

**MEASURING SKILL GAP: A CASE STUDY OF ENGINEERING GRADUATES IN TWIN  
CITIES**



**Pakistan Institute of Development Economics**

**Research Thesis**

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**2025**

**CERTIFICATE**

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## **ACKNOWLEDGEMENTS**

This thesis dissertation would not have been possible without the support of a number of people. Foremost, I would like to thank my supervisor, Dr. Henna Ahsan, who has been extremely supportive, motivating and patient throughout the whole period. Her guidance and feedback have been of utmost importance, and I am extremely grateful for her endless support.

Also, I am very thankful to my parents who supported me throughout this journey and stayed patient. Also, I would like to extend thanks to my uncle Sherin Khan, my cousin Ijlal Ahmad and friends like Nazeef Elahi, Muhammad Junaid and Mazhar Shehzad who provided me motivation and guidance throughout the process.

Thanks to Almighty who gave me health and ability to undertake this journey.

## **Abstract**

Engineering graduates entering the labor market devote their four years to education and professional development. Engineering universities pass graduates into the job market assuming that they are ready to succeed professionally and personally. However, employers all over the world have expressed that recent graduates lack employability skills, and a gap exists between the skills they gain and those needed in the job market. Therefore, it is the need of the hour to analyze the employability skills of engineering graduates. Research shows that studies carried out in Pakistan have mostly adopted a one-sided approach by either analyzing the employers' or only graduates' perspectives. Therefore, this study aims to provide the perspective of both graduates and employers and experts from academia. This research has adopted a mixed-method design. By using purposive sampling, a sample of 210 graduates and 40 employers was obtained for quantitative analysis, and 7 interviews were conducted with academic experts for qualitative analysis. Three skills are identified namely technical skills, general skills, and communication skills by adopting PEC-prescribed skills criteria. Both findings show that technical, general, and communication skills are highly relevant in the labor market for engineering graduates. Specifically, "Having competency in theoretical engineering and research", followed by "Ability to design and conduct experiments, analyze and interpret data", followed by "Ability to use modern tools, equipment, and technologies (other than computers)" are important in technical skills. In general skills, teamwork, and creativity are identified as important for engineering graduates. Academic experts held that industry-academia linkages should be strengthened, and work-based learning and practical courses should be incorporated to prepare students for the job market. The study adds by giving a detailed analysis of both the graduates' and employers' perspectives as well as the perspective of the academic community. The study provides practical directions for engineering graduates to develop the skills required in the job market and to the academia to enhance their collaboration with industry.

**Keywords:** Engineering graduates, employability skills, skills, academic experts

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### **List of Abbreviations**

<b>ILO</b>	International Labor Organization
<b>FPSC</b>	Federal Public Service Commission
<b>SBP</b>	State Bank of Pakistan
<b>FDI</b>	Foreign Direct Investment
<b>P-J</b>	Person Job fit
<b>IET</b>	Institute of Engineering Technology
<b>IT</b>	Information Technology
<b>NUST</b>	National University of Science and Technology
<b>UET</b>	University of Engineering and Technology
<b>IST</b>	Institute of Space Technology
<b>PEC</b>	Pakistan Engineering Council
<b>HEC</b>	Higher Education Commission
<b>HEI</b>	Higher Education Institutes
<b>WIL</b>	Work-Integrated Learning
<b>IMF</b>	International Monetary Fund

## **Chapter 1. Introduction**

### **1.1 Background**

The skill gap refers to the disparity between the skills an employer expects their employees to have, and the actual skills employees possess. The skill gap is a grave issue in both developing and developed economies. It significantly impacts the economic performance of a country. It is defined as the difference between the demand for certain skills and the supply of those skills. The skill gap is not a new concept; it arose with the development of the market economy and has been a persistent issue since then. Data suggest that skill gap has been a common issue in those sectors that require STEM (Science, technology, engineering and math) skills (Christo-Baker et al., 2017). The skill gap leads to a decrease in productivity and this in turn leads to low economic growth and development. Also, the skill gap discourages innovation in the economy. The skill gap is caused by both external and internal factors. External factors are more prominent in the causes of the skill gap which include economic conditions, local labor market trends, demographics, immigration patterns, education, and training capacity. Internal factors include organizational or technological changes or a combination of both. These changes make the employers demand more skills than possessed by the employees (Ramadi et al., 2016).

It is particularly important to form partnerships that focus on informed curriculum development, developing quality assessment techniques, and establishing networks between industry and academia to develop the skill sets of the graduates. Thus, to excel in the competitive market of the modern world, it is essential to have a more flexible workforce with advanced technical skills coupled with well-developed generic skills such as critical thinking, problem-solving, analytic skills, decision-making, and leadership skills (Brunello & Wruuck, 2019). According to a study published by IMF in 2022, achieving global universal basic skills would add \$700 trillion to world GDP (Hanushek & Woessmann, 2022).

