A study of skills gap assessment between computer program graduates and industries of Bangladesh: Software industries perception

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MAY 2023

A study of skills gap assessment between computer program graduates and industries of Bangladesh: Software industries perception

A thesis submitted for the partial fulfillment of the degree of MScTE in Technical Education at the Islamic University of Technology in 2023

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Submitted to:

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Dedication

I dedicated my work to The Almighty Allah without his support, strength and mercy I would be nowhere and to my beloved family have made it possible because of their countless prayers, love, support, guidance, motivation, cooperation and wisdom that held me firm and strong through my program. May Allah S.W.T render their countless support, keep them safe and away from fitnah.

Acknowledgement

All praise to almighty Allah for providing me the opportunity and ability for completing this study which demanded keen concentration, prolonged patience and mental effort. First and foremost, I must feel grateful and wish to acknowledge my profound indebtedness to Mr. Rashedul Huq Shamim, Associate Professor, Department of Technical and Vocational Education (TVE), Islamic University of Technology (IUT). His deep knowledge in the field of research influenced me to carry out this project up to this point. His endless patience, scholarly guidance, continual encouragement, constant supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all circumstances have made it possible to come to this stage. The researcher is also grateful to all the faculty members and Prof. Dr. Md. Shahadat Hossain Khan, Head of the Department of Technical and Vocational Education (TVE), Islamic University of Technology (IUT) for their academic support during the course of this program. The researcher also likes to convey his deep gratitude and appreciation to the members of the committee for their guidance and valuable suggestions regarding this study. The researcher also wishes to thank those Industrial authority who supplied necessary data and also to the staff member of IUT Library, Computer Center and TVE Department for their sincere cooperation. Finally, the researcher likes to appreciate and thank his family members for their patience and continuous encouragement for completion of this research.

Declaration of the Author

This is to certify that the work presented in this thesis is my original work**.** This thesis has neither been submitted nor previously accepted for the award of any other degree in this university or elsewhere. I also declare that the sources used in this thesis were explicitly acknowledged with proper citations and references.

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Abstract

The skills gap between graduates of computer science programmes and the software industry in Bangladesh poses obstacles to graduates' employability and career prospects. This study sought to investigate the skills gap by examining the perceptions of industry professionals regarding computer science programme graduates' knowledge curricula, emotional and attitudinal aspects, and perceived skill. In addition, hypotheses regarding the direct and indirect effects of these factors were tested.

Using structural equation modelling (SEM), the study assessed the reliability and validity of the research model by analysing data collected from industry professionals and graduates. The findings disclosed a number of noteworthy insights. First, there was a significant positive correlation between knowledge curricula and the skills perceived by graduates of computer science programmes. This highlights the significance of aligning curricula with industry demands in order to increase the employability of graduates.

Second, the study found no correlation between knowledge curricula and emotional and behavioural factors. This indicates that curricula may not substantially affect the emotional and behavioural characteristics of graduates. To address the skills divide comprehensively, additional factors, including work experience and practical skills, should be considered.

In addition, the study failed to discover a significant correlation between attitudes and perceived skill. This suggests that attitudes may not play a significant role in determining the perceived capabilities of graduates of computer science programmes.

The study concluded that emotional and attitude factors do not mediate the relationship between knowledge curriculum and perceived competence. This suggests that additional variables should be investigated to determine the factors that contribute to the skills divide.

Several implications and recommendations were proposed based on the findings. It is essential for educational institutions and the software industry to collaborate in order to develop curricula that meet industry needs. In addition, graduates should be encouraged to cultivate emotional intelligence and positive attitudes to increase their employability. Additional research is required to investigate other possible factors that contribute to the skills divide and to develop interventions to address these factors.

This study sheds light on the skills disparity between Bangladeshi graduates of computer science programmes and the software industry. The findings and recommendations provide stakeholders, including computer science graduates, educators, and industry professionals, with valuable insights for bridging the divide and increasing the employability of computer science graduates.

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Chapter 1 Introduction

This study aims to investigate the skills gap between computer program graduates and software industries in Bangladesh. Specifically, it seeks to understand the perceptions of software industries regarding the skills possessed by graduates and identify areas of improvement. To achieve this, a skills gap assessment will be conducted, and the results will be analyzed to provide recommendations for bridging the gap. The study will provide valuable insights into the relationship between computer program graduates and software industries in Bangladesh, and its findings will have significant implications for both parties. In this chapter, the introduction, problem statement, research objectives, research questions, significance of the study, and definition of terms will be discussed.

1.1 Introduction

Students who have just graduated from computer science programmes generally have a difficult time transitioning into profitable careers as software developers. According to Alam et al. (2022), novice professionals frequently struggle with deficiencies in both their "soft skills," which include aspects like as teamwork and communication, and their "technical skills," which include aspects such as source code control and testing. Jony et al., 2022 Confirming this through direct observation of developers at work, these abilities have been shown to play a significant part in daily work and create significant problems. Surveys have also shown that developers pick up many of these abilities on the job, reflecting gaps between the skills they had upon graduation and the skills they have collected since then (Begum et al., 2008; Scaffidi, 2018); this is something that has been discovered. What kinds of information are essential for a software professional to have? Computer Society, IEEE.

The term "Industry 4.0," also known as the "Fourth Industrial Revolution" (IR 4.0), refers to the transformation that enables the collection, evaluation, and exploration of data across machines, thereby allowing for more rapid, flexible, and cost-effective business processes that result in better products at lower prices. 2019 Afroze et al. It represents an evolution in technology that includes the Internet of Things, Big Data Analytics, simulation, and cloud computing. As the prevalence of high-tech gadgets in daily life continues to grow, it is imperative that workers learn how to effectively use them.

The quality of the software engineering (SE) work force is a direct result of the quality of SE education, and how SE students are trained Garousi, Giray, Tüzün, et al., 2019. However, there is a widely-noted "gap" between software industry's skill needs and the education university students receive. The software industry in Bangladesh has experienced significant growth in recent years, with a growing demand for software products and services both domestically and internationally. However, the industry is facing a significant challenge in terms of the skills gap between computer science program graduates and the skills required by the software industry.

Computer science programs in Bangladesh aim to provide students with a strong foundation in the field of computer science, including courses in programming, algorithms, data structures, software engineering, and computer systems. However, there is a concern that the skills taught in these programs do not align with the skills required by the software industry Garousi, Giray, Tüzün, et al., 2019.

In the context of courses on computer science, software engineering, and information technology, universities can instruct students in the abilities necessary to become software developers of the future. Therefore, there are two different ways in which continuing research might contribute to the creation of academic programmes at universities.

The purpose of this study is to assess the skills gap between computer science program graduates and the software industry in Bangladesh, with a focus on the perception of software industries regarding the skills possessed by computer science program graduates. The study will also identify areas where computer science programs in Bangladesh need to be improved to better prepare graduates for the software industry.

Regular conversations about the knowledge level and productivity of the SE workforce take place among practitioners, educators, and researchers (Garousi, Giray, & Tuzun, 2019). Both university instructors and practitioners are working hard to ensure that newly hired employees and recent graduates in the field of software engineering (SE) satisfy the requirements of the industry and possess the "right" skills and knowledge to seamlessly integrate into their new teams and begin contributing to their projects as soon as they are hired. This is a goal shared by both groups. On the other hand, SE is a field in which there are disproportionately large disparities in talent. There are academic papers from the 1980s that have reported about the impact of developer productivity and skill set on software projects, and the community has coined notions such as "10x," which is

a concept used to describe the "best" software engineers who could be 10 times as productive as the low-skilled engineers Wyland et al., 2015. There are also academic papers from the 1980s that have reported about the impact of developer productivity and skill set on software projects.

Several researchers have already brought attention to the gap that currently exists between software education and the requirements of the industry (Abdulqadir Baqadir, 2013; Coll et al., 2002). In addition, there have been several empirical investigations that have looked into this matter. One of the first was a report that had been issued by Lethbridge in the year 2000. It was an analysis of the degree to which a representative sample of software professionals from the United States and Canada had received relevant and in-depth knowledge as part of their graduate studies. According to the findings of the study, there is a considerable knowledge gap between software education and industry in terms of the information that software engineers require to be able to do the activities that are required by industry. More recent research, such as the surveys conducted by Zeidan et al. (2020), has once again discovered a fissure of this kind.

The study will use a quantitative approach, including a survey of software industry professionals with computer science program graduates and industry experts. The findings of the study will provide insights into the skills required by the software industry in Bangladesh, the skill level of computer science program graduates, and the areas where improvement is needed.

The study is significant in that it will provide new insights into the skills gap between computer science program graduates and the software industry in Bangladesh. The findings of the study can be used to inform the development of strategies and initiatives for bridging the skills gap and supporting the growth and sustainability of the software industry in Bangladesh.

1.2 Background of the study

The skills gap assessment between computer science program graduates and industries in Bangladesh has become a significant concern in recent years. To address this issue, a study was conducted to understand the perception of software industries in Bangladesh regarding the skills gap between computer science program graduates and industry requirements.

The information technology (software), Internet service providers, call centers, telecommunications, and hardware sectors make up Bangladesh's ICT industry (Uddin, 2021).

When excluding telecoms and hardware from consideration, the current size of the information and communications technology (ICT) market in Bangladesh is around US$ 2 billion, of which export revenues account for approximately US$ 1 billion (BASIS, 2017). The market has established a goal of $5 billion in United States dollars to be reached by 2021. The majority of IT companies are tiny, and around 70 percent are focused on the local market. After the year 2000, when the government began liberalizing the market to a greater level, the industry started seeing growth and expansion. Over 0.22 million people are employed in this sector at the moment, with over half of those being IT professionals. After 2010, the export of software and IT-enabled services saw a compound annual growth rate of 37%, which resulted in significant growth. The swift proliferation of information and communications technologies prepares the stage for the continued growth of the electronics and computer hardware industries. In a country of 160 million people in 2017, the personal computer (PC) market and the electronics market both grew by 40%. This industry is highly integrated with assembling and repairing services that have strong potential to enter manufacturing.

According to the findings of the research conducted by Scott et al. (2002), there was a correlation between the relevance ranking of industry and the abilities had by students in specific domains. Despite the fact that there is a correlation between the specific skills that the business wants and those that students possess, the official Information System (IS) curriculum continues to be deficient in imparting knowledge of key technical and technological skills.

The study was conducted using a survey method, where questionnaires were sent out to software industries and computer science program graduates in Bangladesh. The study collected data on the skills required by software industries in Bangladesh and the skills possessed by computer science program graduates.

Begum et al., 2008 The results of the study indicated that there is a significant gap between the skills possessed by computer science program graduates and the skills required by software industries in Bangladesh. The study found that while computer science programs in Bangladesh provide students with a strong theoretical foundation in computer science, they often lack practical training and industry-specific skills. Software industries in Bangladesh reported that graduates lacked critical thinking skills, problem-solving skills, communication skills, and practical experience.

Computer science program graduates, on the other hand, reported that they lacked industry-specific skills and practical experience.

Scott et al. (2002) the study suggests that computer science programs in Bangladesh need to be redesigned to better align with the needs of the software industry. This could include the incorporation of more practical training and industry-specific skills in the curriculum. Additionally, internships and apprenticeships could be encouraged to provide students with practical experience.

