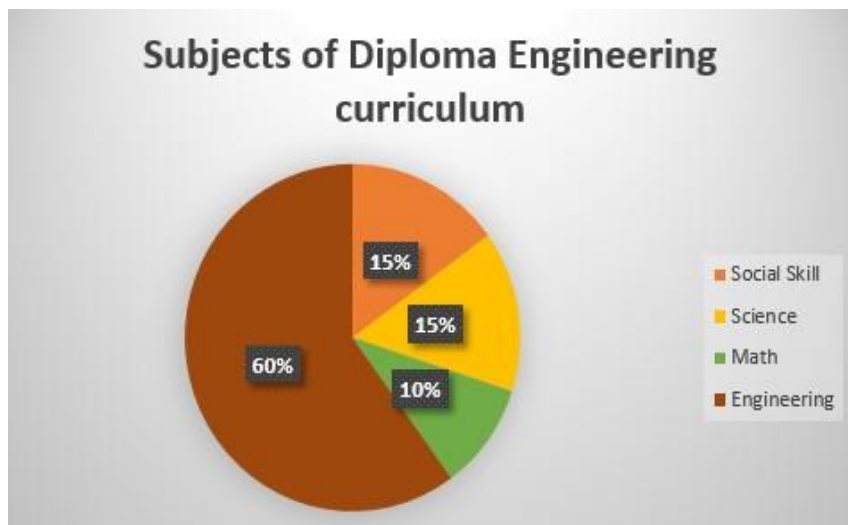


Figure 4.6: Percentage of skills in Diploma Engineering (Curriculum, 2022)

Diploma in Engineering is a four-year (8 semester) course under BTEB is offered by Polytechnic institutes. It is focused on practical and skill oriented. Students get admitted to diploma in engineering after completion of their secondary school certificate. Diploma is awarded in specific branch of engineering.

The Diploma curriculum includes basic knowledge of engineering, social science subjects, basic science and mathematics, computer application, bangla and english. The percentage of different type of subjects in the diploma course (Probidhan 2022) is shown in Figure 4.6.

The percentage of theory and practical subject is 40: 60 in this curriculum. Both theory and practical subjects are assessed merging the continuous assessment and final exam. Continuous assessment of a subject includes presentation and assignments along with midterm exam, quiz test and class test in the newly approved **Probidhan 2022**. Also, after completion of each practical job students need to produce a report and face viva exam on the job. It is done to improve the pupil's soft skills. At the final year, sixteen-week industrial attachment (Internship) is mandatory in Diploma engineering.

After the completion of industrial attachment each student need to submit a project, produce a report and give presentation on the project. Three-member committee comprising of Head of the department, guide teacher and external examiner will assess the project jointly. This will help the students to gain self-confidence and generate innovative ideas.

In the newly approved curriculum & course structure, soft skill is incorporated and there are scopes for practicing soft skill related activities. In the course structure social subjects like sociology, accounting, entrepreneurship, management and physical education & life style are included. These subjects can play vital role to flourish soft skills of the TVET graduates.

To improve the teaching delivery related Teacher's training is initiated by Directorate of Technical education.

4.5 Research/survey available on Demand & Supply:

Many national & international research/surveys are available on the fourth industrial revolution demand & supply gap. We need to study the survey findings to judge our preparedness and for formulating our policy and strategies.

A study of Malaysia²⁰ shows that, demand for TVET graduates in Malaysia is expected to increase to 7.98 million by the year 2030, when it was only about 6.6 million in 2015. It is expected to rise to almost 8 million in about 30 years. Malaysia does not have enough TVET graduates for the industry. New policies that are relevant to industrial needs has been taken. To achieve student competency and effectiveness in facing the Industrial Revolution 4.0, five elements are identified. These elements are: (a) knowledge and understanding, (b) cognitive skills, (c) functional work skills with a focus on practical skills, interpersonal skills, communications skills, digital skills, numeracy skills, and

²⁰ Jeffridzal Bin Ismail¹ , Chemah Tamby Chik² , Mohammad Abdullah Hemdi³
TVET GRADUATE EMPLOYABILITY: MISMATCHING TRAITS BETWEEN SUPPLY AND DEMAND
Accepted: 31 December 2020. Published Online: 25 January 2021
International Journal of Academic research for business & social science

leadership, autonomy and responsibility, (d) personal and entrepreneurial skills, and (e) ethics and professionalism.

Safiur Rashid (August, 2020)²¹ states that to achieve the goal of 2041 to be a developed country, we need more technical and vocational education and training as well as higher education in the areas of various emerging fields of technology.

The Skills for Tomorrow's Jobs in Bangladesh²² attempts to address key skills challenges and identify opportunities in the backdrop of fast technological and economic changes. It proposes mid to long-term strategic policy options that would contribute to economic growth and job creation in Bangladesh with a focus on post-secondary education and skills development sectors.

Technological advances and dynamic economic environment, enabled by skilled workforce, present valuable opportunities for boosting productivity and capitalizing on the demographic transition. Skills development challenges both on the demand and supply sides and how the two sides interact to meet the needs of today's technological changes and dynamic economy – presents promising opportunities for boosting the quality and relevance of skills development system in Bangladesh.

Skills such as critical thinking, problem solving, leadership, communication, work ethics, and team work, have become essential to cope with fast changing technologies and business requirements, and are sought by employers. However, these are largely missing skills for workers in Bangladesh. ICT skills are needed to meet domestic and international business requirements. Both job seekers and education institutions in Bangladesh are weak in job search skills and job placement capacity, and tend to have unrealistic expectations about their job prospects and skills requirements. This creates unnecessarily large frictions and mismatch in the job markets. Supply-side issues for workers are, significant shortfall of skills development opportunities especially among females poor management skills, and the lack of training for informal workers. According to the study, lack of updated job market information, weak industry collaboration and participation, Inadequate capacity for flexible curriculum development, inadequate capacity for delivering quality teaching, and inadequate

²¹ Saifur Rashid, *Technical Education in Bangladesh: the context of 4th Industrial, Digital and Space Revolution*, August 2020 <https://www.researchgate.net/publication/343821753>

²² Shiro Nakata (Sr. Economist, GED06), Yoko Nagashima (Sr. Education Specialist, GED13), Md. Mokhlesur Rahman (Sr. Operations Officer, GED06), Tashmina Rah Rahman (Research Analyst, GED06), Afra Rahman Chowdhury (Consultant, GED06) and Muhammad Asahabur Rahman, *BANGLADESH SKILLS FOR TOMORROW'S JOBS: PREPARING YOUTHS FOR A FAST-CHANGING ECONOMY*, March 2018, The World Bank

implementation capacity are some constrains for Bangladesh in achieving quality assurance.