**Figure 1 : Economic Gains from Achieving Universal Basic Skills**

**Economic gains from achieving universal basic skills**  
 Achieving global universal basic skills would add \$700 trillion to world GDP.

	Value of Reform (trillions of US dollars)	In Percent of Current GDP
World	706	524
<b>By Region</b>		
Sub-Saharan Africa	124	2,798
South Asia	258	2,160
Middle East & North Africa	67	886
Latin America & Caribbean	76	749
Europe & Central Asia	66	197
East Asia & Pacific	75	173
North America	41	177

**Source:** Gust, Hanushek, and Woessmann (forthcoming).  
**Note:** Discounted value of future increases in GDP until 2100 as a result of young people's universal achievement of at least basic skills (equivalent to Programme for International Student Assessment Level 1).

Skill-intensive economic and technological changes are making the problem of the skill gap more prominent. According to ILO, many young applicants across the globe don't possess enough skills and competencies to be employed in competitive markets. Similarly, a survey in Europe concluded that it is difficult to find the right people for the right jobs (Handel, 2003). While having a bachelor's degree or above is a prerequisite for most white-collar jobs, getting a higher education may not necessarily lead to a better job. That is because developing new skills or upgrading existing ones starts to lose value when more people are doing it, as it makes the job market highly competitive. The employers' view, however, is that schooling does not adequately prepare students to meet the various demands of the changing labor market (Sarin, 2019).

Moreover, the labor market is undergoing rapid changes due to the emergence of technologies like artificial intelligence, automation, and the gig economy. Consequently, the skills that employers seek are evolving, leading to a "skills gap" where they struggle to find workers with the necessary training. This gap presents a significant policy challenge, with employers at the forefront. The skill gap has potentially adverse labor market impacts on individuals, firms, and the economy broadly (Brunello & Wruuck, 2019).

In the dynamic landscape of today's global economy, the potential of the workforce to adapt to new trends and technologies hugely influences innovation and competitiveness. For Pakistan, to move from a traditional agricultural to a modern industrial economy, the role and quality of engineering graduates is very important (Hussain, 2005). Also, the engineering sector is important to support industrialization and innovation. The rapid changes in industries and technologies have led to a pressing concern: the widening gap between the skills possessed by engineering graduates and the demand of the job market. This skill gap has significant implications for the economic development of the country. It can lead to decreased productivity, low competitiveness, and lost opportunities for growth (Mirza et al., 2014).

A recent report of the Labor Market Survey conducted in Pakistan concludes that the vital sectors of Information technology, Healthcare, Engineering, and technical fields are in dire need of a skilled labor force. On the other hand, almost 40 percent of fresh graduates report difficulty in finding suitable employment due to a mismatch between their skills and job market demands (Khattak, 2023). The FPSC annual report published in 2021 shows that many vacancies remained unfilled due to the unavailability of eligible or qualified candidates (FPSC, 2021). This can be seen in table 1 below:

**Table 1: Number of Unfilled Seats in FPSC**

Cases finalized					Posts/cases carried over to 2022	
year	Cases finalized	Nomination made	Posts reported failure	Posts withdrawn	Cases	Posts
2021	1	0	0	1	157	1,920
2020	36	220	144	17	167	1,946
2019	82	1,284	83	2	44	1,937
2018	27	651	22	2	13	508
2017	2	6	27	0	14	102
2016	0	0	0	0	8	100
2014	0	0	0	0	7	29
2006	0	0	0	0	1	2
<b>Total</b>	148	2,161	276	22	411	6,544

*Source: FPSC annual report*

## **1.2 Statement of Problem**

Pakistan is demographically quite young with more than one-third of its population is below the age of 30 which has a long way in deciding the course of the country's destiny. This is both an opportunity and a threat, given the fact that currently there is a large youth population in most countries. It provides an opportunity to take benefit of a solid working population capable of further development, though, not all these young people have the required quality education, health, and essential knowledge. Mr. Ahsan Iqbal, current federal minister for Planning Development & Special Initiatives of Pakistan proclaimed at some event that if these young entrants into the labor force do not receive quality education and are poorly skilled, they will fail

to secure decent employment which will have severe socio-economic implications. Tertiary organizations/work institutions are taking out graduates who are not fit for the expectations of employers and industry. Study conducted by Asif et al., (2022) reveals that 63 percent of fresh graduates face unemployment in Pakistan. The major reason for this high unemployment rate of fresh graduates is that they don't possess the necessary skills required by the labor market. Students perform poorly due to the bad way universities train their students to meet industry demands and technological advancement. Prolific weaknesses in the regulatory and quality assurance structures, poor correlation between university performance and the funds provided to them, low quality of research, and internal inadequacies in the HEC structures and management are some of the reasons behind the poor performance of HEIs (Shahid, 2022).