In his analysis, Azim et al. (2016) noted that all of the studies examined students' achievement in the cognitive domain, with some studies taking an experimental approach to the research. Because of this, the demonstrated relationship between students' abilities and their levels of achievement are well-known in the cognitive realm. The extent to which students' abilities may accurately predict their learning results in the affective and psychomotor domains is, however, something that is still not entirely evident. Espinosa (2017) utilized cross-sectional empirical data from Vietnam to depict the education process of cognitive and emotional (affective) abilities in order to demonstrate the significance of two aspects that are frequently disregarded in the research that has been conducted. In order to measure the production of educational results in a manner that is more realistic, an examination of affective capacities was conducted as an educational outcome. The findings demonstrated that children's innate characteristics had an effect on both their cognitive and affective outcomes. In spite of its emphasis on these two domains, Espinosa's research did not take into account the psychomotor component of the learning process. Therefore, the purpose of the current study was to link the intrinsic capacity of students to learning outcomes across all three domains (cognitive, affective, and psychomotor) in order to fill in the information gaps that had been identified in the existing body of research.

Taking into consideration the level of analytical and technological expertise possessed by its population, Bangladesh stands out as a country that has the potential to become an exporter of software. One of the countries with the most potential for expanding its software sector is Bangladesh, which is currently home to a thriving software development community. Around 250 firms, according to the Bangladesh Association of Software and Information Service (BASIS), are working closely with the development of software for both the domestic and international markets for various information and communication technology services. 1. The human resource is the sole

type of property that is considered to be in surplus in the country of Bangladesh. The software sector is a very prospective field because it has the potential to earn foreign exchanges and eliminate the problem of unemployment at the same time. In the past several years, various strategies have been developed by both the public sector and private organizations in order to increase the profitability of this industry. The government of Bangladesh commissioned an in-depth research to determine how the software industry in the country could be adapted to better meet the requirements of international consumers and businesses. A high powered National Standing Committee (NEC) on software export has been constituted in order to follow up on the outcome of the study and to monitor the difficulties related with the growth and development of the sector. The concerned government offices, organizations, and leaders of the software trade have been brought together under the auspices of this standing committee so that they can work together to investigate the challenges and opportunities facing the sector.

The study suggests that computer science programs in Bangladesh need to be redesigned to better align with the needs of the software industry. This could include the incorporation of more practical training and industry-specific skills in the curriculum. Additionally, internships and apprenticeships could be encouraged to provide students with practical experience.

The findings of the study are consistent with previous research on the skills gap between graduates and industry requirements (Uddin, 2021). A study conducted by the International Labor Organization (ILO) found that there is a significant mismatch between the skills possessed by graduates and the skills required by industries in Bangladesh (ILO, 2017). Another study conducted by the Bangladesh Association of Software and Information Services (BASIS) found that the lack of practical experience and industry-specific skills is a major barrier to the employment of computer science program graduates (BASIS, 2017).

The current job market in Bangladesh is becoming increasingly competitive for newly graduated workers. Improving one's employability through further education can help one reach their personal learning goals as well as increase their work prospects. However, there is a skill gap among recently graduated students who just have academic knowledge but lack practical experience. This skill gap can be solved by acquiring soft skills, as stated by Roos et al. (2016). According to Kechagias (2011), it is necessary to learn soft skills through training, particularly through self-training, attending language lessons, presentation skills development session, and

mingling with others. It has also been discovered that the use of soft skills in the workplace is rather low in Bangladesh, and that very few measures have been done by employers to improve these skills (Hossan et al., 2012; Zaman et al., 2018). This was found by Hossan and his colleagues in 2012 and by Zaman and his colleagues in 2018. As a result, the primary concentration of this research is on the students' points of view regarding the significance of acquiring soft skills and the connection between such talents and their chances of finding employment early in their careers. Exploratory Factor Analysis (EFA) was used in this research to determine which "soft skills" are most generally thought to be necessary for students to possess in order to be employable in Bangladesh. Confirmatory Factor Analysis (CFA) was performed first, and then Structural Equation Modelling (SEM) was used to investigate the links between graduates' employability and the graduates' soft skills (obtained by EFA) practices.

In conclusion, the skills gap between computer science program graduates and industries in Bangladesh is a significant issue that needs to be addressed. The study conducted in this regard suggests that there is a need for a redesign of computer science programs to incorporate more practical training and industry-specific skills. The findings of the study are consistent with previous research on the skills gap between graduates and industry requirements in Bangladesh.

1.3 Statement of problem

The problem that this study seeks to address is the skills gap between computer science program graduates and the software industry in Bangladesh. The software industry in Bangladesh has been growing rapidly in recent years, and it is projected to continue to grow in the future. However, there is a perception that there is a gap between the skills possessed by computer science program graduates and the skills required by the software industry.

According to a report by the Bangladesh Association of Software and Information Services (BASIS), the software industry in Bangladesh is facing a shortage of skilled professionals, which is affecting the growth of the industry (Uddin, 2021). The report highlights that there is a lack of skilled software developers, project managers, and business analysts in the industry. This shortage is attributed to the skills gap between the graduates of computer science programs and the requirements of the software industry.

Furthermore, research conducted by the Bangladesh Institute of Development Studies (BIDS) revealed that the coursework for computer science degree programmes in Bangladesh is predominately theoretical, with little to no focus placed on the development of practical skills. It is possible that as a result of this, there will be a skills gap between those acquired by graduates of computer science programmes and those required by the software business.

Therefore, the problem that this study seeks to address is the skills gap between computer science program graduates and the software industry in Bangladesh. The study aims to identify the skills required by the software industry in Bangladesh and the skills possessed by computer science program graduates, and to assess the extent of the gap between these skills. The results of the study can help to identify the areas where computer science programs in Bangladesh need to be improved to better prepare graduates for the software industry and to enhance the employability of computer science program graduates.

1.4 Purpose of the study

The purpose of the study on skills gap assessment between computer science program graduates and industries of Bangladesh is to understand the perception of software industries in Bangladesh regarding the skills gap between computer science program graduates and the software industry, and to identify the areas for improvement to bridge this gap. The specific objectives of the study are:

- To assess the skills possessed by computer science program graduates in Bangladesh.
- To identify the areas where computer science programs in Bangladesh need to be improved to better prepare graduates for the software industry.
- To identify the skills that are most important for the software industry in Bangladesh, which can be used to develop training programs for computer science graduates.

The findings of the study can be used to improve the quality of computer science programs in Bangladesh, to ensure that they adequately prepare graduates for the software industry. The findings can also be used to develop training programs and initiatives to bridge the skills gap between computer science program graduates and the software industry in Bangladesh. This can

help to enhance the employability of computer science program graduates and support the growth and sustainability of the software industry in Bangladesh.

1.5 Objective of the study

The objectives of the study on skills gap assessment between computer science program graduates and industries of Bangladesh are:

- To assess the skills possessed by computer science program graduates in Bangladesh: The study aims to assess the current skill level of computer science program graduates in Bangladesh. This will help to identify the areas where CSE/SWE graduates' curricula are lacking and where improvement is needed.

Overall, the objectives of the study are to identify the skills gap between computer science program graduates and the software industry in Bangladesh and to provide recommendations for bridging this gap. This will help to enhance the employability of computer science program graduates and support the growth and sustainability of the software industry in Bangladesh.

1.6 Research questions and hypotheses

Research Questions:

- What is the relationship between the perceived skill gap of CS/SWE graduates working in industry and their level of satisfaction with their knowledge curricula, emotional and attitudinal aspects, and perceived skill level?

Hypotheses:

- Knowledge curricula will highly predict skill perceived.
- Knowledge curricula will have a significant relationship with emotion & attitudinal aspects.
- Emotion & attitudinal aspects will also have a significant correlation with skill perceived.

- Emotional & attitudinal aspects mediate the relationship between knowledge curricula and skill perceived.

Note: These hypotheses are tentative and would require further refinement based on the results of the study.

1.7 Significance and originality of the study

The study on skills gap assessment between computer science program graduates and industries of Bangladesh has significant practical and theoretical implications. The findings of the study can be useful to:

- Academic institutions: The study can help academic institutions to identify the areas where computer science programs need to be improved to better prepare graduates for the software industry. This can help to enhance the employability of graduates and improve the quality of computer science education in Bangladesh.
- Software industries: The study can provide software industries in Bangladesh with insights into the skills possessed by computer science program graduates and the areas where improvement is needed. This can help software industries to develop better recruitment strategies and identify training needs for their employees.
- Policy-makers: The study can inform policy-makers in Bangladesh about the skills gap between computer science program graduates and the software industry. This can help policy-makers to develop policies and initiatives to bridge this gap and support the growth and sustainability of the software industry in Bangladesh.

1.8 Originality of the study

This study is unique in that it focuses explicitly on the skills gap between graduates of computer science programmes and the software industry in Bangladesh. This is a topic that has not previously been researched. There have been studies conducted on the skills gap in other nations; however, there has not been enough research conducted on this subject in Bangladesh. This study

will shed new light on the talents that are required by the software industry in Bangladesh, the skill level of graduates from computer science programmes, and the areas in which there is a need for improvement. The study will also contribute to the establishment of strategies and initiatives for bridging the skills gap between computer science programme graduates and the software industry in Bangladesh. These strategies and initiatives will be developed as a direct result of the findings of the study.

Chapter 2 Literature review

2.1 Introduction:

The software industry in Bangladesh is a sector of the economy that is expanding at a rapid rate and is adding considerably both to the GDP and employment levels of the country. However, the sector is confronting a significant obstacle in the form of a skills gap, which may be defined as a disparity between the abilities possessed by graduates of computer science programs and the skills required by the business. It has been determined that this void presents a significant challenge to the expansion and long-term viability of the software sector in Bangladesh. In this section, we conduct a literature review on the topic of the skills gap that exists in Bangladesh between graduates of computer science programs and those working in the software business.

2.2 Literature Review:

A several studies have been conducted to evaluate the skills gap that exists between graduates of computer science programs and software industry professionals in Bangladesh (Radermacher et al., 2014). For instance, a study conducted by discovered that there is a considerable gap between the abilities acquired by graduates of computer science programs and the skills required by the software industry in Bangladesh (Radermacher et al., 2014). This was found to be the case when comparing the two groups' respective skill sets. According to the findings of the study, one of the primary causes for this gap is a lack of exposure to real-world problems and challenges as well as a lack of practical experience.

Afroze et al., 2019 Another study by Sarker and Islam (2018) found that the technical skills possessed by computer science program graduates in Bangladesh are not sufficient for the software industry. The study recommended that computer science programs in Bangladesh need to be revised to better align with the needs and requirements of the software industry. We have not been able to find any published reports of rigorous initiatives by companies addressing the gap through systematic, pre-employment training targeted at graduating students.

Similarly, a study by (Uddin, 2021) found that computer science program graduates in Bangladesh lack certain technical skills, such as programming languages, software development frameworks,

and database management. The study also found that graduates lack certain non-technical skills, such as communication, critical thinking, and problem-solving.

Radermacher and others (2014) The use of case studies was another well-liked technique for identifying typical challenges and concerns faced by freshly employed recent graduates. Eight new software developers at Microsoft were the subject of a two-month case study by Begel et al. The study's researchers discovered that the new software engineers had the most trouble collaborating and communicating. One concrete illustration was the fact that several of the new developers were reluctant to seek clarification, even when they were having difficulties. Additionally, a number of technical problems were mentioned as a frequent source of difficulty. The use of the revision control system was the most frequently encountered issue, with which six of the eight subjects had some sort of difficulty. When attempting to resolve errors in their code, four of the individuals reportedly had trouble using debugging tools properly.