The study suggested to strengthen labor market information and graduates feedback system; increase labor market responsiveness; strengthen central Planning and Coordination Facilities for Skills Development; Train Higher-order cognitive skills and soft skills in post-secondary education; assess students soft skills in post-secondary education; and to ensure solid foundational skills among post-secondary student for improvement.

Key findings of a survey²³ on demand analysis of printing technology graduates states that, almost all employers & TVET experts says job demands for the skilled people not only for the graduates, Employers are very satisfied regarding printing graduates' behavior with junior/senior/contemporary official.

According to the study, 94.1% of the participating graduates, their educational background supports them in their earning. Majority of the graduates were employed in the private sector; 10.8% are self-employed and 6.5 % pursuing higher study.

Similarly, the current status of our graduate respondents are shown in the Figure 4.7 indicates that, most of them are still job seekers and only 10.4% are self-employed. This rate of self-employ is not satisfactory. This results indicate that TVET system need to emphasis on developing the entrepreneurship skills for their graduates and emphasis on employability skills.

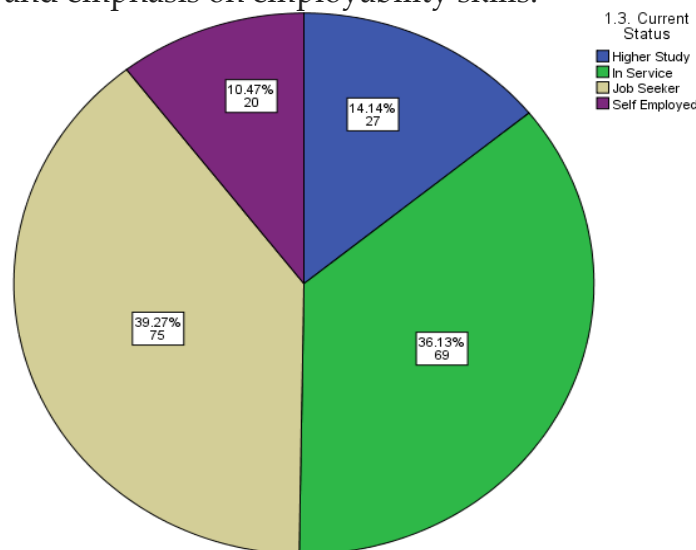


Figure 4.7: Current status of the Diploma graduates

Employment type of the employed graduates show that majority of them are employed in the private sector. These results give us clear indication that

²³ Md. Ali Hossain, *Demand analysis of diploma in engineering (Printing) in current Job Market of Bangladesh*, June 2021, Directorate of Technical Education

private sector has the largest scope for employability for TVET graduates. To grab this opportunity, we must explore the industry needs; expected skills from the TVET graduates. Hence improve the current curriculum as per needs.

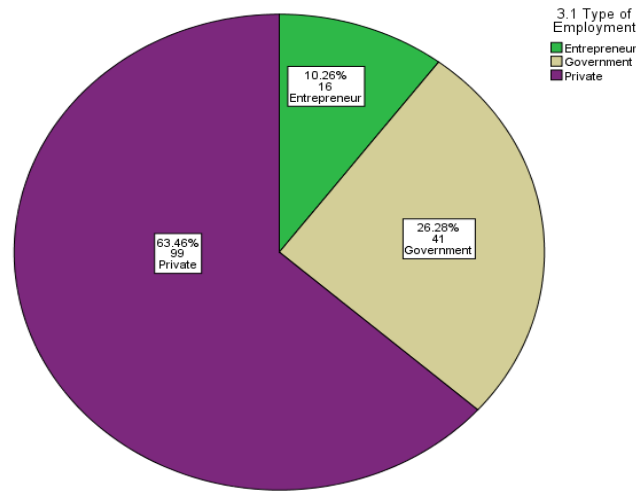


Figure 4.8: Employment types of the Diploma graduates

Our industry respondents mentioned of forming a national body comprising of TVET practitioners, representatives of chamber of commerce, employer’s federation, Ministry of Education, Ministry of Finance, Ministry of Commerce and major industries to take measures according to the skills demand for Bangladesh.

4.6 Strategic Planning:

IR4 will create both positive and negative impact on different sectors. Key finding of a study ²⁴ of A2i (Aspire to Innovate) states that nearly two in five jobs face the risk of Automation. At the same time IR 4.0 will create new jobs like IoT specialist, 3D printing operator, CAD/CAM operator, big data analyst, augmented reality specialist, etc. This implicates that Bangladesh needed to focus on developing technology based skills set in new trades.

Bangladesh is attempting to increase awareness of the IR4 concept among all relevant parties and to inspire industry to adopt new technology to get benefit from it.

Five policy papers have been developed by the Government to guide the students, teachers, researchers, innovators and entrepreneurs to work with technologies of IR4. These are National Strategy for Artificial Intelligence, National Strategy for Robotics, National Blockchain Strategy, National Internet of

²⁴ A2i, Future skills Finding Emerging Skills to Tackle the Challenges of Automation in Bangladesh, Second edition 2022

Things Strategy and Microprocessor design capacity in Bangladesh. Special projects has been taken on IR4.

National Skill Development Policy (NSDP) was approved by the Bangladesh Cabinet in January 2012. The primary objectives of the NSDP are to formulate a clear strategy for skills development in the country; enhance the quality and relevance of skills development; establish a responsive delivery mechanism that services the need of labor markets, individuals and community more efficiently; improve access to skill development and motivate participation from industry and Businesses.

The Government of Bangladesh has approved Bangladesh National Qualification Framework for the development, classification, and recognition of skills, knowledge, and attitudes along a continuum of agreed levels. Main objective of BNQF is to promote lifelong learning and produce quality graduates. The BNQF is constituted based on 3 unique streams of education and training TVET and Skills (BNQF level 1 to 6). The other two new incorporated streams are higher education (BNQF level 7 to 10) and School and Madrasah Education (BNQF level 3, 5, 7 and 9). Diploma in engineering is placed at BNQF level 6. The BNQF level descriptors explain TVET levels (Level 1-6) in terms of knowledge, skills and attitudes. Skills may be cognitive or practical. Cognitive skills involve the use of logical, intuitive and creative thinking as well as written and oral communication and information literacy.

Here, we see that rightly our government has given emphasis on the soft skills and future skills in its policy. So, BNQF will definitely play vital role to escalate TVET graduates level of soft skills.

To build awareness Seminar and workshops can be organized regarding the scopes and challenges of IR4. As part of APA (Annual Performance Agreement) of DTE, TVET institutes are bound to organize awareness building programmes. Polytechnic institutes need to sign minimum two MoUs within a financial year to meet APA target. Memorandums of Understanding (MoU) are signed between industry and TVET providers ensure strong linkage.

To increase placement, the graduates, the industry demand identification, exchange facilities and industry linkage is necessary.