It has been observed that the overall unemployment rate for graduates rose from 14 percent to 16 percent between 2018-19 to 2020-21. However, a more detailed breakdown of the unemployment rate by sub-disciplines reveals a bleaker outlook. The unemployment rate for engineering graduates rose from 11.2 percent to 23.5 percent in just two years (Ahsan & Khan, 2023). This can be seen in figure 1.2:

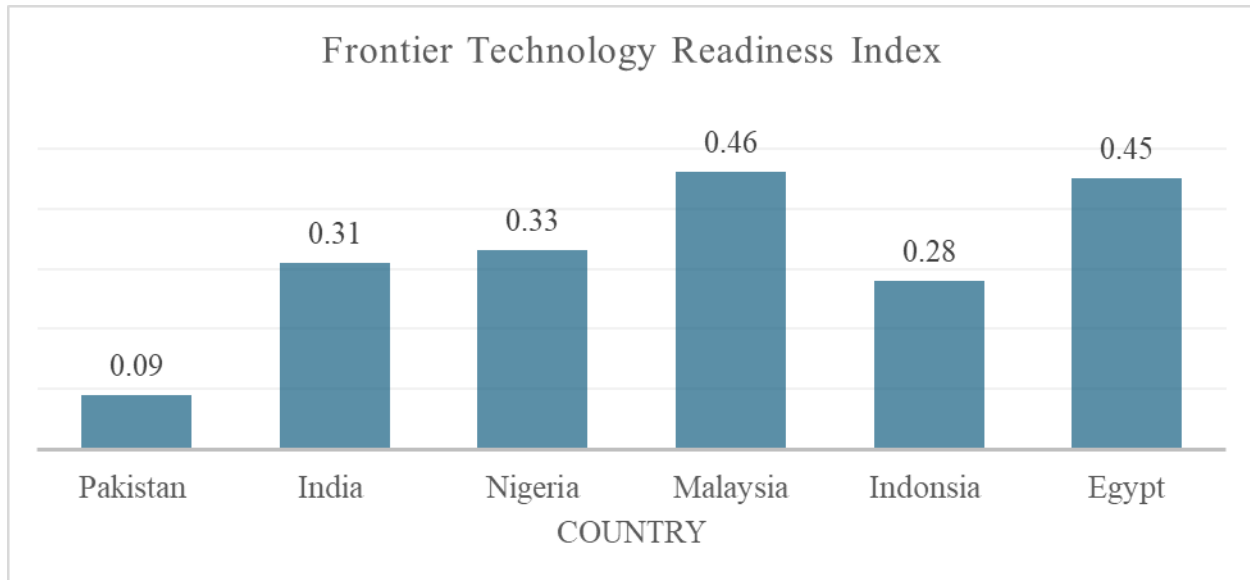
**Table 2: Unemployment rate of Graduates by fields of Study (2018-2019 and 2020-2021)**

Field of Study	Over All		Male		Female	
	2018-19	2020-21	2018-19	2020-21	2018-19	2020-21
Degree Engineering	11.2	23.5	9.43	22.2	37.25	42.6
Degree Medicine	6.4	10.8	2.67	6.1	14.65	18.4
Degree Computer	14.2	22.6	10.56	16.7	37.96	51.5
Degree Agriculture	11.4	29.4	0.00	32.1	34.07	26.8
Degree in other subjects	15.5	16.1	6.66	8.1	39.39	35.2
MPhil/ PhD	12.0	12.2	6.05	6.9	26.76	20.2
Total	14.9	16.1	6.75	8.8	37.98	33.8

Ahsan & Khan (2023) revealed that issue of graduate unemployment has emerged as a significant concern, with rates three times higher than the national average in Pakistan. This trend can be attributed to three main factors. Firstly, there exists a notable disparity between the education possessed by graduates and the education demanded by the employer. As the job-search model suggests, highly educated individuals are more likely to remain unemployed and voluntarily wait for a long time till a suitable job matching their educational credentials is offered. On the other side, Pakistan is ranked 146 out of 158 countries in the skills component of the United Nations

Conference on Trade and Development (UNCTAD). The Frontier Technology Readiness Index of Pakistan is 0.09 out of 1, significantly lower than Indonesia's score of 0.28, India's 0.31, Nigeria's 0.33, Egypt's 0.45, and Malaysia's 0.46. This can be seen in figure 1 below:

**Figure 2: Frontier Technology Readiness Index**



So, the second reason for graduate unemployment seems to be that despite an increasing number of graduates entering the job market, a vast majority of them lack the competencies required to meet the evolving demands of the digital landscape (SBP, report 2023). The report revealed that a mere 10 % of IT graduates possess the necessary skills to secure employment in the industry. Lastly, the overall economic downturn and macroeconomic imbalances further exacerbate the situation (Ahsan and Khan, 2023).