Furthermore, a study by Garousi et al., 2019 found that there is a lack of collaboration between academic institutions and the software industry in Bangladesh. The study recommended that academic institutions should collaborate with the software industry to provide students with practical experience and exposure to real-world problems and challenges.

In addition to these studies, other studies have also identified the skills gap between computer science program graduates and the software industry in Bangladesh. These studies highlight the need for academic institutions to revise their curricula to better align with the needs and requirements of the software industry, provide students with practical experience and exposure to real-world problems and challenges, and collaborate with the software industry to bridge the skills gap.

The literature review highlights the significant skills gap between computer science program graduates and the software industry in Bangladesh. The studies identified a lack of practical experience, insufficient technical and non-technical skills, and a lack of collaboration between academic institutions and the software industry as the main reasons for this gap. The findings of the studies suggest that computer science programs in Bangladesh need to be revised to better align with the needs and requirements of the software industry, and academic institutions need to collaborate with the software industry to provide students with practical experience and exposure to real-world problems and challenges.

2.3 Categories of skills linked with employability

Multiple research studies have been published in the literature that have found a variety of industry skills (skills related to job). Asheim et al. (2009), for example, identified three major categories of skills:

- Technical expertise
- Non-cognitive or soft skills, as well as
- cognitive capabilities

Other studies cited abilities under different titles. For instance, "Employability skills" are vital abilities that are combined with knowledge, skills, and attitudes that are necessary for 21st century workplaces (Salina Daud, 2012). Further details on them include:

- Individual skills (communication skills, respect, computer skills and cultural skills)
- Skills covering individual reliability (individual management, ethical, and vocational maturity)
- Economic skills (problem-solving skills, learning skills, employability and career development skills).
- Group and organizational effectiveness (interpersonal skills, organizational skills, negotiation skills, creativity, and leadership). (Radermacher et al., 2014)

However, the necessary abilities that are covered in literature for the twenty-first century are not generally available. Although they may go by different names in other studies, most of the talents are linked and interconnected. Because of this, this study suggests two major talents that are also those of recent research by S. Jayaram and Engmann (2017) and S. Jayaram, Munge, Adamson, Sorrell, and Jain (2017).

Technical skills: A technical talent is an aptitude that is connected to the accomplishment of a certain task. Apprentices must be capable of carrying out specialised duties or working in a position related to the software sector (development role/management tool).

soft or non-cognitive skills Any talent that is connected to behaviour (human life) is considered non-cognitive. Apprentices should be able to manage a variety of issues that are unrelated to the other two abilities. It combines a variety of qualities, including leadership, communication, emotional stability, and other behavior-related attitudes.

The skills that are associated with employment have been the subject of extensive research (Garousi et al., 2019a). Therefore, it is still essential to conduct more detailed research on the employability skills needed in Bangladesh's businesses.

2.4 Employability skills

Employability skills refer to a set of transferable skills and personal attributes that are required for success in the workplace (Wickramasinghe & Perera, 2010). These skills go beyond technical or academic qualifications and include a range of abilities such as communication, teamwork, problem-solving, critical thinking, time management, adaptability, leadership, and initiative.

Employability skills are essential for individuals seeking to enter or progress in the workforce (Aheisibwe, 2021). Employers often prioritize candidates with strong employability skills as they are better equipped to work effectively in teams, communicate with clients and colleagues, and adapt to new situations and challenges.

In recent years, the importance of employability skills has been increasingly recognized in the academic sector (Skevi et al., 2014). Universities and other higher education institutions have started to incorporate employability skills development into their curricula to better prepare their students for the job market. These efforts aim to bridge the gap between academic knowledge and practical skills required by employers.

According to the findings of a number of studies, students who have excellent employability skills have a greater chance of securing work, as well as a higher level of job satisfaction and career growth than their counterparts who lack these abilities (Garousi, Giray, Tuzun, et al., 2019).

In general, employability skills are essential for achieving success in the workplace. Furthermore, it is becoming ever more vital for students and those looking for work to cultivate these skills and demonstrate them to potential employers.

2.5 Categories of skills linked with employability

Over the course of the past few years, employability skills have evolved into a criterion that has become an increasingly significant consideration for students as well as those who are actively seeking jobs. Employability skills are required for effective job searching as well as the evolution of one's career, as the findings of a study carried out by(Garousi et al., 2019) indicate. An additional point of emphasis was given on the necessity of employability skills by (Jony et al., 2022), who claimed that these qualities are crucial for both obtaining job and progressing one's career.

Cognitive, psychomotor, and emotional skills are the sub-categories that make up employability skills, as stated by Roberts et al. (2013). In order to be successful in business, you need cognitive talents that are at a specific degree of proficiency to be able to solve problems, make decisions, and plan strategically. These qualities include the capacity to think logically, analyse facts, and pay great attention to details. On the other hand, psychomotor skills are role- and industry-specific competencies that can only be acquired through a combination of academic study and practical application in the workplace. Examples of psychomotor skills include the operation of machinery, the programming of computers, and the performance of medical operations. Affective skills are human attributes that relate to feelings, attitudes, and the ability to engage with other people in social circumstances. Affective skills can also refer to the capacity to interact with other people. Some of the skills that fall under this area include self-motivation, self-management, leadership, and the ability to work well with others. Communication, leadership, and interpersonal skills are also included.

Universities and other types of higher education institutions have begun to incorporate training in employability skills into their academic programmes as a result of the value that has been placed on these skills and the fact that they have been recognised by these institutions. Work-integrated learning (WIL) programmes are successful in promoting the development of employability skills in students, according to the findings of a study that was done by Radermacher et al., (2014). Students who take part in WIL programmes, which combine classroom instruction with real-world experience in the workplace, have the opportunity to build the academic and professional knowledge and abilities necessary for them to be successful in the workforce. This opportunity is

made available to students as a result of the integration of classroom instruction with real-world work experience.

Students who do not have strong employability skills have been shown in a number of studies to have a lower likelihood of getting work, as well as a lower level of job satisfaction and career progression (Radermacher et al., 2014). In comparison, students who do have good employability skills have a higher chance of securing work, as well as a higher level of job satisfaction and career growth. This is a consequence of the fact that students who graduate with high employability skills have a greater chance of finding work after graduation.

Overall, employability skills are a combination of cognitive, psychomotor, and emotional abilities that are required for success in the workplace. These skills are needed for success in the workplace. Students have been demonstrated to benefit from work-integrated learning programs, which have been shown to be beneficial in increasing students' practical skills and knowledge. As a result, higher education institutions have begun adding employability skills development into their curricula through these programs.

Table 1 Skill needs in South Asia

Delhi	Mumbai	Bhopal	Lahore	Dhaka
Non-cognitive				
Communication	Aptitude	Quest for knowledge	Voluntarism	Diligence
Leadership	Willingness to learn	Good communication skill	Leadership	Interpersonal skills
	Appearance and personality	Teamwork and social interaction	Career planning	Behavioral skills
	Diligence and hard working	Quick responsiveness	Communication	Adaptability
	Influencing skills	Time management	Entrepreneurial skills	Time management
	Multitasking	Positive thinking and attitude	Attitude	Attitude
				Dignity of labor
Cognitive				
Critical thinking	3R's		Conceptual understanding	
Specific and technical skills				
	Problem-solving	Flexibility and adaptability	Hands-on experience	Secretarial skills
		Physical fitness and stamina		Language
				ICT
				Business acumen
				Negotiations skill
				Secretarial skills
				Accounting skills
				Kaizen method
Values				
		Values and ethics	Loyalty	Understanding
		Honesty	Respect for seniors	Commitment
		Commitment and dedication		Sincerity

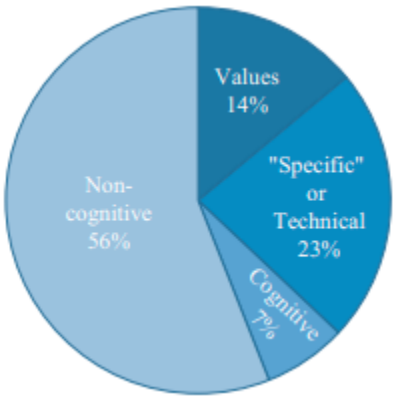


Figure 1 Skills prioritized by employers in South Asia

2.6 Need of Skills Development for Future Employability

In just a few short months, the COVID-19 epidemic has profoundly transformed how people all around the world understand what it means to be normal in a way that hasn't been seen in any previous decade in modern history.

It has already had an impact on how people in different parts of the world think about different companies and services, and this perception will continue to shift in the years to come (Zeidan et al., 2020) . (Alam et al., 2022) stated that the world needs to reconstruct itself so that it conforms to the status quo that has been established following COVID-19 in order for it to be able to resume its action towards greater effectiveness, advancement, and sustainability.

As a consequence of this, the majority of significant organisations in Bangladesh would commit their resources to retraining their workforce or recruiting candidates in accordance with the new typical standards emphasising 4IR. As a consequence of this, recent university graduates would need to require additional competency and skills development in order to find employment in the period following COVID-19. In the new normal that will exist after COVID-19, tertiary educational institutions and other facilities of a similar nature will play an important role.

As a result, it is reasonable to anticipate that increasing employability competency through the development of skills will be at the top of every nation's priority list in the era that will follow COVID-19. This is the case if the nation wishes to become healthier, more competent, and more sustainable than simply producing highly educated graduate students from tertiary educational institutes with outstanding academic performance. The primary objective will be to produce university graduates from tertiary educational institutes who are capable of overcoming unexpected and anticipated obstacles, and to turn them into a source of development and differentiation for their organisations through the utilisation of the skills they have gained through education and training. This will be accomplished by producing competitive university graduates. Academic competence on its own will no longer be sufficient in the eyes of employers for employing university graduates in post-COVID-19 periods, and without proper competency and skills development, university graduates will fail to secure future employment in post-COVID periods (Jony et al., 2022) . This is the result of the fact that academic competence on its own will no longer be sufficient.

However, numerous studies conducted over the course of the past year by (Exter, 2014) , (Coll et al., 2002), and (Scott et al., 2002) have demonstrated that the higher educational (HE) institutes in the country are still using outmoded curricula and have not embraced the use of ICT in the classroom. In addition, these higher education institutions have almost little impact on the graduates' capacity to build their skills and competencies for future employment opportunities. During COVID-19, the country's dearth of institutions of higher education was brought into sharper focus. In comparison, institutions of higher education on a global scale are increasingly embracing the utilisation of new technologies, innovations, and regulations in order to solve these concerns (Azim et al., 2016). Research carried out thereafter by (Cappel, 2002; Fang et al., 2005).

According to (Wickramasinghe & Perera, 2010) and (Lethbridge, 2000), companies have been placing a significant emphasis, when it comes to hiring, on the skills and competencies of graduates.

During COVID-19, the country's employers made an even clearer demonstration of how much of an importance they place on the development of skills and competencies.