4.7 Stake holder Feedback:

In a case study of Bangladesh done by UNICEF states that, 43% of their respondent replied yes to the question of whether TVET courses provide students with relevant skills to be hired in the first place and 27.5 % indicated no, while 30 percent were unsure. We conducted FGD and KII with the stakeholders including the current TVET students, graduates, employers, industry persons, faculties, principals and DTE and BTEB representatives.

BTEB representatives stated that, 20 generic skill modules for occupational competencies of CBT (Competency Based Training and Assessment) has been developed. These modules include practice negotiation, apply critical thinking and problem solving, practice creativity and innovation in workplace, Interpret fundamental of entrepreneurship, Work in team environment, Lead small team, Occupational health safety, use of English in workplace, use of ICT in workplace, demonstrate work value, prepare for employment, ensure gender equality and social inclusion, etc. These modules can also be customized and adopted to the diploma engineering course structure.

Feedback from our respondents and key informants show that at the very beginning the teacher need to be aware of impacts our teaching delivery system and assessment techniques can be modified to provide regular feedback and assessment to students to help them identify areas for improvement and track their progress over time.

In our survey in response to a question about does the diploma curriculum need to be modified, the 48.5 % (majority) graduates replied yes.

According to our respondents, TVET institutions can emphasize the importance of soft skills to their students. This can be done through workshops, seminars, or guest lectures from industry professionals. Frequent arrangement programs to meet with successful industry guys & share their ideas as a part of their curriculum activities can improving their understanding about industry require soft skill. TVET institutions can foster a positive learning environment that encourages the development of soft skills. This can include promoting a culture of collaboration and respect, encouraging feedback and constructive criticism, and providing opportunities for self-reflection and growth. Some foundation courses can be included in the diploma course structure to develop interpersonal skills, manner antique, management skills, workplace ethics, etc.

From our survey it is evident that, employers prefer to hire candidates who will be productive from a very early stage on. If a TVET graduate first has to be trained on how to do a proper presentation, or how to chat in a pleasant and winning manner with colleagues and customers, this graduate will not qualify as a quick starter. Also basic knowledge in business management, project management and general economy will improve the chances of a job candidate considerably. Also, employers prefer to promote staff members with superior soft skills. Good hard skills alone are not necessarily enough anymore to be a first choice when it comes to promotion.

Both graduate and industry representatives highlighted that, Industrial attachment & engagement with industry from early part of academic life can helpful for the graduates. To prepare TVET graduates for the workplace,

institutions can provide exposure to real-world scenarios and they can easily know the industrial culture. This can also be done through simulation exercises.

According to the industry representatives, monitoring & evaluation of industrial attachment need to be strengthened for both hard and soft skill quality. For, effectiveness and seriousness of this program, guide teacher need to frequently visit the industry and online monitoring system can be developed for getting regular feedback about the performance of the students from industries.

Participating in extracurricular activities such as clubs, sports teams, or volunteer organizations can help TVET graduates develop their soft skills. These activities provide opportunities for teamwork, leadership, communication, and problem-solving. Mentorship and coaching can be highly beneficial for developing soft skills. TVET institutes need to engage with employers and industry to focus on practical education in relation with actual workplace environment.

In Summary, the ability to demonstrate a good work ethic, compassion, understanding diversity, emotional intelligence, as well as being able to value and appreciate differences are just some examples of soft skills which employers actively seek in potential hires. We tried to show the readiness of the graduate level, institute level and national level to meet the challenges of IR 4.0 in terms of soft skills level. Our survey shows students are confident about their time management and teamwork. In the same time, communication skills, negotiation, presentation skills and ability to work under pressure are the areas where students need to improve. The graduate's self-assessment indicate that they have excellent in using the social media safely and time management; they are good in situation handling, communication and self-confidence; this result is also backed by their supervisors. The main constrains for achieving soft skills are lack of awareness and lack of academic scope.

Chapter 5: Conclusion

5.1 Key Questions:

The purpose of our social survey was to benefit the TVET graduates in terms of find the way to enhance their soft skills. The main reason for selecting the subject matter was due to knowledge we gathered from literature reviews and information collected from different sources about the challenge TVET graduates face for employability and to adjustment with job environment.

There are many benefits to improving our soft skills, including relationship-building with colleagues, adapt to workplace changes and career development, through this research we attempted to find gaps between level of soft skills of TVET graduates at present and what is expected from them to benefit them meeting the challenges of IR4. The purpose of the study tried to find the support & policies available in this regard and explore some ways to improve based upon the findings.

5.2 Summary of findings:

IR 4.0 is characterized by the fusion of advanced technologies, such as artificial intelligence, the Internet of Things, robotics, and big data analysis into manufacturing and production processes. To meet the challenges of IR 4.0, TVET graduates need to develop a range of core skills, including: digital literacy, critical thinking, creativity, problem-solving, technical skills, adaptability, communication, collaboration etc.

The key finding of study is summarized and presented in this section.

Awareness: On basis of our survey we can say that impact of the 4th Industrial Revolution is still ambiguous to the TVET students. Related training must be provided for the teachers. DTE has already initiated level based pedagogical trainings for the polytechnic teachers. Opportunities for innovative project based learning (PBL) were less for those studying in polytechnic institutes. But, in 2022 course structure PBL is introduced. Shortage of teachers in polytechnic institutes is one constrain to practice soft skills.

Soft skills Need: TVET graduates need to be updated to reflect the changing technological landscape. This could include incorporating training in areas such as automation, data analytics, and cyber security into existing TVET programs. Additionally, employers may need to re-evaluate their job requirements to ensure that they are attracting and retaining qualified workers who possess the necessary skills for IR 4.0. 94.3% of our respondents said that soft skills are needed and 99.05% sample agreed that soft skills are important for technical jobs

Skills demand: TVET graduates need to acquire new skills to operate and maintain advanced manufacturing and production technologies, such as robotics, automation, and big data analytics. They need to develop skills in areas such as computer programming, data analysis, and digital design.

Changes in the workplace: IR 4.0 has brought about significant changes in the nature of work, with the increasing use of automation, artificial intelligence, and other digital technologies. These changes have led to increased productivity, efficiency, and competitiveness. Due to these changes one major challenge for institutes and industries is updating their equipment and tools to keep up with the changes in technology. Both institutes and industries need to update their equipment and tools to remain competitive in the era of IR 4.0.

Labor Market challenge: The labor market in Bangladesh is facing significant challenges including the displacement of workers due to automation, a shortage of skilled labor, and the need for retraining and up skilling. At the same time, IR 4.0 also presents significant opportunities, including the potential for increased productivity and competitiveness, new job opportunities in the tech sector, and the ability to leverage the country's large pool of young, tech-savvy workers.

Supports: Facilities and institutional capacity should be increased in order to spread quality technical education. Skilled human resource with ethical values suitable for domestic and international labor markets should be created and every institute needs to modernize its labs to meet the challenges of the fourth industrial revolution. In this purpose direct funding for support programs can play a very important role.