There is a common criticism regarding Pakistan's education system's failure to prepare graduates for employment in the labor market. It is mostly argued that our curriculum is based on theoretical knowledge while little or no attention is paid to practical knowledge (Mirza et al., 2014). The study further states that our education system mainly focuses on information retention and the reproduction of theoretical knowledge. The examination system merely assesses the information and theoretical knowledge of students. There is a lack of focus on practical or experimental knowledge which leads to serious deficiencies in the labor market. Most of the graduates are unable to find employment in a competitive labor market due to lack of experimental or practical knowledge. Also, industries prefer to recruit graduates who are well-versed in both technical and

theoretical knowledge. This issue of curriculum weakness and poor educational practices leads to a skills gap as well as an increased number of graduates unemployed.

The engineering sector of Pakistan has always been a key contributor to economic growth, FDI, and the export industry. However, the current state presents a rather dangerous tipping point that may compromise the future growth of this sector and the long-term economic sustainability of the country. Hence, the study seeks to determine the gap in skills of engineering graduates deployed in various industries. Moreover, the study also assists in grasping the issues that employers face while recruiting the young graduates. Furthermore, the study also includes views of experts from academia regarding the skill gap of engineering graduates.

### **1.3 Research Questions**

- 1 What are the most important skills sought by employers while recruiting employees in engineering firms?
- 2 What are the skills gained by engineering graduates during their bachelor's degree?

### **1.4 Research Objectives**

- 1 To identify the most important employability skills for engineering graduates as perceived by the graduates.
- 2 To identify the most important employability skills for engineering graduates as perceived by the employers.
- 3 To know the academia's perspective about reasons responsible for this skill gap of graduates.

### **1.5 Significance of Research**

This study helps in identifying the skill gap between skills provided by academia and those required by industry. It also helps the academia to revise the curriculum and prepare job-ready graduates. Also, this research aids to develop employability skills for engineering graduates. Moreover, this thesis provides valuable insights into policy decisions related to skill development by enabling policymakers to initiate programs that address the skill gap. It also contributes to the

development of a highly skilled and competitive workforce that aligns with Pakistan's national goals and vision for economic growth and development.

## **1.6 Organization of The Study**

The rest of the study is organized as follows: The second chapter presents a review of existing literature on the research problem, theoretical framework, and research gap. The third chapter discusses the methodology by which the study was carried out. It includes research design, research approach, unit of data collection, and the locality in which the study was carried out.

## **Chapter 2. Literature Review**

Skill can be defined as general cognitive and non-cognitive abilities or characteristics of a particular job, profession, or sector. Skills can be classified as technical, cognitive, or soft skills (Rikala et al., 2024). The skill gap can be defined as a shortfall in the aggregate supply of a certain skill or set of skills broadly sought by employers (Donovan et al., 2022). Intensive economic and technological changes are making the issue of skill mismatch more prominent (Stoevska, 2018). The skill gap can contribute to unemployment and may reduce productivity. According to the International Labor Organization, many young applicants do not have enough skills and competencies required for job entry (Institution of Engineering and Technology (IET), 2006). The impact of the skills gap is noticeable at three levels: individual, company, and country. At the individual level, it leads to a decrease in employment opportunities and career advancements. At the company level, the skill gap hinders development by a decrease in productivity as well as a decrease in the quality of production. At the country level, the skill gap has negative impacts on the country's competitiveness and potential for growth (Ahmeti, 2022).

The remainder of the literature review is organized as follows. The first part of the literature will discuss the theoretical framework. The second part of the literature review will discuss the skill gap in the developed countries. The third part of the literature review will discuss the skill gap prevalent in the engineering sector in developing countries. The last part of the literature review presents a general overview of the skill gap prevalent in Pakistan. Particularly, it discusses the skill gap prevalent in the engineering sector in Pakistan.

### **2.1 Theoretical Background Regarding the Skill Gap:**

#### **2.1.1 Human Capital Theory:**

This study is based on the Human Capital Theory developed by Gary Becker. The term human capital was first introduced by Theodore W. Schultz (1961) and was published in the American Economic Review, called investment in human capital. Gary Becker defines human capital as a physical means of production. The human capital theory states that "Different levels of education and training contribute to different levels of wages and salaries, more the knowledge, skills and ability, more the likelihood to get a better job" (Wuttaphan, 2017).

### **2.1.2 Person Job (P-J) Fit Theory:**

Edwin E. Ghiselli coined the Person Job-Fit theory in 1971. PJ fit theory can be defined as the match between the person's knowledge, skills, and abilities and the demands of the job. The P-J fit theory holds that an individual's personality traits will give insight into whether he could be given a job in an organization (Matilda & Neena, 2016).