2.7 Skills requirement in south Asian region

This section relies from the report on curriculum skills in South and Southeast Asia that was produced by the National University of Educational Planning and Administration (NUEPA) (Sirohi & Singh, 2012). Five cities in India, Pakistan, and Bangladesh hosted focus groups with a total of 87 business owners: New Delhi, Mumbai, and Bhopal in India; Lahore in Pakistan; and Dhaka in Bangladesh. Interviews were conducted with a total of 49 employers based in India, while interviews were conducted with a total of 19 employers based in the remaining two cities. The participants reflected the industries in the area that are experiencing rapid expansion, and a significant number of them were directly involved in youth recruitment and education. The discussion in the focus groups was centered on the following four topics: the perception of skills, the demand of general abilities, the possibility of obtaining skills while still in school, and the skill shortages in specific industries. The most important ones are summarized in Table 1.1, which may be found below. There are possibly two distinct recurring themes that have emerged from the employer interviews that took place throughout the three South Asian countries. The first is the significance of non-cognitive abilities, including communication, leadership, honesty and ethics, collaboration, and adaptability (Fig. 1.2).

The second is the significance of having the ability to learn, whether that learning is overt, as it is in the case of Mumbai, or covert, as it is in the case of many of the other cities (Delhi: critical thinking and analytical abilities; Bhopal: thirst for knowledge; Lahore: conceptual

understanding). Another topic that emerged from the employer focus groups in South Asia was that secondary school teachers (both general and technical/vocational) lacked a grasp of what is important to businesses as well as proper training and assistance. The education of educators continues to be a significant concern; insufficiently qualified teachers lead to outmoded methods of pedagogy and limit the potential for student growth.

2.8 Skills gap between computer science/Software engineering graduate and software industry

The skills gap between computer science and software engineering graduates and the software industry is a growing concern globally (Berger & Frey, 2016). While universities and other higher education institutions are offering computer science and software engineering programs, the industry demands a set of skills that are often not adequately addressed in these programs (Lethbridge, 1998).

One major factor contributing to the skills gap is the rapid pace of technological change, which makes it challenging for higher education institutions to keep up with the latest trends and technologies (Skevi et al., 2014). As a result, graduates may lack the skills required to work with the latest technologies and tools that are in demand in the industry.

Another factor is the mismatch between the curriculum and the demands of the software industry. Some studies have shown that the curriculum of computer science and software engineering programs does not adequately address the practical skills and knowledge required by the industry (Weaver & Osterman, 2017) This mismatch can lead to a skills gap where graduates lack the skills required to meet the needs of the industry.

The skills gap can have significant implications for graduates and the industry. Graduates may struggle to find employment or may require additional training to develop the skills required by the industry. On the other hand, the industry may face challenges in filling critical positions and may have to invest resources in training and development to bridge the skills gap. To address the skills gap, some universities and higher education institutions are incorporating industry partnerships, internships, and other forms of experiential learning into their programs (Garcia et al., 2018; Hobbs et al., 2018). These initiatives can help students gain practical skills and knowledge and develop industry-relevant skills that are in demand.

The skills gap between computer science and software engineering graduates and the software industry is a growing concern globally. The mismatch between the curriculum and industry demands and the rapid pace of technological change are major factors contributing to the skills gap. Addressing the skills gap requires collaboration between universities and the software industry, and the incorporation of industry partnerships, internships, and other forms of experiential learning into the curriculum.

2.9 Computer science/software engineering curricula and industry collaboration

It is necessary for the software industry and higher education institutions to work together to close the skills gap that exists between graduates of computer science and software engineering programs and industry professionals. According to (Stojanovic et al., n.d.), higher education institutions can incorporate insights provided by the industry into their curricula. These insights can be provided by the industry regarding the skills and knowledge required by the sector.

The incorporation of feedback from industry professionals into the process of creating curricula for computer science and software engineering is one kind of collaboration. According to Cappel (2002), this strategy entails soliciting feedback from relevant industry stakeholders about the development of the curriculum, the content of the courses, and the delivery methods. Input from industry can be helpful in ensuring that the curriculum is relevant to the expectations of the business and that graduates obtain the skills and knowledge required by the sector.

The offer of internships and co-op programs is yet another kind of partnership. These programs give students the opportunity to obtain practical experience and build skills that are relevant to the business. According to (Jones et al., 2018), students who participate in internships and co-op programs have the opportunity to work on projects that are relevant to the real world and develop skills that are not normally covered in the classroom setting. Students will also get the opportunity to network with industry leaders and acquire insight into the work culture of the business through participation in these activities.

Universities and other types of higher education institutions can facilitate research and development (R&D) efforts by forming collaborations with software firms. These relationships might take the form of internships, cooperative education programs, or both. According to (Jones

et al., 2018), students who participate in research and development projects are given the opportunity to work on cutting-edge research projects and gain skills that are in demand in the industry.

Overall, it is very necessary for educational institutions of higher learning and the software industry to work together in order to close the skills gap that exists between graduates of computer science and software engineering programs and the industry. The incorporation of input from industry into the formulation of curricula, the provision of internships and co-op programs, and the formation of partnerships for research and development can all be considered forms of collaboration.

Chapter 3 Methodology

3.1 Introduction

The software industry in Bangladesh has seen tremendous growth in recent years, with the sector contributing significantly to the country's economy. However, despite the increasing number of computer program graduates, the software industries in Bangladesh often face challenges in finding suitable candidates for their job vacancies. This situation suggests that there is a mismatch between the skills possessed by computer program graduates and the skills demanded by software industries. The skills gap between computer program graduates and software industries is a critical issue that has far-reaching implications for the employability of graduates and the productivity and growth of the software industry in Bangladesh.

To address the skills gap, it is crucial to understand the perception of software industry professionals regarding the skills of computer program graduates. This study aims to fill this research gap by exploring the perception of software industry professionals in Bangladesh towards the skills gap of computer program graduates. The study will use a quantitative research approach to collect and analyze data from a sample of software industry professionals in Bangladesh.

3.2 Theoretical Background

The skills gap theory proposes that there is a mismatch between the skills possessed by job seekers and the skills required by employers. This mismatch can result in a shortage of skilled workers in the labor market and decreased productivity and competitiveness of industries (Billett, 2011). The skills gap theory emphasizes the need for continuous assessment of the skills demanded by industries and the incorporation of those skills in the curriculum of educational institutions.

In the context of Bangladesh, the skills gap between computer program graduates and software industries has been identified as a significant challenge (Khan, 2020). The rapid advancement of technology and the changing demands of software industries make it difficult for educational institutions to keep up with the required skills. Additionally, the lack of coordination between industry and academia has been identified as a significant barrier to addressing the skills gap (Sarwar & Alam, 2019).

To address the skills gap between computer program graduates and software industries in Bangladesh, there have been calls for more effective assessment of skills demanded by industries and incorporation of those skills in the curriculum of computer program courses (Sarwar & Alam, 2019). This study seeks to contribute to this discussion by assessing the perception of software industries in Bangladesh regarding the skills gap of computer program graduates. The findings of this study can provide insights into the skills demanded by software industries in Bangladesh and contribute to the development of effective strategies for bridging the skills gap.

Moreover, the role of perception in shaping the job market is a crucial factor to consider in this study. Industry perception of the skills and competencies of graduates can have a significant impact on their employability and career opportunities. For example, if the industry perceives that graduates lack certain skills, they may be less likely to hire them, leading to a mismatch between the supply and demand of labor.

In summary, the theoretical background of this study is based on the existing literature on skills gap analysis, industry-academic collaboration, and the role of perception in shaping the job market. The aim of this study is to contribute to the literature by exploring the perception of software industries in Bangladesh regarding the skills and competencies of computer program graduates, in order to identify the skills gap and potential solutions to address this issue.

3.3 Research model and hypothesis development

Prior literature has utilized different theoretical frameworks for studying knowledge curricula, emotional and attitudinal aspect , and skills perceived .

The present study establishes a model that utilizes the combination of these frameworks for understanding the relationship between knowledge curricula, emotional and attitudinal aspect, and skills perceived. The main reason behind coming up with a model is that there isn't one. The present model comprises three constructs, namely, knowledge curricula, emotional and attitudinal aspect, and skills perceived .

Our research model is presented in Fig. 1.

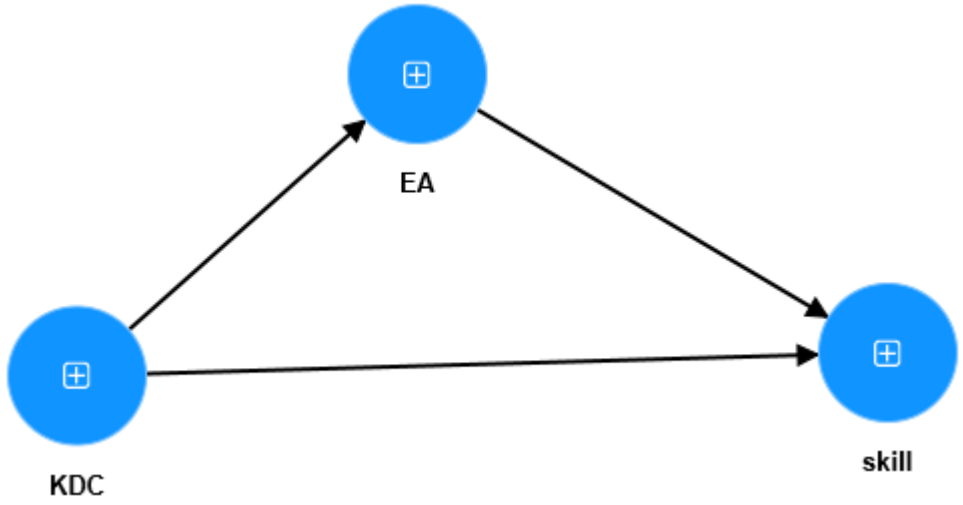


Figure 2 Research model

Therefore, the proposed research will investigate the relationship between knowledge curricula, emotional and attitudinal aspects, and skill perceived, with knowledge curricula as the indicator variable and emotional and attitudinal aspects as the mediating variables.

The research will aim to explore the extent to which emotional and attitudinal aspects mediate the relationship between knowledge curricula and skill perceived among computer program graduates in the software industry of Bangladesh. By investigating these relationships, the study can identify effective approaches to designing educational and training programs that promote holistic learning and development and enhance the acquisition and transfer of skills in graduates.

Individuals higher on skills perceived might be more susceptible to perceiving higher social demands because of not wanting to miss out and may be motivated to seek relationships to quell their anxiety and needs deficits (Budnick et al., 2020). As such they are more prone to expend mental energy considering social elements and neglect to take adequate downtime as a result, leading to increased symptoms of burnout. fear of missing out is currently a hot topic in the popular, with emerging works showing that general FOMO predicts negative health and well-being indicators, such as anxiety, fatigue, and poor overall life satisfaction (Alt, 2018; Elhai et al., 2016; Przybylski et al., 2013; Wolniewicz et al., 2018). The FOMO on some social media posts or information of friends forces one to use social media compulsively (Pradhan, 2022). General

FOMO has a positive relationship with social media account checking frequency (Alt, 2018; Scott & Woods, 2018; Przybylski et al., 2013; Budnick et al., 2020). Also, Higher levels of FOMO predict higher reports of burnout, message-checking behaviors compulsive use behavior (Budnick et al., 2020; Desjarlais & Willoughby, 2010; Oberst et al., 2017) To our knowledge, there is no research to date linking FOMO with academic burnout, but we anticipate that FOMO will be related to academic burnout. Thus, we hypothesize the following;

H1: Knowledge curricula will highly predict skill perceived.