Readiness: To meet the challenges and leverage the opportunities of IR4, policymakers, businesses, and workers must take proactive measures to adapt to the changing nature of work and employment. Employability and productivity can be increased by investing in training and up-skilling programs, promoting the development of new skills, and supporting the soft skill enhancement for TVET graduates.

Areas for Improvement: Students showed their confidence about time management and teamwork. In the same time, Communication skills, Negotiation, Presentation skills and ability to work under pressure are the areas where students need to improve. The graduate's self-assessment indicate that they have excellent in using the social media safely and time management; they are good in situation handling, communication and self-confidence; this result is also backed by their supervisors.

Promote entrepreneurship: Our research show that private sector is the largest employer of TVET graduates. The rate of becoming entrepreneur is not

satisfactory. Students need to be encouraged to become entrepreneurs to reduce the extra pressure on the job market.

Constrains: Our student respondents mentioned lack of awareness and lack of academic scope as the main constrains for achieving soft skills. The other constrains are lack of institute initiatives and lack of trained teachers

5.3 Contribution to Knowledge:

We have tried to explore three dimensions of our research area. Firstly, the necessity of TVET graduates to have soft skills, the scope of support for soft skill enhancement and readiness in terms of analysis of achieved level of skills and expected level.

The necessity to have soft skills is must for all the job seekers, TVET graduates are no exception. Today's job-market is becoming ever increasingly competitive. To be successful, job candidates need to have some specialty that distinguishes them from other candidates with similar qualifications and comparable evaluation results. During the job interview good communication skills are invaluable. This skill can serve to successfully cover up weaknesses on the hard skills side too.

In bringing along additional knowledge and skills, added up by convincing personal traits and habits. Soft skill development can improve the employability of the students. They will be more confident which will help them at the interview as well as at their job place. They will be more vigilant about the industrial culture which will help them to cope up with new environment. From literature review and feedback from the stakeholders it is evident that, despite all the initiative taken by different agencies there is a gap between the existing soft skill level and what we expect from our TVET graduates.

5.4 Implications:

Soft skills are fundamental set of skills for preparing students for life long and work in today's global world. Knowledge, innovation and creativity play key functions in developing human capital, which is a core driver of economic progress and sustainable development globally. Researches show the positive correlation between soft skill and employability. The world is changing every day due to effect of industrial revolution 4.0. The corona pandemic worked like a catalyst to accelerate effectiveness of IR4, as it made people more dependent on technology. The way we think or do is changing. Many of the current jobs will be extinct and scope of high tech jobs will be created. To cope with this there is an urgency for adopting policies to flourish soft skills to increase employability.

In this section, we discuss some implications of our research in terms of policy and implementation.

Scope in the Curriculum: Soft skills should be incorporated in the TVET curriculum in a structured way. The course structure can be redefined to a module based system. Soft skills can be incorporated as generic skill modules in the diploma engineering courses. BTEB has already developed 20 generic skill modules for occupational competencies of CBT (Competency Based Training and Assessment). These modules can be adopted to the course structure. Some foundation courses can be included in the diploma course to develop interpersonal skills, manner antique, management skills, workplace ethics, etc.

Improvement of Teaching delivery method: Teaching delivery method need to be updated and teachers need to be trained in project based learning, blended education and pedagogy. Teachers play main role to nourish the student quality. So, they should be made aware of new technologies, challenge and benefits of IR4.

Funding: Teachers can be engaged in technology based researches with adequate funding. To motivate the teachers, special grants can be awarded annually by selecting "Best Teachers". Funding should be provided to encourage students develop innovative projects. Skills competition and innovation fairs can be organized in every polytechnic institute. To give support in innovative works innovation club, science club or programming clubs can be established and patronized.

Funding provisions should be made for non-government institutes for teachers training, skill development and modernization of lab/workshops.

Emphasis on Co-curricular activity: Students can be involved in social activities and event management to develop their responsibilities and leadership. Debate competition, quiz competition on general knowledge can be organized with other cultural competitions.

Student Guidance & counselling: Polytechnic students should be provided exposure to real-world scenarios. Strong Alumni associations can be built for experience sharing with the current students and alumni's. Study tour, excursion, field visit, industry visits, guest speaker, seminar and workshop can be organized. They need to be encouraged to participate in extracurricular activities. Students counseling officer should be added for job market survey, local demand analysis and carrier guidance purpose of the students.

Strengthen Industrial attachment: Sixteen-week industrial attachment program through internship gives the students real workplace experience and it can be helpful for them in selecting career pathway and acquiring the required skills accordingly. To increase the effectiveness of the representatives, monitoring

& supervision process of industrial attachment need to be modified and strengthened for both hard and soft skill quality.

Continuous Market Survey & Research: We tend to find a picture of job market demand for soft skills, current level of TVET graduates' soft skills, challenges faced by TVET graduates that can resolved with Continuous Market Survey & Research.

Monitoring & Supervision: A huge budget has been allocated among 50 Government Polytechnic Institutes under DTE for Lab/workshop modernization in response to the need for setting up IR4 responsive technologies. Implementation of the budget need to be monitored.

BTEB has been working on developing 4th Industrial-Revolution-based curriculum to prove its worth in line with the demands of the changing labor market. The new 2022 course structure has scope for incorporating soft skills. Strong monitoring & supervision on the implementation of this curriculum is required.

5.5 Limitations:

It's important to acknowledge and consider the following limitations of this study:

Sample size and representativeness: Limited sample sizes and representativeness, which may not adequately represent the entire population of TVET graduates. A small sample size can affect the statistical power and generalizability of the findings. Additionally, the characteristics and demographics of the selected sample may not fully reflect the diversity of TVET graduates.

Self-reporting bias: Self-reported data from participants, which can introduce biases. Participants may overstate or understate their skills, leading to inaccurate results. Social desirability bias may also impact responses, as participants may provide answers they believe align with societal expectations.

Measurement challenges: During this study we use various assessment methods, such as surveys, questionnaires, or observations, but these methods may not capture the complete complexity and nuances of soft skills. Additionally, the validity and reliability of these measurement tools can vary.

Industry relevance: This study was focusing on specific sectors or technologies which may not fully capture the diverse challenges and soft skill requirements across various industries. Therefore, it's crucial to consider industry-specific context and collaborate with different sectors for a comprehensive understanding.

Timeframe: This research was conducted within a short period which may not capture the long-term impact of soft skills on graduates' career success and adaptability to IR 4.0 challenges. So it's needed more time for rigorous consultations and workshops.

External factors: Soft skills development does not occur in isolation but is influenced by external factors such as workplace environment, organizational culture, and economic conditions. In our study, focusing solely on the graduates' skills may overlook the influence of these external factors, which can shape the demand for and utilization of soft skills.