This theory lays a foundation for us to measure the job requirements and personal characteristics of the employees. Job requirements include technical skills, soft skills, and interpersonal skills. Personal characteristics include the skill level of the employees. The framework assesses a person's Job Fit by comparing the job requirements and personal characteristics of the employees.

## **2.2 Skill Gap in Developed Countries**

The literature claims that academic knowledge is not sufficient, students must gain more employability skills to enhance their employment prospects (Sarin, 2019). Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem-solving, information and communications technology (ICT), language skills, learning to learn skills, and competencies to protect themselves and their colleagues against occupational hazards and diseases (Stoevska, 2018). Interaction between the academia and labor market will be the major trend in the new millennium (Sarin, 2019).

Engineering graduates don't always possess the required skills or abilities when they begin their careers. This lack of skills and abilities limits the productivity of recent graduates. It also sometimes prevents the recent graduates from gaining employment in the industry. The empirical study carried out by Radermacher et al., (2014) shows the results of twenty-three managers and hiring personnel from companies in the United States and Europe. The study asked participants about areas where recent graduates have difficulty while beginning their careers. The results showed that fresh graduates had difficulty in using configuration management systems, effective communication and other skills. The study also highlighted that lack of project experience and problem-solving abilities are the most common issues that prevent graduates from gaining employment.

Consequently, all employers who have noticed a lack of necessary skills among job applicants find that it affects their business operations to some extent. About 96 percent of employers who had

identified skill shortages were of the view that this skill shortage impacts their business in some way or other. The most common impact of this skill gap is manifested during the hiring process. Half of the employers said they struggle with recruiting suitable candidates, while almost half faced an extended recruitment timeline (Institution of Engineering and Technology (IET), 2006).

Moreover, Handel (2003) used qualitative as well as quantitative approaches to assess the skill gap prevalent in the United States. The author designed a questionnaire and collected responses from different institutes and corporations in the United States. The author is of the view that skill mismatches are difficult to measure because different sectors require different skills. The skill gap develops due to rapidly changing job requirements and the lack of change in skills provided by academia. According to the Rural Manufacturing Survey, interpersonal and work habits were ranked by employers as the most demanded skill. Also, other institutions have concluded that many employees lack communication skills and are unable to adjust to changing job environments.

Similarly, Mohtadi et al., (2014) surveyed the UK labor market to measure the skill gap for fresh engineering graduates. The survey questionnaire was filled out by both businessmen and academic experts. The survey showed that 59 percent of businesses and 79 percent of academics were of the view that there exists a skill gap. The skill gap exists in technical skills, communication skills, business and commercial awareness, technical skills, teamwork, and self-management.

For recently developed countries like India, Sarin (2019) used a survey method to measure the skill gap prevalent among engineering graduates in India. She divided skills into three categories: Technical skills; skills related to the understanding and application of engineering knowledge, non-technical skills; skills related to communication and performance, behavioral skills; and skills related to self-management and interpersonal relations. The questionnaire filled in by engineering firms concluded that in technical skills, the engineering graduates were lacking in making spreadsheets followed by computer literacy, word processing, databases, presentations, and project management. In non-technical skills, the graduates were deficient in communication skills followed by problem-solving, learning agility, time management, and teamwork. In behavioral skills, the graduates were lacking in motivation followed by taking responsibility, intelligent decision-making, self-confidence, and ethical behavior.

Also, Gaurav (2020) has analyzed the skill gap of engineering graduates by using qualitative and quantitative methods. The author has collected data through filling out questionnaires from civil

engineers and academic experts. The researcher has divided the skills required by civil engineers into two categories: Technical skills and soft skills. The findings of the study showed that there exists a skill gap in both technical and soft skills. It was concluded that students were required to gain Drawing Skills and related software, Communication Skills with oral and presentation skills, Structural Analysis with related software, Project Management software and Managerial skills, Estimation, and Costing, and knowledge of codes as technical skills. In the case of soft skills, the gap existed in work ethics, value engineering, negotiation skills, and Modern survey methods such as LIDAR.

In the case of recently developed countries, Zeidan & Bishnoi (2020) conducted research in the labor market of UAE. They used survey methods to gain information from the employers regarding the skill gap prevalent in their corporations. The author divided skills into two categories: hard skills and soft skills. They designed a questionnaire to record the responses of the employers. About 22 percent of the employees were satisfied with the performance of the employees, while 78% were not satisfied with the performance of the employees. Also, 78 % of the employers believed that universities were unable to develop the hard skills of their employees. About 90 % of the employers believed that universities were unable to develop the soft skills of their graduates. In focus group interviews, the respondents presented their view that they employ tech-savvy graduates, who have strong communication skills and possess interdisciplinary skills as well.