For example, a study by on the skills gap assessment between computer program graduates and industries in Bangladesh found that there was a significant gap between the skills possessed by graduates and the skills required by the industry. The study also found that a major contributing factor to this gap was the lack of industry-oriented curricula in the educational programs.

Similarly, a study by Azam and Shaheen (2018) on the impact of curricula on the perceived employability of graduates in Pakistan found that the alignment of curricula with industry needs was a significant predictor of graduate employability.

These studies suggest that there is a strong relationship between the knowledge curricula taught in educational programs and the perceived skills of graduates. When curricula are designed to align with industry needs, graduates are more likely to possess the skills that are valued by employers. Therefore, it is reasonable to hypothesize that knowledge curricula will highly predict skill perceived.

H2: Knowledge curricula will have a significant relationship with the emotional & attitudinal aspects.

For example, a study by Adedoyin and Soykan (2019) on the effect of curriculum on students' emotional intelligence found that the inclusion of emotional intelligence components in the curriculum had a positive effect on students' emotional intelligence development. Similarly, a study by Roth and Assor (2012) found that the way educational material is presented can affect students' motivation and attitudes towards learning.

These studies suggest that knowledge curricula can impact emotional and attitudinal development, and that educational programs can be designed to promote positive emotional and attitudinal

outcomes. Therefore, it is reasonable to hypothesize that knowledge curricula will have a significant relationship with emotional and attitudinal aspects, and that curricula designed to promote emotional and attitudinal growth will have a greater impact on graduates' emotional and attitudinal development.

H3: Attitudinal aspects will also have a significant correlation with skill perceived.

For example, found that those present a study by Latham and Locke (2019) found that positive attitudes towards a task were significantly correlated with higher levels of skill development and performance. Similarly, a study by Mullen et al. (2016) on the relationship between attitudes and skills in healthcare found that positive attitudes towards learning and skill development were associated with higher levels of skill acquisition and performance.

These studies suggest that attitudes can impact skill development and performance, and that positive attitudes towards skill development can lead to higher levels of perceived skill. Therefore, it is reasonable to hypothesize that attitudinal aspects will also have a significant correlation with skill perceived, and that positive attitudes towards skill development will be associated with higher levels of perceived skill.

H4: Attitudinal aspects will mediate the relationship between knowledge curricula and skills perceived.

For example, a study by Chen and Elliott (2017) on the mediating role of attitudes in the relationship between educational quality and skill development found that positive attitudes towards learning and education played a significant mediating role in the relationship between educational quality and skill development.

Similarly, a study by Hamdan and Aman (2017) on the role of attitudes in the relationship between curriculum and academic performance found that attitudes towards the curriculum played a significant mediating role in the relationship between curriculum and academic performance.

These studies suggest that attitudes can mediate the relationship between educational factors and skill development, and that positive attitudes towards education and skill development can enhance the impact of educational factors on skill development. Therefore, it is reasonable to hypothesize that attitudinal aspects will mediate the relationship between knowledge curricula and skills

perceived, and that positive attitudes towards knowledge curricula will enhance the impact of knowledge curricula on perceived skill.

3.4 Research design

The study aimed to assess the skills gap between industry and CS/software curricula by using the opinions from industrial experts. This chapter describes methods used for data collection, Research model and hypothesis development analysis, and interpretation. A quantitative method was used in this research, which includes research design, area of the study, population, sample and research tool and data analysis procedure. The method employed in this research was descriptive type of quantitative research. Descriptive research was introduced to gathering of information about prevailing condition for the description and interpretation purposes.

To describe the current condition, practices and situation descriptive method of research is suitable, which is based on fact-finding and accurate interpretation of the findings. Since this study is concerned with the present status of CS/Software engineering curricula and industries relationship and the identification of skills gap between the requirement of industry and skills provided by the CS/Software engineering curricula, the descriptive method of research was found to be the most appropriate method to be used.

3.5 Research field

Researchers minimized the field of study into Software industries to find out a crystal-clear view of present skills condition of CSE/Software engineering graduates at workplace. Software companies located in Dhaka, Bangladesh were selected for conducting the research. The samples were from different areas of Dhaka.

3.6 Population and sample

The study was conducted on the industries situated in Dhaka, Bangladesh. The researcher selected participants from industries which are in the Dhaka region. To conduct this study, researchers sampled twelve industries from those in Dhaka. The industries selected randomly from the Dhaka region were shown in Table 3.

Title	Frequency	Percentage
Developer/Lead developer	40	54.8%
Software architect	5	6.8%
Project management	6	8.2%
QA architect	12	16.4%
Business analyst	2	2.7%
Corporate executive	1	1.4%
Bi & analytics lead	1	1.4%
System administrator	2	1.4%
Technical support & engineer	1	1.4%
Account	1	1.4%
Sr. engineer	1	1.4%
Offensive security and compliance	1	1.4%

Table 2 Demographic information

The number of participants for this study was targeted of about 150 from different software industries. Unfortunately, the numbers of software industries in Bangladesh are not responding well. That's why 72 respondents fill up the form from industries in where software/CS graduates are working, also selected for this study. The researcher followed a few characteristics of experts to select them as research participants. Characteristics of participant:

- The selected participants were highly skilled and experienced personnel.
- The eligible participants for the research were marked up to developer level or higher, from the software industry.
- All participants of this research obtained a minimum currently working in software industry to understand the research.

3.7 Preliminary Analysis / Descriptive analysis

Role

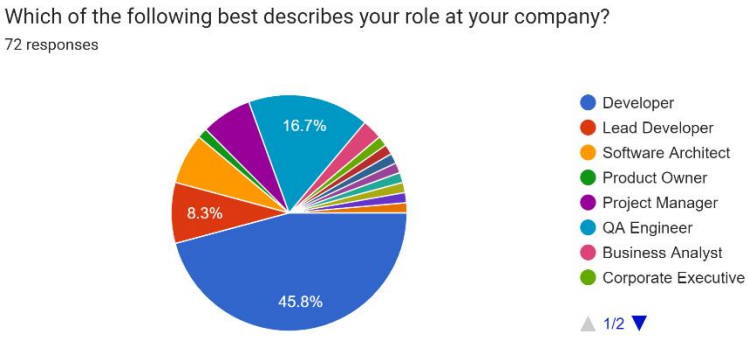


Figure 3 Role of there company

Most the data we got from the developers or lead developer, software architect, product owner or project manager , QA engineer and some business analyst and corporate executive

Size

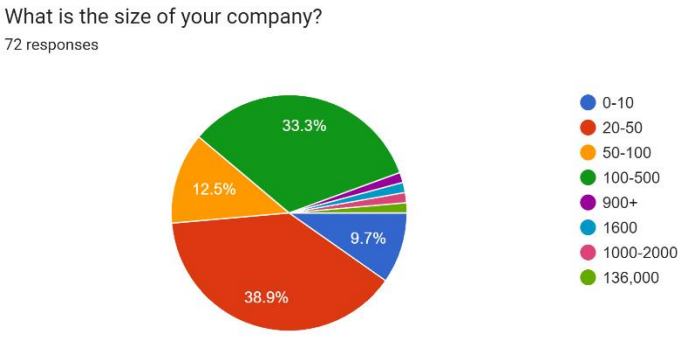


Figure 4 Size company

0-10: Micro-sized software companies typically have less than 10 employees, and may be characterized by a small, tight-knit team that is highly agile and able to respond quickly to changes in the market.

11-50: Small software companies usually have between 11 and 50 employees and may have a more established market presence and a slightly more structured organization than micro-sized companies.

51-100: Medium-sized software companies typically have between 51 and 100 employees, and may have a more defined organizational structure, with separate departments for development, marketing, and customer support.

101-500: Large software companies may have between 101 and 500 employees, and may have a more complex organizational structure, with multiple locations and a larger customer base. They may have more resources to invest in research and development, marketing, and sales efforts.

3.8 Research tool

The survey questionnaire which was used in this study has three sections (Section A, Section B, Section C and Section D).

Section A: Section A of the questionnaire contains general information about the participant and his workplace. Skill level of the experts was measured by asking the participants "What are your area of expertise?" Participants were ensured their skill level by answering the preformed multiple choices. The question, "How many years of work experience do you have in the software development industry?" clarified the expertise in his area. "How long have you been working at your current company? "Amount of CSE/SWE graduates employed at the industry were working same company how long?

Section B: In the 2nd phase of survey questionnaire, Participant's In the cognitive domain (knowledge curricula), assess knowledge, comprehension, application, analysis, synthesis, and evaluation, and the study examined these abilities in the context of software development with 10 items.

- In first sub-section, they were asked about the knowledge for the curricula they help them prepare to what they're working now was measured via six items (item 1 - item6).
- In second sub-section, the technical skills they have learn during undergraduate help them during employment was measured via 11 item (from item 7 to item 10).

The participants' opinions in10 items were measured using a five-point rating scale. Strongly agree (5) Agree (4) Neutral (3) Disagree (2) Strongly disagree (1) as shown in Table 3.2

Table 3. 2: Weighted average based on five-point scale SA (5) A (4) N (3) D (2) SD (1) 4.50-5.00 3.50-4.49 2.50-3.49 1.50-2.49 1.00-1.49

SA (5)	A (4)	N (3)	D (2)	SD (1)
4.50-5.00	3.50-4.49	2.50-3.49	1.50-2.49	1.00-1.49

Section C: In the 3rd phase of survey questionnaire. In the psychomotor domain (skill perceived), assessing the ability of CSE/SWE curricula help them working in industry to perform tasks such as coding, debugging, and software testing, as well as their proficiency in using various software tools and platforms and the study examined these abilities in the technical context of software development with 10 items.

Section D: In the 4th phase of survey questionnaire, Participant's In the affective domain (emotional & altitudinal aspect), assessing the ability of CSE/SWE graduates working in industry how graduates approach their work, communicate with others, and collaborate with team members and stakeholders and the study examined these abilities in the emotional & altitudinal aspect of software development with 10 items.

3.9 Data collection procedure

A close-ended questionnaire and a check list of skills was used during data collection in this study with few open-ended questionnaires to textually answer by the participants. Each participant was allowed to freely and voluntarily participate and respond to the questionnaire. Participants were informed about the confidentiality of his/her opinions and identity, and they were also informed that they are free to withdraw their participation at any time.

The questionnaire was distributed to the participants physically and via online. Most of the time researcher was available for giving further clarifications regarding the required responses. Out of twelve industries researcher went to eleven industries by himself.

3.10 Data analysis procedure

We conducted an analysis of the survey results making use of the partial least squares (PLS) method (Chin, 1998) and the SmartPLS 4 software. PLS is a second-generation regression method

that integrates confirmatory factor analysis with linear regression. This enables the measurement and structural models to be run simultaneously, which was not possible with earlier generations of regression methods. PLS is a suitable approach to use when the purpose of the study is both to evaluate the validity of a research model and to test the hypothesized associations within that model (Hair, Hult, Ringle, & Sarstedt, 2017). This is the case for the study that is being presented here, so PLS is the method that will be utilized.