5.6 Future scope:

The future scope of research on soft skills of TVET graduates to meet the challenges of IR 4.0: needs, supports and readiness is vast and encompasses several potential areas of exploration. Here are some potential directions for future research:

Technological integration: As IR 4.0 is driven by technological advancements; future research can explore the integration of technology in soft skills development. This could include investigating the effectiveness of virtual reality, augmented reality, gamification, or online platforms in enhancing the acquisition and application of soft skills among TVET graduates.

Industry-specific investigations: Future research can focus on specific industries or sectors to understand the unique soft skill demands in each field within the context of IR 4.0. This would involve exploring the specific soft skills that are most critical for success in industries such as healthcare, manufacturing, finance, or technology, and designing interventions that cater to those specific needs.

Technology-driven skill gaps: With the rapid pace of technological advancements, future research can analyze the evolving skill gaps resulting from the integration of new technologies in the workplace. This would involve identifying emerging soft skill requirements, such as digital literacy, cybersecurity awareness, data analysis, and human-machine interaction, and examining the effectiveness of current training approaches in addressing these gaps.

Long-term impact assessment: Future research can focus on conducting longitudinal studies to assess the long-term impact of soft skills development on the career trajectories of TVET graduates in the context of IR 4.0. This would involve tracking graduates' progress over an extended period to understand how soft skills contribute to their employability, career advancement, and resilience in the face of technological advancements.

Innovative pedagogical approaches: Future research can focus on exploring innovative pedagogical approaches and methodologies for soft skill development in TVET programs. This could include investigating the effectiveness of project-based learning, interdisciplinary collaborations, mentorship programs, or apprenticeships in fostering the acquisition and application of soft skills among TVET graduates.

Employer perspectives: Research can shift focus towards understanding the perspectives of employers regarding the soft skills they expect TVET graduates in the context of IR 4.0. This would involve conducting surveys, interviews, or case studies to gain insights into employers' expectations, perceptions, and experiences related to the soft skills of TVET graduates, enabling educational institutions to align their training programs accordingly.

Policy implications: Future research can explore the policy implications of soft skills development in TVET programs to meet the challenges of IR 4.0. This would involve analyzing the existing policy frameworks, identifying gaps and opportunities, and providing evidence-based recommendations to policymakers to enhance the integration of soft skills in TVET education.

Cross-cultural studies: Given the global nature of IR 4.0, future research can delve into cross-cultural studies to examine the influence of cultural factors on the development and application of soft skills among TVET graduates. Comparative studies across different countries and regions can shed light on the cultural nuances and variations in soft skill requirements and help tailor training programs accordingly.

5.7 SWOT Analysis:

Strength: This research paper on the soft skills of TVET students to meet the challenges of IR 4.0 exhibits numerous strengths, including a well-defined research objective, a thorough literature review, a robust methodology, empirical evidence, clear findings and implications, a contribution to knowledge and practice, and clarity of writing and structure. These strengths collectively enhance the paper's credibility and significance.

Well-defined Research Objective: The research paper establishes a clear and focused well-defined Research Objective. This objective provides a solid foundation for the study, ensuring that the research is purposeful and outcomes-oriented.

Thorough Literature Review: The paper incorporates a comprehensive literature review of relevant scholarly articles, reports, and studies; the research paper builds a strong theoretical foundation, establishing the context and significance of the research question. This thorough analysis demonstrates the authors' commitment to a well-informed study.

Robust Methodology: The research paper outlines the research design, data collection methods (e.g., surveys, interviews, observations), and statistical analyses employed to gather and analyze the data. The transparent and replicable approach enhances the credibility and reliability of the study's findings.

Empirical Evidence: The study provides quantitative and qualitative insights into the development and application of soft skills in the context of IR 4.0. The inclusion of real-world examples and concrete data strengthens the paper's arguments and increases its overall impact.

Clear Findings and Implications: The research paper presents clear and coherent findings, synthesizing the results of the study and aligning them with the research objective. Moreover, the paper highlights the practical implications of these findings for educational institutions, policymakers, and other relevant stakeholders.

Contribution to Knowledge and Practice: By addressing the intersection of soft skills and IR 4.0 challenges within the TVET context, this research paper makes a valuable contribution to both academic knowledge and practical implementation. It provides a platform for further research, encourages the development of targeted interventions, and informs policy decisions related to TVET curriculum development, pedagogical approaches, and industry partnerships.

Clarity of Writing and Structure: The research paper demonstrates strong writing skills and an organized structure, ensuring that readers can easily follow the arguments and navigate the content. The paper adheres to appropriate academic conventions, using clear language, well-structured paragraphs, and appropriate referencing.

Weaknesses: While the research paper on soft skills of TVET students to meet the challenges of Industrial Revolution 4.0 possesses several strengths, it is important to acknowledge certain weaknesses that may impact the overall quality and reliability of the study. These weaknesses include:

Limited Sample Size: The research paper may suffer from a limited sample size, which could undermine the generalizability of the findings. This limitation restricts the extent to which the conclusions can be applied to a broader population.

Potential Bias in Data Collection: The research paper may be susceptible to bias in data collection methods. This bias could compromise the validity of the findings and limit the study's reliability.

Lack of Longitudinal Analysis: The research paper may lack a longitudinal analysis, focusing only on a specific point in time. Industrial Revolution 4.0 is an ongoing process, and the development of soft skills among TVET students may evolve over time. Without longitudinal data, the study may not capture the temporal dynamics, limiting its ability to provide insights into the long-term effectiveness of soft skills interventions in addressing IR 4.0 challenges.

Insufficient Comparison Groups: The research paper may not adequately incorporate comparison groups, such as students who have not undergone interventions to develop soft skills or students from different educational backgrounds. The absence of comparison groups limits the researchers' ability to establish a causal relationship between soft skills development and the specific challenges posed by IR 4.0. Comparative analyses are essential to determine the unique contributions of soft skills in the TVET context.

Overemphasis on Quantitative Data: Soft skills development is a complex and multifaceted process that cannot be fully captured through numerical measurements alone. By underutilizing qualitative approaches such as in-depth interviews or case studies, the research paper may miss important contextual factors and nuanced understandings of soft skills acquisition.

Limited Discussion of Limitations: The research paper may not thoroughly address the limitations such as sampling biases, data collection challenges, or the generalizability of the findings, is crucial to maintain transparency and to provide readers with a comprehensive understanding of the study's boundaries. The absence of a robust discussion of limitations weakens the paper's overall credibility.

Absence of Practical Recommendations: The research paper may lack clear and actionable recommendations for stakeholders, such as educational institutions, policymakers, or industry partners. While the study identifies the importance of developing soft skills among TVET students to meet IR 4.0 challenges, the paper may fall short in providing concrete strategies or guidelines for implementing effective interventions or changes in educational practices.