In the same way, Blom & Saeki (2011) have analyzed the skill gap for fresh engineering graduates in India. They used survey questionnaire methods to collect data. The findings show that there exists a skill gap for fresh graduates in India. When asked about their level of satisfaction with fresh graduates, 69 percent of employers were satisfied with fresh graduates, 3.9 percent were not at all satisfied, 16.1 percent were not satisfied, and 11 percent were somewhat satisfied with the quality of fresh graduates. Also, a major skill gap was identified in reliability, teamwork, and communication skills.

### **2.3 Skill Gap in Developing Countries**

Lack of requisite skills is evident across developing and emerging nations because the public education system in these countries fails to provide students with essential skills that the engineering sector requires. Little improvement has occurred in getting children enrolled in secondary and higher forms of education in recent years though the magnitude of basic and literacy

education has improved in the decades preceding this period. Besides, the labor market is oversaturated with college graduates who nonetheless fail to meet the market's demand for relevant skills. In the workplace, different kinds of skills help people achieve success; these include the technical or academic skills that are preferred in academic institutions, for example, knowledge in accounting or the operation of certain machines, and the other category that institutions lack to prioritize but are acquired through personality development, for example, creativity and interpersonal skills. Some of these skills are essential to a particular job depending on its nature. However, most jobs do not allow us the luxury of choosing between these two, but we must do a little about both. For instance, a woodworker or seamstress may need strong hand and machine work, while an employee in the finance industry needs to be well endowed with excellent arithmetic skills. Soft skills also differ based on the hierarchy of the job, for instance, higher-order creativity is vital for artisans while calculations are crucial for financiers. Similarly, both hard and soft skills are very important in the engineering and IT sector (Barthel et al., 2016).

Ramadi et al., (2016) carried out a study to measure the skill gap in the Middle East and North Africa (MENA) region for engineering graduates. The purpose of this study was to measure the gap between the expectations of the industry and the perceptions of graduates. The study used a survey method to gather data from graduates of different universities and firms in the MENA region. The study concluded that cooperation skills, communication skills, and personal accountability were considered the most important skills in 36 skills manifested by the employees. While skill gap was reported in cooperation and learning skills, communication skills, and personal accountability skills were also lacking among the graduates .

In the same way, African countries are also faced with severe skill gaps that are negatively affecting their economic growth and industrial development. Literacy and improved primary schooling have shown great improvement in Namibia in the last few years but secondary and tertiary education is still a problem. African Statistics Database indicated that the literacy level in the Otjozondjupa region where Ohorongo is situated is comparatively low with 40% of the population having completed only primary education, 19% having secondary education and only 4% having tertiary education. Additionally, a mere 3% attend technical vocation education and training (TVET) or higher learning institutions with about 2,800 students joining TVET and 4,000 joining universities annually from a population of 2.3 million school-going age population.

However, the curricula do not reflect the required characteristics of the spheres, and there is a shortage of qualified teachers and learners. In all sectors of the Namibian economy, businesses have a severe lack of skills. Findings revealed by a survey conducted in 2010 on about 100 companies showed that nearly every company held perception that the country was in dire need of skilled workers, and 45 percent of the respondents viewed it as a critical requirement. Some expected it to escalate during the subsequent five years. Technical, managerial, and professional employment vacancies are the most difficult to fill in. The total shortage of skilled workers in the mining and building industry from 2012 to 2016 was over 15000 and projecting the said industry from 2022- 2025 was estimated to be 25000. In detail for Ohorongo, it was projected that there would be almost a shortage of 300-400 stationary plant operators from 2012 to 2025. Namibia continues to struggle with skills deficit while unemployment stands at 30 % with youths' unemployment rate being above 56 %. Currently, the unemployment rate is 36.8% in the Otjozondjupa region. While 64 percent of firms experiencing these skills deficits have formulated tactical skills acquisition strategies, 53 percent described their outcomes as partially successful (Ntinda et al., 2021) .

Similarly, Hossain (2018) carried out a study to measure the skills gap in the engineering sector in Bangladesh. The study used a survey method to measure the skills gap in engineering graduates and focused group discussions with firms to identify the causes of the skills gap. The results showed that 40% of engineering jobs remained vacant due to skills shortage. Within the existing pool of workforce, 60% were skilled, the rest were either unskilled or semi-skilled. The study concluded that the cause of the skill gap was the huge divide between academia and industry. It was observed that there was a lack of proper training and industry-oriented education.

A study carried out in Malaysia analyzed the employer's expectations of engineering graduates. The data for the study was collected through a questionnaire that was filled in by diverse engineering sectors. The results showed that employers were dissatisfied with entrepreneurial abilities and the ability to design and conduct experiments and to analyze and interpret data. Employers deem communication skills as the most important attribute in engineering graduates. A skill gap existed in the application of technical skills and effective communication (Zaharim et al., 2008).