The PLS-SEM method of model evaluation consists of a two-step approach. In the first step, the measurement models will be analyzed, and depending on the type of measurement model, the analysis will draw from a variety of different sets of metrics. In the context of reflective measurement models, it is necessary for the researchers to evaluate the indicator and construct reliabilities, as well as convergent and discriminant validity (Sarstedt et al. 2017a; Hair et al. 2019a). Formative measurement models need to be evaluated in terms of convergent validity, multicollinearity, and the importance and relevance of the indicator weights (Sarstedt et al. 2017a; Hair et al. 2019a). These are the aspects that need to be taken into consideration. Examining the structural model is the second phase, which focuses on determining the importance and relevance of the path coefficients, the model's explanatory capacity (i.e., the R2), and the model's predictive power (for example, by using PLSpredict; see Shmueli et al. 2016, 2019). Due to the conceptual difficulties that they present in the context of PLS-SEM, model ft testing with metrics such as SRMR or precise ft tests (Lohmoller 1989; Henseler et al. 2014) should be approached with considerable caution if they are to be considered at all (Hair et al. 2019a, b).

As a result, we divided the analysis into two parts and carried them out separately. To begin, we investigated the construct reliability as well as the convergent validity of the instrument [Composite reliability (CR), Cronbach's alpha, Outer loadings, Average variance extracted (AVE)]. In the second step of the process, we validated the structural equation model. Within the framework of the structural equation model, we implemented the estimate method known as maximum likelihood.

3.11 Validity and reliability

The items of the survey questionnaire and check list were adopted from the framework of Jayaram and Engmann (2017). The framework also dividend the skill set in different domain and sub-domain. To check the internal consistency of the instrument reliability coefficient was calculated.

To ensure the reliability of the questionnaire and skill set, a pilot study was conducted on a sample of 10 participants.

3.12 Ethical consideration

The study followed the tradition and did not break any rules and regulation acted upon the data collection process in Bangladesh or the enterprises contribute to the study. Following the rules of research data collection, this study do not disclose the name and identity of any participant and the response from the participant will strictly use only for the research purposes. Data gathered from industry was strictly kept confidential. The researcher ensured the participant about all condition and rules of the certain questionnaire before participant gives his valuable response.s

Chapter 4 Interpretation and Results

4.1 Introduction

The chapters titled "Interpreatation" and "Results" show in great depth the findings that were obtained by conducting the study of the data. PLS SEM analysis that also takes into account the evaluation of the structural model and measurement data. It is the responsibility of the measurement model to determine whether or not the construct is reliable and valid. The relevance of postulated linkages can be determined with the use of the structural model. In order to investigate the relationship between the predictors and the outcome, various hypotheses were put up.

H1: Knowledge curricula will highly predict skill perceived.

H2: Knowledge curricula will have a significant relationship with affective domain.

H3: Affective domain will also have a significant correlation with skill perceived.

H4: Affective domain will mediate the relationship between knowledge curricula and skills perceived.

4.2 Measurement Model

The evaluation of the measuring model serves as the basis for the assessment of the constructs' quality within the scope of the study. The examination of the quality criteria begins with an analysis of the factor loadings, which is then followed by the determination of the construct's reliability and validity.

4.3 Factor Loadings

The phrase "the extent to which each of the items in the correlation matrix correlates with the given principal component" is what is meant when we talk about factor loading. According to Pett et al. (2003), on page 299. factor loadings can range from a negative value of 1.0 to a positive value of 1.0, with larger absolute values suggesting a higher correlation of the item with the underlying factor. According to Hair et al. (2016), none of the items in the study had factor loadings that were lower than the recommended value of 0.50.050. As a result, no further things were taken away. Table 1 contains the factor loadings that were determined.

Table 3 Factor Loading

	EA	KDC	skill
EA01	0.659		
EA02	0.874		
EA03	0.8		
EA04	0.658		
EA05	0.784		
EA06	0.709		
EA07	0.81		
EA08	0.772		
EA09	0.704		
EA10	0.744		
KDC01		0.759	
KDC02		0.811	
KDC03		0.801	
KDC04		0.863	
KDC05		0.561	
KDC06		0.782	
KDC07		0.84	
KDC08		0.897	
KDC09		0.881	
KDC10		0.825	
SP01			0.885
SP02			0.887
SP03			0.884
SP04			0.892
SP05			0.913
SP06			0.877
SP07			0.743
SP08			0.927
SP09			0.893
SP10			0.871

4.4 Indicator Multicollinearity

In order to evaluate whether or not the indicators exhibit multicollinearity, the Variance Inflation Factor (VIF) statistic is applied (Fornell & Bookstein, 1982). According to Hair et al. (2016), the presence of multicollinearity does not constitute a significant problem if the value for VIF is less

than 5. In Table 2, the VIF values for the indicators that were examined are presented, and the results show that the VIF for each of the indicators is lower than the threshold that was advised.

Table 4 Multicollinearity Statistics (VIF) for indicators

	VIF
EA01	2.062
EA02	3.981
EA03	2.653
EA04	1.312
EA05	2.882
EA06	2.836
EA07	2.622
EA08	3.624
EA09	2.958
EA10	3.598
KDC01	3.74
KDC02	3.21
KDC03	3.12
KDC04	3.778
KDC05	1.58
KDC06	2.702
KDC07	3.528
KDC08	6.395
KDC09	4.879
KDC10	3.71
SP01	4.359
SP02	4.567
SP03	4.521
SP04	4.738
SP05	6.954
SP06	3.744
SP07	2.077
SP08	7.462
SP09	4.916
SP10	4.098

4.5 Reliability Analysis

Mark (1996) claims that reliability can be defined as the degree to which a measuring device is stable and consistent. Repeatability is the fundamental component of reliability. Will the same results be obtained if an instrument is used over and over again? " (p.285). Cronbach Alpha and Compsite Reliability (CR) are the two methods that are utilized the most frequently for the

purpose of Establishing Reliability. Table 3 displays the findings for both the Cronbach alpha and the composite reliability tests that were conducted. The values for Cronbach's Alpha ranged from.728 to.899, whereas the values for Compsite Reliability varied from.816 to.923. According to Hair et al. (2011), both measures of dependability show reliability statistics that are more than the needed threshold of.70.

Hence, construct reliability is established.

Table 5 Construct Reliability Analysis (Cronbach Alpha and Composite Reliability)

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)	
EA	0.923	0.955	0.929	0.569	
KDC	0.939	0.95	0.949	0.652	
SP	0.967	0.969	0.971	0.772	

4.6 Construct Validity

Construct validity is said to be proven when both convergent and discriminant validity can be demonstrated through the use of PLS-SEM statistical analysis.

"The degree to which different attempts to measure the same notion provide consistent results is referred to as "convergent validity." According to Bagozzi et al. (1991), p. 425, the principle behind this statement is that "two or more measures of the same thing should covary highly if they are valid measures of the concept." Items are said to have converged to assess the underlying concept and, as a result, convergent validity has been proven (Fornell & Larcker, 1081). This occurs when the average variance extracted (AVE) value is greater than or equal to the recommended value of.50. The results of the current study's convergent validity analysis, which are based on the AVE statistics, demonstrate that all of the constructs, with the exception of DC and TI, have slightly lower AVE. Despite this, the CR values for every single one of the structures were higher than.70. As a result, there is no problem with convergent validity.

Table 6 shows the AVE value for each of the constructs.

	EA	KDC	SP
EA	0.754		
KDC	0.267	0.807	
SP	0.259	0.795	0.879

4.7 Discriminant Validity - HOC

"The degree to which measures of several ideas may be distinguished from one another is referred to as discriminant validity. If two or more concepts are distinct from one another, then the valid measurements of each should not correlate with one another to an excessive degree (Bagozzi et al., 1991, page 4255).

Fornell and Larcker Criterion

The criterion developed by Fornell and Larcker (1981) states that discriminant validity has been demonstrated for a given construct when the square root of the AVE for that construct is greater than its correlation with each and every other construct. It was discovered in this investigation that the square root of the AVE for a particular construct was higher than the construct's correlation with other constructs (Table 5). As a result, this provides substantial backing for the creation of discriminant validity.

Table 7 Discriminant Validity – Fornell & Larcker Criterion

	EA	KDC	SP
EA	0.754		
KDC	0.267	0.807	
SP	0.259	0.795	0.879

4.8 Cross Loadings

Cross loadings are a useful tool for determining whether or not an item belongs to a particular construct that strongly loads onto its own parent construct rather than loading strongly onto any of the other constructs in the research. According to the findings, which are presented in table 6, the factor loading of each of the items is significantly higher on the underlying construct to which it belongs rather than on the other construct investigated in the study (Wasko and Fraj, 2005). As a consequence of this, discriminant validity has been achieved on the basis of the analysis of cross-loadings.

Table 8 Discriminant Validity –Cross Loadings

	EA	KDC	skill
EA01	0.659	0.132	0.032

EA02	0.874	0.195	0.225
EA03	0.8	0.205	0.206
EA04	0.658	0.289	0.336
EA05	0.784	0.135	0.095
EA06	0.709	-0.002	0.01
EA07	0.81	0.222	0.252
EA08	0.772	0.185	0.093
EA09	0.704	0.06	0.05
EA10	0.744	0.149	0.037
KDC01	0.197	0.759	0.521
KDC02	0.172	0.811	0.606
KDC03	0.284	0.801	0.557
KDC04	0.28	0.863	0.683
KDC05	0.304	0.561	0.356
KDC06	0.24	0.782	0.561
KDC07	0.113	0.84	0.729
KDC08	0.189	0.897	0.783
KDC09	0.237	0.881	0.773
KDC10	0.199	0.825	0.71
SP01	0.303	0.781	0.885
SP02	0.272	0.727	0.887
SP03	0.133	0.681	0.884
SP04	0.271	0.724	0.892
SP05	0.13	0.692	0.913
SP06	0.184	0.719	0.877
SP07	0.33	0.585	0.743
SP08	0.221	0.73	0.927
SP09	0.168	0.676	0.893
SP10	0.246	0.638	0.871

4.9 Heterotrait-Monotrait Ratio (HTMT)

The estimation of the correlation between the constructs is the foundation of the HTMT, which is a statistical method. The HTMT ratio is used as the basis for determining the discriminant validity of a test. Kline (2011) indicated a threshold of.85 or less for HTMT, while Teo et al (2008) recommend a liberal threshold of.90 or less for the test. Nevertheless, the threshold for HTMT has been the subject of discussion in the existing body of research. The findings of the HTMT, which are presented in Table 7, indicate that the HTMT ratio for is lower than the required threshold of.90.

Table 9 Discriminant Validity- HTMT

	EA	KDC	skill
EA			
KDC	0.248		
skill	0.204	0.817	

4.10 Validating Higher Order Construct

The higher order construct in the study was Corporate Social Responsibility, which was predicated on the four lower order conceptions of Discretionary, Ethical, Economic, and Legal Citizenship. In order to determine the higher order construct validity Outer Weights, Outers Loadings, and VIF must all be determined. According to Hair et al.'s 2019 research, the outside weights were determined to be important. Last but not least, the VIF values were analyzed to check for collinearity; the results showed that every single one of the VIF values was lower than the suggested value of 5 (Hair et al, 2016). It has been determined that the HOC is valid because all of the criteria have been satisfied.