Opportunities: This research paper provides significant opportunities for advancing TVET education, fostering industry collaboration, guiding policy decisions, enhancing professional development, promoting further research, and improving graduate employability. Capitalizing on these opportunities can lead to positive outcomes for TVET students. These opportunities include:

Informing Curriculum Development: The research paper can provide valuable insights to inform the development of TVET curricula that align with the demands of 4IR. By identifying the specific soft skills required in this transformative era, the study can guide curriculum designers in integrating these skills into educational programs.

Strengthening Pedagogical Approaches: The findings of the research paper can contribute to the enhancement of pedagogical approaches within TVET institutions. By understanding the effective strategies and interventions for developing soft skills, educators can refine their teaching methods to create engaging and interactive learning environments.

Supporting Industry-Academia Collaboration: The research paper can facilitate stronger collaboration between TVET institutions and industry stakeholders. This opportunity promotes mutually beneficial partnerships that bridge the gap between academia and industry, ensuring that TVET students are equipped with the skills needed for successful employment in the era of IR 4.0.

Guiding Policy Decisions: The research paper can inform policy decisions at various levels, including government bodies, educational authorities, and funding agencies. This opportunity enables policymakers to create an enabling environment that fosters the growth and recognition of soft skills among TVET students, promoting their employability and long-term career success.

Enhancing Professional Development Programs: This research may contribute to the improvement of professional development programs for TVET educators. By identifying effective strategies and interventions for developing soft skills, the study can guide the design and implementation of training programs aimed at enhancing the pedagogical and mentoring skills of educators.

Promoting Further Research: The research paper can stimulate further research and exploration in the field of soft skills development among TVET students. The study's findings and limitations can inspire researchers to delve deeper into specific aspects of soft skills, investigate new approaches, and explore different contexts. This opportunity allows for a broader understanding of the subject, as well as the identification of emerging trends and best practices in preparing TVET students for the challenges of IR 4.0.

Enhancing Graduate Employability: The research paper's findings can contribute to improving the employability of TVET graduates in the context of IR 4.0. By emphasizing the importance of soft skills and their alignment with industry demands, the study can help graduates position themselves as valuable assets in the job market. This opportunity empowers TVET students to develop a competitive edge, increasing their chances of securing meaningful employment and successfully navigating the rapidly changing world of work.

Threats: While the research paper on soft skills of TVET students to meet the challenges of Industrial Revolution 4.0 possesses strengths, it is important to identify potential threats that could undermine the validity and reliability of the study. These threats include:

Limited Scope: The research paper may focus on a narrow aspect of soft skills development or a specific subset of TVET students. By limiting the scope, the study may not capture the full range of soft skills required to address the challenges of IR 4.0. Consequently, the findings may not provide a comprehensive understanding of the topic and its implications for TVET education.

Evolving Nature of IR 4.0: Industrial Revolution 4.0 is a dynamic and rapidly evolving phenomenon. The research paper may face challenges in keeping up with the pace of technological advancements and changes in industry demands. As a result, the study's findings and conclusions may become outdated or less relevant over time, limiting their applicability to the current state of IR 4.0.

Lack of Consensus on Soft Skills: Defining and categorizing soft skills can be subjective and context-dependent. The research paper may encounter challenges related to the lack of a universally accepted framework or consensus on which soft skills are most relevant for TVET students in the context of IR 4.0. This ambiguity may introduce variability in the interpretation and measurement of soft skills, potentially impacting the study's reliability and comparability with other research.

External Factors and Influences: The research paper may face threats from external factors that could influence the development and application of soft skills among TVET students. These factors could include economic fluctuations, policy changes, or shifts in industry requirements. Failure to account for these external influences may limit the paper's ability to provide accurate and applicable insights into the challenges and strategies for soft skills development.

Lack of Long-Term Impact Assessment: The research paper may not address the long-term impact of soft skills development on the career trajectories and success of TVET students in the IR 4.0 era. This limitation may hinder a comprehensive assessment of the long-term benefits and potential challenges associated with soft skills development.

Appendix A

Survey Questionnaire to identify the Soft skills level of TVET graduates to meet the challenge of IR4: Need, Support, and readiness

This survey is designed as a tool to identify the TVET graduates need for soft skills, current level and gaps. It should take between 5 - 10 minutes to complete. Please remember the feedback you provide will lead to the recommendations for improvement. Please fill in the data and put a tick on the appropriate option. You can withdraw at any time or refuse to answer any question without any consequences of any kind. All information you provide for this study will be treated confidentially.

Section 1: General Information of Participant

1.1. Name of the Participant:

1.2. Age: 1.3. Current Status: Job Seeker In Service Self Employed
 Higher Study

1.4. Technology of Diploma:

1.5. Name of the Polytechnic Institute:

1.6. Name of the Working Organization:

1.7. Workplace Address:

1.8. Personal e-mail(Optional):

1.9. Personal Mobile No(Optional):

1.10 Home Address (Optional):

1.11. Locality of your residence: Village Upozilla Zilla City

1.12. Diploma in Engineering Passing Year:

Section 2 : Needs of Soft Skills to meet the challenges of 4IR For TVET Graduates

2.1 Please answer the following questions in Yes/No:

I. Have you heard about Soft Skills and 4IR before?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
II. Do you feel you need to develop Soft Skills?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
III. Do you think Technical Jobs require Soft Skills?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
IV. Do you think 4IR will create new Job Opportunities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
V. Do you think 4IR will decrease Job Opportunities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
VI. Do you think you can survive in Job market of 4th IR without soft skills?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
VII. Do you find 4th IR and changing the job responsibilities/ job patterns?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
VIII. Do you face the challenges of 4IR?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

2. Are you involved in any Social/cultural activities? If yes then state the field.

Section 3: Supports for Soft Skills development of TVET graduates to meet the challenges of 4IR

3.1 Type of Employment: Government Private Entrepreneur

3.2 Mark your major workplace responsibilities using the Scale: Never = 1, Sometime = 2, rarely = 3, Often= 4.

Sr. No	Activities	1	2	3	4
A.	Give presentations				
B.	Take part in group work				
C.	lead a team or project				
D.	mentor or coach junior mates				
E.	Give feedback on issues				
F.	Produce Reports				
G.	Take advice and Update projects				
H.	Visit industries for Study Tour				

3.3 Did you participated in any of the following activities while studying Diploma? (Please put ticks where necessary)

- a. Term Projects
- b. Group Task
- c. Give presentation on a topic
- d. Debating
- e. Cultural Club
- f. Science Club
- g. Scouting
- h. Other (Please specify).....

3.4 Do you feel that our academic courses match the requisite skills for 4IR? (Please put a tick where necessary)

- a. Yes
- b. No, Need to be modified
- c. Other (Please specify).....

3.5 Do you think policy is needed for enhance soft skills among TVET graduates?

- a. Yes
- b. No.

3.6 Did you get any on the Job training?

- a. Yes
- b. No.

- 3.7 Does your company has any policy for up skilling or reskilling the employees?
 a. Yes
 b. No.
- 3.8 Does your company allow scope of higher education for the employees?
 a. Yes
 b. No.