## 2.4 Skill Gap Analysis in Pakistan

Bano et al., (2022) holds that there is a significant shortage of skilled people in Pakistan, hindering the country's efforts to develop nationally. While TVET was implemented to train people for various jobs including CPEC projects, it has not lived up to expectations. Most of the country's youth who start working are either unskilled or semi-skilled. Earlier theories of global trade indicated that, with growing global trade, the principal beneficiary would be the less skilled workers in the developing world, but data reveals shifting global trends where demand for skilled workers is on the rise resulting from the surge in the application of new technologies. Employees with higher education and skills are paid much more than those with low education, meaning that people with education and skills are important for a country's economic growth, attracting more investors and retaining the country's competitiveness in the global market. In Pakistan, lack of skills is a major problem, which might help to mitigate future development and competition in the global world. It is therefore important to reverse these skill gaps to continue supporting the virtuous cycle of economic development, employment, and poverty eradication in the next decade. Labor resources are not only considered as an economic value but also act as an important factor that is used by governments to maintain conditions conducive to investment and a country's lasting success. As a result, there is a need to enhance and expand technical and vocational education and training, increase access to tertiary education, and ensure the relevance of skills development initiatives and education to sectoral upgrading especially those circumstances by new technology and global markets (Hussain, 2019).

The study conducted by Khattak (2023) for the Pakistani economy regarding skill gap concludes that the IT industry is faced with a shortage of 30,000 skilled professionals. She takes her data from the Labor Force Survey published in 2018-19. The health sector is in dire need of 25,000 doctors and 60,000 nurses to administer quality healthcare to the populace. About 60 percent of employers report that they have difficulty finding the right talent for the job. Similarly, about 40 percent of fresh graduates report difficulty in finding suitable employment that matches their skill set.

In the same way, deficiency of skill is an influential factor in the unemployment of young graduates in Pakistan. The study conducted by Amjad et al., (2005) shows that many graduates especially those in the engineering and technical disciplines are ill-prepared for employment in today's world.

The major gaps identified are skills in information and communications technology, critical thinking, and the ability to apply what has been learned. Employers pointed out that the gap arose due to poor exposure to several vocational training courses and poor industrial exposure in university education. The authors recommend that improving vocational and technical training approaches as well as fixing academic programs are the ways to enhance the skill sets of the graduates.

Moreover, Hussain (2005) argued that Pakistan needed an integrated approach to improve the skill set of its workforce. He suggested that universities should revise and formulate a curriculum that is in line with the demands of the labor market. Lack of quality skills is one of the major hurdles in the way of economic growth in Pakistan. To measure the skill gap in Pakistan, a study was conducted in Gujrat-Gujranwala and Sialkot industrial clusters (Mirza et al., 2014). Data was collected through survey questionnaires from both students and employers to reflect on the existence of the skill gap. The study divided 24 skills, by factor analysis, into three skill groups: Core employability skills, communication skills, and professional skills for engineering, IT, and commerce and business graduates. The findings showed that both employees and employers agreed that there exists a skill gap in all three categories of skills. Employers were less satisfied with the professional skills of students of all three categories. Also, students scored themselves low on the importance of professional skills. Students of technical fields like engineering, computer science, and IT which are required to have higher technical skills, claimed that they have a shortage of technical skills.

A study has been carried out in Pakistan to inquire about the importance of thinking skills, management, and interpersonal skills for engineering graduates. The data was collected through a questionnaire. The results showed that there existed a disparity between employer's perception and graduates' perception regarding the importance of soft skills. Employers considered thinking skills, interpersonal skills, and personal qualities as important for engineering graduates. On the other hand, graduates considered information skills and basic skills as most important for gaining employability (Rizwan et al., 2018).

Also, only 10% of IT graduates in Pakistan tend to be employable. This situation can be attributed to a lack of competencies such as marketing skills, problem-solving, critical thinking, an entrepreneurship mindset, communication skills, and technological skills. There is an urgent

requirement to close the gap between academic institutions and industries. There is a requirement for investment not only to help improve skills in current technologies but also to improve skills in cutting-edge technologies like artificial intelligence, robotics, and the Internet of Things (Hanif, 2023)

Similarly, Shahid, (2022) reports that there are gaps in technical competency in emerging techs, poor problem-solving skills, and inadequate communication skills. Many employers identified that graduates tend to lack practical experience and skills to the extent that they could apply theory to practice, particularly in the automation and digital engineering industries. Some of the recommendations made were a call for adjustment of engineering curricula to be in tandem with current market needs and enhancement of relationships between universities fitness to industries for internship and training programs.