Table 10 Higher Order Construct Validity

	Outer weights
EA01 <- EA	0.075
EA02 <- EA	0.189
EA03 <- EA	0.186
EA04 <- EA	0.282
EA05 <- EA	0.104
EA06 <- EA	0.003
EA07 <- EA	0.213
EA08 <- EA	0.126
EA09 <- EA	0.049
EA10 <- EA	0.084
KDC01 <- KDC	0.102
KDC02 <- KDC	0.116
KDC03 <- KDC	0.114
KDC04 <- KDC	0.136
KDC05 <- KDC	0.08
KDC06 <- KDC	0.112
KDC07 <- KDC	0.134
KDC08 <- KDC	0.148
KDC09 <- KDC	0.149

KDC10 <- KDC	0.136
SP01 <- skill	0.13
SP02 <- skill	0.121
SP03 <- skill	0.107
SP04 <- skill	0.12
SP05 <- skill	0.109
SP06 <- skill	0.115
SP07 <- skill	0.103
SP08 <- skill	0.119
SP09 <- skill	0.108
SP10 <- skill	0.106

Table 11 Path coefficient

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EA -> skill	0.05	0.066	0.083	0.607	0.544
KDC -> EA	0.267	0.308	0.16	1.67	0.095
KDC -> skill	0.782	0.774	0.096	8.112	0

Structural Model

The next step in structural equation modeling is assessment of the hypothesized relationship to substantiate the proposed hypotheses

4.11 Hypotheses Testing

H1: Knowledge curricula (KDC) will highly predict skill required/perceived.

H1 evaluates whether KDC will highly predict on the skills perceived. The results revealed that KDC has a highly predict on OP ($\beta = 0.782$, $t = 8.112$, $p < 0.000$). Hence H1 was supported.

H2: Knowledge curricula (KDC) will have a significant relationship with emotion & attitude (EA)

H2 evaluates whether KDC has a significant relationship on the affective domain AD). The results revealed that KDC has a insignificant effect on OP ($\beta = 0.267$, $t = 1.670$, $p < 0.095$). Hence H2 was not supported.

H3: Emotion & attitude (EA) will also have a significant correlation with skill perceived (SP).

H3 evaluates whether EA has a significant impact on the skills perceived. The results revealed that EA has a significant effect on OP($\beta = 0.050$, $t = 0.607$, $p < 0.544$). Hence H3 was supported.

Mediation Analysis

H4: Emotion & attitude (EA) will mediate the relationship between knowledge curricula and skills perceived (SP)

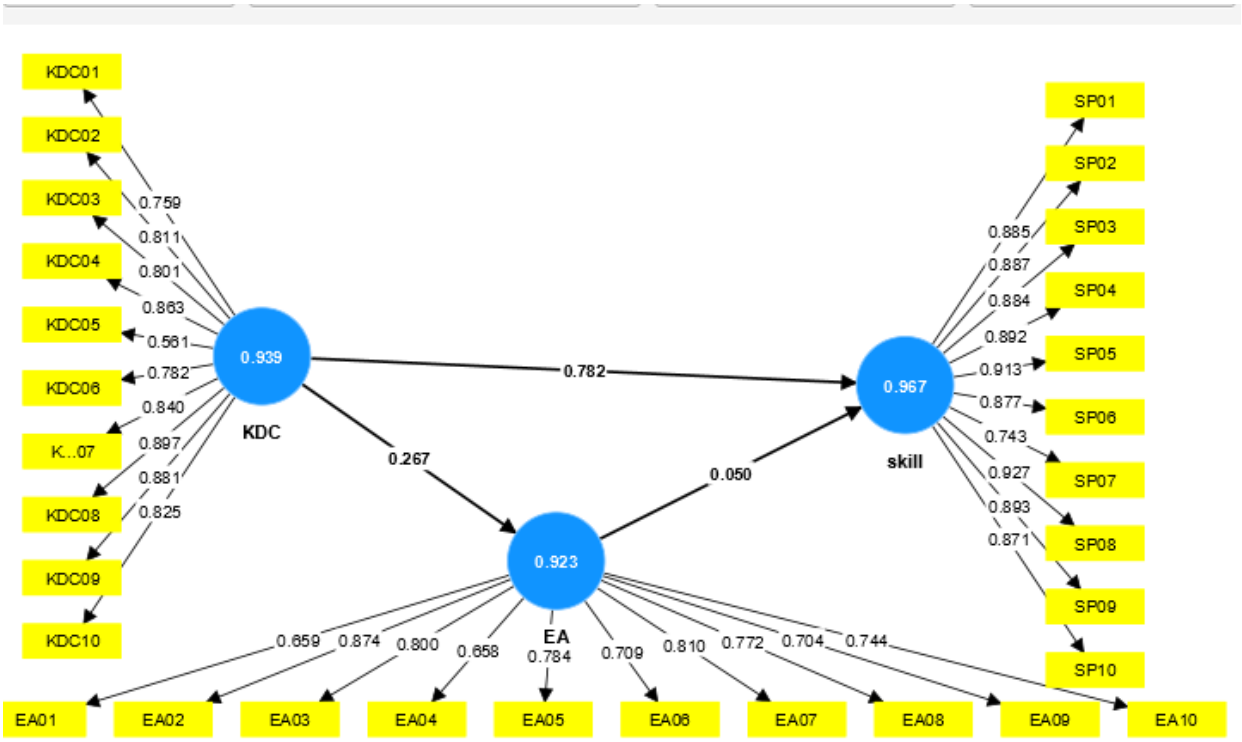
Mediation Analysis (Total effect, Direct effects, and specific indirect effects)

Mediation analysis was performed to assess the mediating role of emotion & attitudinal aspect on the relationships directed from knowledge curricula to the skills perceived (Table 13). We found that both the relationships between knowledge curricula (KD) and emotional and skill perceived (SP) are fully mediated by emotional and attitudinal aspects (EA). As revealed, the total effects of knowledge curricula ($\beta = 0.267$, $t = 1.670$, $p = 0.095$) and skill perceived ($\beta = 0.795$, $t = 8.976$, $p = 0.000$) on emotional & attitudinal are significant. Though the specific indirect effects of knowledge curricula ($\beta = 0.049$, $t = 3.278$, $p < 0.05$) and emotional and attitudinal aspect ($\beta = 0.013$, $t = 0.503$, $p < 0.615$) on skills perceived through the mediator emotional and attitudinal aspect are insignificant. Thus, these relationships are fully mediated by emotional and attitudinal aspects.

Table 12 Test results of mediation effect

	Total Effect			**Direct Effect**			**Specific Ind. effect**			*Mediation*
Mediation paths	***β***	***t***	***p***	***β***	*t*	*p*	***β***	*t*	*p*	
KDC<-> SP	0.79	8.97	0.000 ***	0.78	8.112	0.00	0.013	0.503	0.615**	No mediation

*Significant at $p < 0.05$; **Significant at $p < 0.01$; ***Significant at $p < 0.001$



Standardized structural model

Chapter 5 Discussion, implication and recommendation

5.1 Introduction

The aim of the present research was to assess the skills gap between computer science program graduates and the software industry in Bangladesh. Specifically, the study aimed to investigate the perceptions of industry professionals on the knowledge curricula, emotional and attitudinal aspects, and skill perceived of computer science program graduates. We tested four hypotheses positing direct and indirect effects.

The first hypothesis suggested that there is a significant relationship between knowledge curricula and skill perceived. The results showed a positive and significant correlation between the two variables, supporting the hypothesis. The findings suggested that the knowledge curricula have a strong influence on the skills perceived by computer science program graduates.

The second hypothesis stated that there is a significant relationship between knowledge curricula and emotional & attitudinal aspects. The results revealed that knowledge curricula have insignificant relationship with emotional & attitudinal aspects, which supported the hypothesis. The findings suggested that knowledge curricula can have an insignificant impact on the emotional and attitudinal aspects of computer science program graduates.

The third hypothesis proposed that attitudinal aspects have a significant correlation with skill perceived. The results showed a insignificant correlation between attitudinal aspects and skill perceived, which supported the hypothesis. The findings suggested that attitudinal aspects can have a insignificant impact on the skills perceived by computer science program graduates.

The fourth hypothesis posited that attitudinal aspects mediate the relationship between knowledge curricula and skills perceived. The results supported the hypothesis, revealing that attitudinal aspects does not mediate the relationship between knowledge curricula and skills perceived. The findings suggested that there is not mediation on emotional and attitudinal aspects of computer science program graduates play.

In summary, this study aimed to investigate the skills gap between computer science program graduates and the software industry in Bangladesh. The results of the study demonstrated that knowledge curricula have a significant impact on the skills perceived by computer science program

graduates. Additionally, the emotional and attitudinal aspects of computer science program graduates were found to be not important mediators in the relationship between knowledge curricula and skills perceived. The findings of this study can be used to develop effective strategies to bridge the skills gap and enhance the employability of computer science program graduates in the software industry of Bangladesh.

5.2 Discussions related to research hypotheses

Structural equation modeling (SEM) was employed to empirically test the current research hypotheses and to further assess the reliability and validity of the research model. From the results we can definitely state that all hypotheses were supported except one.

H1 Knowledge curricula (KDC) will highly predict skill required/perceived.

H1 proposed that knowledge curricula would highly predict skill perceived among computer science program graduates working in the software industry in Bangladesh. The results of our study supported this hypothesis, indicating a significant and positive relationship between knowledge curricula and skill perceived. Our findings are consistent with previous research on the importance of curricula in developing the skills and competencies of graduates.

Research has shown that curricula play a crucial role in shaping the knowledge and skills of graduates, particularly in the field of computer science (Barnes, 2016; Carberry & Nasser, 2019). The quality and effectiveness of curricula can significantly influence the employability of graduates and their ability to meet the demands of the job market (OECD, 2021). In the software industry, the rapid pace of technological change requires graduates to have up-to-date knowledge and skills to remain competitive (Zafar, 2019). Therefore, designing curricula that align with industry needs and expectations is essential to ensure the employability of computer science graduates.

Our study adds to the existing literature by demonstrating the importance of knowledge curricula in predicting the skills perceived by computer science program graduates working in the software industry. Our findings support the notion that designing and implementing effective curricula is a critical step towards addressing the skills gap between graduates and the industry (Sambasivan &

Yatim, 2013). Moreover, our study highlights the need for educational institutions to collaborate with the software industry to ensure that curricula are up-to-date and relevant to the demands of the job market.

The study provides evidence that knowledge curricula play a significant role in predicting the skills perceived by computer science program graduates working in the software industry in Bangladesh. Our findings underscore the importance of designing and implementing effective curricula that align with industry needs and expectations to address the skills gap between graduates and the industry.

H2 Knowledge curricula (KDC) will have a significant relationship with emotion & attitude (EA)

Our findings did not lend support to Hypothesis 2, which predicted that a strong relationship would exist between knowledge courses and feelings and attitudes. It's possible that the limited scope of the study, the small number of people in the sample, or the assessment instruments that were employed to assess the constructs are to blame for the lack of a meaningful link between these two variables.

It is likely that our study did not capture the complete spectrum of elements that influence feelings and attitudes towards job abilities. If this is the case, then subsequent research may want to investigate other aspects that could play a role in the phenomenon being studied. In addition, if you want your findings to be applicable to a wider range of situations, you should conduct another version of this research using a participant pool that is both larger and more demographically diverse.