Section 4: Readiness of Soft Skills to meet the challenges of 4IR For TVET Student

4.1 Please rate the challenges faced in workplace using a scale of **1 to 4** with 4 being the most important challenge

Issue	1	2	3	4
Knowledge of evolving technologies				
Adopting Technological Changes				
Inequalities and access				
Maintain workplace safety				
Unemployment caused by automation				

4.2 Assess your current Soft skill level using the list & scale given (Please Put a Tick where necessary) Scale: Not Satisfactory = 1, Satisfactory= 2, Good= 3, Excellent= 4.

Issue	1	2	3	4
A. Self Confidence				
B. Communication				
C. Negotiation				
D. Leadership				
E. Situation Handling				
F. Time Management				
G. Machine Operation				
H. Computer literacy				
I. Cyber Security				
J. Safe Use of social media				

- 4.3. How will 4IR empower people to up-skill themselves? (Please put a Tick Mark)
 a. Use of Technology
 b. Soft skill improvement
 c. above all

4.4. Give your feedback on what can done to improve the soft skills of the TVET Graduates?

Appendix B

Survey Questionnaire to identify the Soft skills level of TVET graduates to meet the challenge of IR4: Need, Support, and readiness

This survey is designed as a tool to identify the TVET graduates need for soft skills, current level and gaps. It should take between 5 - 10 minutes to complete. Please remember the feedback you provide will lead to the recommendations for improvement. Please fill in the data and put a tick on the appropriate option. You can withdraw at any time or refuse to answer any question without any consequences of any kind. All information you provide for this study will be treated confidentially.

Section 1: General Information of Participant

1.1 Name of the Participant:

1.2. Age: 3. Semester: 4. Technology:

1.3 Name of the Institute:

1.4 Institute Address:

1.5 Personal e-mail(Optional):

1.6 Personal Mobile (Optional):

1.7. Home Address (Optional):

1.8 Locality of your residence: Village Upzila Zilla City

Section 2 : Needs of Soft Skills to meet the challenges of 4IR For TVET Student

2.1 Please answer the following questions in Yes/No:

A. Have you heard about Soft Skills and 4IR before?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
B. Do you think Technical Jobs require Soft Skills?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
C. Do you find any change in the requirements of the job circulars now?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
D. Do you think that soft skills are required to accommodate technological advancements?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
E. Do you need to enhance your soft skills?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

2.2 Please put ticks where necessary to reflect yourself:

1.	Communicate well with teacher and mates	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
2.	Enjoy with friends	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
3.	Confident to take responsibilities	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
4.	Complete task/assignments within given time	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
5.	Like to participate in team work	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
6.	Like to work individually	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
7.	Take feedback from others about your work	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
8.	Have set goals for future	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No

Section 3 : Supports for Soft Skills development to meet the challenges of 4IR For TVET Student

3.1 What do you like to do besides your studies?(Please put ticks where necessary)

- a. Cultural Activities
- b. Sports
- c. Net Surfing
- d. Social Activity
- e. Other (Please specify).....

3.2 Do you participate in any activities stated below as part of your academic course? (Please put ticks where necessary)

- a. Term Projects/Assignments
- b. Group Task
- c. Give presentation on a topic

3.3 Does your academic institute provide scope for any of the following activities?

(Please put ticks where necessary)

- a. Debating
- b. Cultural Club
- c. Science Club
- d. Scouting
- e. Study Tour
- f. Industry Visit
- g. Experience sharing with Ex-students or industry persons
- h. Other (Please specify).....

3.4 Do you have any of the following assistance from your institute?

(Please put ticks where necessary)

- a. Supervisor/guide teacher
- b. Guidance for future planning/ Entrepreneurship
- c. Career Guidance
- d. Job Placement

3.5 Do you feel that your current academic courses improve your soft skills?

- a. Yes
- b. No

3.6 Give your suggestions on how to improve the soft skills of the TVET Students?

Section 4 : Readiness of TVET students to meet the challenges of 4IR For TVET Student

4.1. Define yourself in five sentences:

4.2 Assess your current Soft skill level using the list & scale given (Please Put a Tick where necessary) Scale: Not Satisfactory = 1, Satisfactory= 2, Good= 3, Excellent= 4.

Sr. No	Issues	1	2	3	4
1.	Communication skills				
2.	Negotiation				
3.	Leadership				
4.	Empathy				
5.	Time Management				
6.	Presentation skills				
7.	Ability to work under pressure				
8.	Teamwork				

4.3 Rank the skills you feel that are needed to adopt the changes of workplace due to IR4 using the list & scale given (Please Put a Tick where necessary) Scale: Not Satisfactory = 1, Satisfactory= 2, Good= 3, Excellent= 4.

Sr. No	Issues	1	2	3	4
A.	Problem solving /Situation Handling				
B.	Innovative idea				
C.	Decision making				
D.	Health & Workplace Safety				
E.	Simple Machine Operation				
F.	Computer literacy				
G.	Adaptation for changes				

4.4 What are the difficulties you face in achieving soft skills?
(Please put ticks where necessary)

- a. Lack of awareness
- b. Lack of academic scope
- c. Lack of teachers
- d. Lack of institute initiatives
- e. Other (Please specify).....

REFERENCES

- Akhter, W. (10 Oct), 4th Industrial Revolution: Skills Sets for Employability of Business Graduates in Bangladesh, *International Journals of Multidisciplinary Research Academy*.
- Aspire to innovate (2022), Future skills Finding Emerging Skills to Tackle the Challenges of Automation in Bangladesh.
- Balcar, J. (2016). Is it better to invest in hard or soft skills? *Economic & Labour Market Review*. Rev. 27, 453–470. doi: 10.1177/1035304616674613.
- Ministry of Education (2023, March), Bangladesh National Qualifications Framework (BNQF).
- Bangladesh Bureau of Educational Information and Statistics (2022) Bangladesh Education Statistics 2021.
- Cengage (2019 Jan 16), Demand for "Uniquely Human Skills" Increases Even as Technology and Automation Replace Some Jobs. Retrieved from <http://www.prnewswire.com/news-releases/new-survey-demand-for-uniquely-human-skills-increases-even-as-technology-and-automation-replace-some-jobs-300779214.html>
- Calero López, I., & Rodríguez-López, B. (2020). The relevance of transversal competences in vocational education and training: a bibliometric analysis. *Empir. Res. Vocat. Educ.* 12:12. doi: 10.1186/s40461-020-00100-0.
- Charlton, E.(2019 Jan 16), These are the 10 most in-demand skills of 2019, according to LinkedIn. Retrieved from <https://europeansting.com/2019/01/16/these-are-the-10-most-in-demand-skills-of-2019-according-to-linkedin/>
- Cherri, L. H. (2008), The Mathematics of Industry 4.0, Retrieved from <http://medium.com/@luizcherri/the-mathematics-of-industry-4-0-81904d7bd3cb>
- Cimatti, B. (2016). Definition, development, assessment of soft skills and their role for the quality of organizations and enterprises. *Int. J. Qual. Res.* 10, 97–130.

- Cinque, M., Carretero, S., and Napierala, J. (2021). Non-Cognitive Skills and other Related Concepts: towards a Better Understanding of Similarities and Differences. Retrieved from: <https://ec.europa.eu/jrc/en/publication/euro-scientific-and-technical-research-reports/non-cognitive-skills-and-other-related-concepts-towards-better-understanding-similarities> [accessed on February 1, 2021].
- Cooke, B., & Zaby, A. (2015). Skill gaps in business education: Fulfilling the needs of tech startups in Berlin. *Journal of Higher Education Theory and Practice*.
- Diploma in Engineering Probidhan 2022, Bangladesh Technical Education Board. Retrieved from <https://drive.google.com/drive/folders/19gqwGlwCzDkgQrVOxZTqkQSBqLlrzI3o>
- Dweck, C. S. 2007, Dec 26), *Mindset: The New Psychology of Success* Paperback.
- ELEARNING infographics.com (2016 Sep 16), *Soft Skills vs Hard Skills Infographic*. Retrieved from <https://elearninginfographics.com/soft-skills-vs-hard-skills-infographic/>
- Elfadil, N., and Ibrahim, I. (2022). Embedded system design student's learning readiness instruments: systematic literature review. *Front. Educ.* 7:799683. doi: 10.3389/educ.2022.799683
- Hartanto, S., Lubis, S. and Rizal, F. (2017 Jan 13), *Need and analysis of soft skills for students of the mechanical engineering department of vocational high school*.
- Hossain, M. A. (2021), *Demand analysis of diploma in engineering (Printing) in current Job Market of Bangladesh*, Directorate of Technical Education,
- ILO, News (2021 Mar 17), *Soft skills improve the employability of youth and job seekers*. Retrieved from https://www.ilo.org/jakarta/info/public/pr/WCMS_776501/lang--en/index.htm
- Ismail, J.B., Chik, C. T., & Hemdi, M. A. (2021 Jan 25), *TVET graduate employability: mismatching traits between supply and demand*, *International Journal of Academic research for business & social science*.

- Kamaruzaman, F. M., Hamid, R., Mutalib, A.A., & Rasul, M.S.(2019), Comparison Of Engineering Skills With Ir 4.0 Skills, International Journal of Online and Biomedical Engineering (iJOE)
- LinkedIn 2023 Most In-Demand Skills (2023 Feb 20), Learn the skills companies need most. Retrieved from <https://www.linkedin.com/business/learning/blog/top-skills-and-courses/most-in-demand-skills>
- Martin, J. P., Skills for the 21st century: findings and policy lessons from the OECD survey of adult skills, Organization for Economic Co-operation and Development, Working Paper No. 166
- Mentortec, Anespo, Blick, Cece, Efvot, Pit and Pixel (2018). Soft Skills Framework for The Vocational Education & Training, VET_GPS project. Retrieved from <https://www.vetgps.eu/download/Integration%20of%20Soft%20Skills%20in%20VET-Guide.pdf>
- Mundy, K., & Verger, A. (2015). The World Bank and the global governance of education in a changing world order. International Journal of Educational Development, 40, 9–18. <https://doi.org/10.1016/j.ijedudev.2014.11.021> [Crossref], [Web of Science ®], [Google Scholar]
- Nakata, S., Nagashima, Y., Rahman, M.M., Rahman, T.R. Chowdhury, A.R. & Rahman, M.A. (2018) Bangladesh Skills For Tomorrow's Jobs: Preparing Youths For A Fast-Changing Economy, The World Bank.
- Oviawe, J. I. (2018). Revamping technical vocational education and training through public-private partnerships for skill development. Journal of Higher Education, 10(1), 73–91. <https://doi.org/10.4314/majohe.v10i1.5>
- Okoye, K. R. E., & Chijioke, O. P. (2013). Private-public partnership and technical Vocational Education and Training (TVET) in a developing economy. Arabian Journal of Business and Management Review, 2 (10), 51–61. Retrieved from [https://www.arabianjbm.com/pdfs/OM_VOL_2_\(10\)/6.pdf](https://www.arabianjbm.com/pdfs/OM_VOL_2_(10)/6.pdf)
- Powar, K. B. (2004). Internalization of Higher Education: An Aspects of India's Foreign Relations. New Delhi: Gyan Publishing House.

- PwC EU Services (2020). Skills for Industry Curriculum Guidelines 4.0: Future-Proof Education and Training for Manufacturing in Europe. Retrieved from: <https://op.europa.eu/en/publication-detail/-/publication/845051d4-4ed8-11ea-aece-01aa75ed71a1>.
- Rashid, S. (2020), Technical Education in Bangladesh: the context of 4th Industrial, Digital and Space Revolution. Retrieved from <https://www.researchgate.net/publication/343821753>
- Rumi, M. H., Rashid, Makhdom, M. H., & N. U. Nahid, Fourth Industrial Revolution in Bangladesh: Prospects and Challenges. *Asian Journal of social sciences and legal studies*. Retrieved from <https://www.researchgate.net/publication/344444672> Fourth Industrial Revolution in Bangladesh Prospects and Challenges
- Shmatko, N., & Volkova, G. (2020). Bridging the skill gap in robotics: global and national environment. *SAGE Open* 10, 1–13. doi: 10.1177/2158244020958736.
- Skills for Employment Investment Project (SEIP 2017), BIDS study Report- Labor Market and Skills gap in Bangladesh. Retrieved from http://bidslink.bids.org.bd/bidsorgbd/completed_research/LABOUR_MARKET_AND_SKILL_GAP.pdf
- Stewart, C., Wall, A., & Marciniak, S. (2016). Mixed signals: Do College graduates have the soft skills that employers want? *Competition Forum*, 14(2), 276-281.
- Talentlms (2020, Jun 25), Employee upskilling & reskilling statistics: Casting light on the trend. Retrieved from <https://www.talentlms.com/blog/reskilling-upskilling-training-statistics/>
- Thapa, A., Willing to know more about Soft Skills?
- The World Bank Group (2018), Bangladesh skills for tomorrow's jobs: preparing youths for a fast-changing economy, Education Global Practice.
- UNESCO (2015). Shaping the education of tomorrow, 2012 Report on the UN Decade of Education for sustainable development, Abridged. Retrieved on 12 May, 2018, www.unesco.org/.../education/...education-for-sustainable-development/publications/

Van Dam, N., 4th Industrial Revolution & the Future of Jobs, Bookboon, 2017,

World Economic Forum 2020, Future of Jobs Report. Retrieved from <https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-omorrow-how-long-it-takes-to-learn-them/>