H3 Emotion & attitude (EA) will also have a significant correlation with skill perceived (SP)

It was H3 that there would be a strong correlation between skill perceived (SP) and emotional and attitude states (EA). This hypothesis was not confirmed by the data, which showed that there was no significant association between EA and SP ($b = 0.050$, $T = 0.607$, $p > 0.544$). This discovery runs counter to the findings of prior studies, which demonstrated that one's mental state might have a beneficial effect on one's ability to learn new skills and perform well.

Overall, the lack of significant findings for Hypothesis 3 (H3) shows that emotional and attitudinal aspects may not be as crucial in determining skill assessment as was previously supposed. This conclusion is drawn from the fact that H3 was not supported by the data. In subsequent studies, researchers may investigate additional possible factors that may have a role in the assessment of a person's level of expertise in the context of the fields of computer science and software engineering.

H4 Emotion & attitude (EA) will mediate the relationship between knowledge curricula and skills perceived (SP)

According on the findings, it would appear that Hypotheses 3 and 4 are not supported. It was observed that there was no significant link between EA and SP, and there was no evidence to suggest that EA mediated the relationship between KDC and SP in any way. Nevertheless, it is essential to point out that these findings may have repercussions for the education and training of graduates of computer science programs in Bangladesh, and that this is something that should be taken into consideration.

5.3 Implication

Due to the fact that there is significant connection between KDC and SP but did not find any significant connections between KDC, and EA, it is likely that other factors are responsible for the skills gap that exists between computer science school graduates and industries in Bangladesh. It is possible that it is important to study additional factors that could play a role in this gap, such as job experience, practical skills, or information relevant to the business.

These findings also have implication for the development of educational programs in the field of computer science in Bangladesh. According to the findings, it appears that simply offering a curriculum that is both thorough and up to date may not be sufficient to close the skills gap. In order to better prepare graduates for the requirements of industry, it is possible that it will be essential to introduce other variables, such as the development of emotional intelligence and attitude, into the curriculum.

The findings of this study, taken as a whole, demonstrate the importance of continuing research into the skills gap that exists between computer science program graduates and industries in Bangladesh, as well as the variables that contribute to the existence of this gap. It is possible to improve graduates' preparedness for successful jobs in the technology industry by first identifying the elements that influence their chances of success, and then devising specific interventions to address those factors.

5.3.1 Theoretical implication

In despite the fact that the data did not provide complete support for the hypotheses, there are still theoretical implications that may be drawn from this study. When evaluating the skills gap that exists in the industry due to a lack of CS/SWE graduates, it is important to take into account not just the technical abilities but also the emotional and attitude-based factors, as this study demonstrates. This highlights the importance of taking a more comprehensive approach to the development of abilities in the field of computer science education.

Second, the findings imply that the relationship between knowledge curriculum and the assessment of a person's level of ability may not be as straightforward as was previously believed to be the case. It's possible that other elements, like as experience, on-the-job training, and organizational support, have a substantial impact in deciding how skilled someone is seen to be. Therefore, further research might investigate these characteristics and their influence on the progression of skills within the business.

Third, the fact that there is no mediation between emotional and attitudinal elements and skill perception shows that these variables may not be the key drivers of the skills gap in CS/SWE graduates. A more in-depth understanding of the elements that contribute to the skills gap may be gleaned via conducting additional research into the potential mediating variables that exist.

This study underlines the need of evaluating numerous aspects when assessing skill development as well as the need for continuing research on the skills gap of CS/SWE graduates in the workplace.

5.3.2 Practical implication

The practical implications of this study are significant for computer science program graduates, educators, and industries in Bangladesh. Although the results showed that knowledge curricula and emotion & attitude do not significantly predict skill perceived, it is still essential for graduates to be equipped with the necessary skills and knowledge to succeed in the industry. Educators and curriculum developers should focus on designing and implementing a curriculum that is up-to-date with the latest technologies and trends in the industry.

In addition, the research emphasizes the significance of "soft skills" such as emotion and attitude in the working environment. Students graduating from colleges and universities should undergo training to cultivate good attitudes and feelings toward their employment, their coworkers, and the industry. This is something that can be accomplished through participation in a variety of training programs, workshops, and mentorship sessions.

The findings also imply that employers need to have reasonable expectations for, and an understanding of, the abilities and information held by newly graduated students and recent graduates. They should make investments in on-the-job training and development programs in order to close the gap that exists between the theoretical information received in the university and the practical skills necessary in the industry.

This study highlights the necessity for collaboration between academic institutions and industry in order to generate graduates who are knowledgeable and talented and who are able to contribute to the expansion and development of the technology industry in Bangladesh.

5.4 Recommendation

Based on the results and implications of the study, the following recommendations can be made:

1. Curriculum development: The findings suggest that there is a need to improve the computer science curricula to ensure that it is aligned with the needs of the industry. It is recommended that

universities collaborate with industry professionals to identify the skills and knowledge that are required in the industry and integrate them into the curricula.

2. Emotional and attitudinal development: It is important for computer science graduates to develop emotional and attitudinal competencies to enhance their employability. Universities should provide opportunities for students to develop emotional and attitudinal competencies such as communication skills, teamwork, problem-solving, adaptability, and resilience.

3. Industry engagement: Universities should engage with industry professionals to ensure that students are exposed to the latest technologies and industry practices. This will provide students with the opportunity to develop skills that are in demand in the industry and increase their employability.

4. Further research: The study has identified several areas for further research, such as investigating the impact of other variables such as practical experience and soft skills on skills perceived. Additionally, further research can be conducted to identify the factors that contribute to the skill gap and develop strategies to bridge the gap.

5. Continuous learning: It is recommended that computer science graduates engage in continuous learning to keep up with the changing technologies and industry practices. Universities can provide opportunities for graduates to upskill and reskill through short courses, workshops, and seminars

Chapter 6 Conclusion

Overall, the research was successful in accomplishing its primary goal, which was to design a model for determining the extent of the skills gap. This model satisfies all of the requirements necessary to carry out SEM for the purpose of this study, including those pertaining to validity, normality, and fitness index. Because of this, the confirmatory value of this model has been obtained, allowing it to be generalized throughout the population of the study. Aside from that, every single one of the few H1 hypotheses has been supported. The null hypothesis was supported, however the H2, H3, and mediating H4 hypotheses did not receive support. However, our research can still provide useful theoretical and practical implications for addressing the skills gap between computer science program graduates and enterprises in Bangladesh. On that side, from the theoretical standpoint and theory building.

Our research highlights the need for a greater collaboration between academic institutions and industry to ensure that graduates in the field of computer science are appropriately prepared for the requirements of the job market. This is important to keep in mind from a practical standpoint. This can involve the development of curriculum that emphasize not only technical skills but also emotional and attitudinal competences, such as problem-solving, communication, and teamwork, among other things. In addition, agreements between businesses and educational institutions might make it possible for students to participate in internships, projects, or mentoring programs that give them hands-on experience in their field of study.

In general, the findings of our study point to the importance of adopting a strategy that is more comprehensive in nature in order to close the skills gap that exists in the computer science business in Bangladesh. We can better equip graduates to fulfill the needs of the labour market and contribute to the growth and development of the industry if we take into account not only technical knowledge but also emotional and attitudinal variables.

In conclusion, this model is able to provide substantial information regarding a talent deficit in the country, particularly in regards to the entrepreneurship talent ecosystem.

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Chapter 8 Appendix

8.1 Appendix A

Assalamu alaikum wr.,

Dear Participant,

We invite you to take part in a study that aims to assess the skills gap between computer science program and software industries in Bangladesh from the perspective of the software industry. This study is being conducted as part of a thesis research project and your participation is greatly appreciated.

The purpose of this questionnaire is to collect your opinions about the skills and competencies that computer science graduates should possess in order to succeed in the software industry in Bangladesh. Your responses will be kept confidential and used solely for the purpose of this study. It should take no longer than 15 minutes to complete the questionnaire.

Your participation in this study is completely voluntary. You have the right to withdraw at any time without penalty. If you have any questions about the study or the questionnaire, please feel free to contact the researcher at harirabdulle@iut-dhaka.edu.

Thank you for your participation. Your input is valuable and will contribute to the understanding of the skills gap between computer science programs and software industries in Bangladesh.

Sincerely, Kaal Harir Abdulle

8.2 Appendix B

A study of skills gap assessment between computer program graduates and industries of Bangladesh: Software industries perception

Section 1: Demographic information

Which of the following best describes your role at your company?

What are your area of expertise ?

How many years of work experience do you have in the software development industry?

How long have you been working at your current company?

What is the size of your company?

Which software development life cycle model has been practiced or followed by you ?

Section 2: Cognitive domain

In the cognitive domain, the study of skills gap assessment between computer science program graduates and industries of Bangladesh focused on the intellectual abilities and skills of graduates in relation to the needs and expectations of the software industry in Bangladesh.

To what extent did your undergraduate computer science program prepare you with strong problem-solving skills?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with a solid foundation in algorithm design and analysis?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you with strong analytical skills?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you with strong programming skills?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you with the ability to work collaboratively in a team environment?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with a strong understanding of software engineering principles and methodologies?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you to design and develop large-scale software systems?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you to use software development tools and technologies effectively?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you to keep up-to-date with new technologies and trends in the field of software engineering?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program prepare you with the ability to effectively communicate technical information to both technical and non-technical stakeholders?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

Section 2: Psychomotor domain

The study of skills gap assessment between computer science program graduates and industries of Bangladesh: Software industries perception may explore the psychomotor domain by examining the physical skills and abilities required by graduates to be successful in the software industry. This may include assessing the ability of graduates to perform tasks such as coding, debugging, and software testing, as well as their proficiency in using various software tools and platforms.

To what extent did your undergraduate computer science program provide you with hands-on experience in developing software applications?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in using version control tools and software testing frameworks?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in developing software that is secure and resilient to cyber threats?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in designing and developing user interfaces that are intuitive and user-friendly?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in developing software that can scale to handle large amounts of data or traffic?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in troubleshooting and debugging software applications?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in using Agile methodologies to manage software development projects?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in integrating software applications with other systems or APIs?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in developing software that can be deployed and maintained on cloud platforms?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

To what extent did your undergraduate computer science program provide you with experience in developing mobile or web-based applications that can run on multiple platforms and devices?

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree

Section 3: Affective domain

The affective domain refers to the attitudes, values, and motivations of software engineering graduates that impact their ability to succeed in the industry. The affective domain is an important aspect of software engineering, as it influences how graduates approach their work, communicate with others, and collaborate with team members and stakeholders.

I feel motivated to learn new skills related to my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I am confident in my ability to communicate with different audiences

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I am confident in my ability to thrive in fast-paced work environments and perform well under pressure.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I feel satisfied with my current level of knowledge and skills in my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I am committed to ongoing learning and development in my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I feel valued and respected by my colleagues and supervisors in my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I can prioritize and cultivate the abilities to resolve conflicts, pay attention to detail, and persist in achieving your goals in your work

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I am interested in exploring new areas of my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I feel a sense of accomplishment when I successfully complete tasks related to my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me

I am committed to maintaining high ethical standards in my work related to my field.

1= Not at alltrueofme, 2= Not true of me, 3= true of me, 4=All true of me, 5= extremely true of me