On industry- academia linkages, the study carried out by Baig et al., (2018) analyses a gap that has been created by academia in shaping the engineering profession in Pakistan as compared to market demands on employment. The paper identifies archaic curriculum, absence of curriculum designing specialists, lack of teaching-learning process innovations, and inadequate interfaces with innovative technologies as the key causes of the skill deficit. The employers in the study indicated that today's graduates are poorly equipped to work in the interactive, cross-functional organized world. The study recommends internships with industries, cooperation programs, and the frequent updating of the curriculum to reflect the needs of the employers. This thesis primarily stresses enhancing the general relevance of curricula and training courses offered by the educational institutions of Pakistan, the general concentration is on technical as well as non-technical competencies.

A summary of the literature review regarding the measuring skill gap across the countries is given in table 3

**Table 3: Literature Review Regarding Measuring the Skill Gap**

<b>Author/Year</b>	<b>Country</b>	<b>Methodology</b>	<b>Findings</b>
(Zeidan & Bishnoi, 2020)	UAE	The quantitative and qualitative approach	22 percent of respondents were of the view that the university curriculum meets the needs of the industry while 78 percent of the respondents believed otherwise. About 78 percent of the respondents believed that universities were not able to develop the hard skills of the students. On the other hand, 90 percent of the respondents believed that universities were unable to develop the soft skills of graduates. In focus group interviews, most respondents were of the view that the industry prefers to employ graduates who are digital savvy, have strong interpersonal skills, and possess interdisciplinary skills.
(Handel, 2003)	USA	Qualitative and Quantitative Approach Observational approach	The author is of the view that skill mismatches are difficult to measure because different sectors require different skills. The skill gap developed due to rapidly changing job requirements and the lack of change in skills provided by the academia. According to a rural manufacturing survey, interpersonal and work habits have ranged by employers as the most demanded skill in employees. Also, other institutions have concluded that many employers lack communication skills and are unable to adjust to changing job environments.

(Khattak, 2023)	Pakistan	Literature review	The author is of the view that the IT industry is faced with a shortage of 30,000 skilled professionals. Similarly, the health sector is in dire need of 25,000 doctors and 60,000 nurses to administer quality healthcare to the populace. About 60 percent of employers reported that they have difficulty finding the right candidate for the job. On the other hand, about 40 percent of fresh graduates' report difficulty in finding suitable employment that matches their skill set.
(Sarin, 2019)	India	Qualitative and Quantitative Approach Survey and interviews	<b>Technical skills</b> (students): spreadsheets followed by computer literacy, word processing, databases, presentations, and project management. <b>Non-technical skills:</b> communication skills followed by problem-solving, learning agility, time management, and teamwork. <b>Behavioral skills:</b> motivated followed by responsible, intelligent, self-confident, ethical. <b>HR PERSPECTIVE;</b> <b>technical skills:</b> word processing followed by spreadsheets, databases, computer literacy, and project management. <b>Non-technical skills:</b> view communication skills followed by problem-solving, learning agility, team building, and adaptability: ethical, responsible, flexible, motivated, and enthusiastic .
(Mohtadi et al., 2014)	UK	Survey Questionnaire	59 percent of businesses and 79 percent of academics were of the view that there exists a skill gap. Skill gap exists in technical skills, communication skills, business and commercial

			awareness, IT skills, Teamwork, and self-management.
(Ramadi et al., 2016)	Lebanon	Survey Questionnaire	Cooperation skills, communication skills, and personal accountability were termed as the most important skills among 36 skills. While skill gap was reported in cooperation and learning skills, communication skills, and personal accountability skills.
(Blom & Saeki, 2011)	India	Survey Questionnaire	A major skill gap was identified in reliability, teamwork, and communication skills.  69 percent employers were satisfied with fresh graduates, 3.9 percent were not at all satisfied, 16.1 percent were not satisfied, and 11 percent were somewhat satisfied with the quality of fresh graduates.
(AZAMI ZAHARIM et al., 2008)	Malaysia	Interview Based on Questionnaire	The employers were dissatisfied with their entrepreneurial abilities and the ability to design and conduct experiments and to analyze and interpret data. Employers deem communication skills as the most important attribute in engineering graduates. A skill gap existed in the application of technical skills and effective communication.

(Gaurav, 2020)	India	Mix method research, Survey Questionnaire (civil engineers)	Students were required to gain Drawing Skills and related software, Communication Skills with oral and presentation skills, Structural Analysis with related software, Project Management software and Managerial skills, Estimation and Costing, and Knowledge of codes as technical skills. In the case of soft skills, the gap existed in work ethics, value engineering, negotiation skills, and Modern survey methods such as LIDAR.
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**2.5 Research Gap**

The review of the above literature shows that limited research has been done on skill gaps among engineering graduates in Pakistan. The existing literature has either discussed the demand side perspective of the skill gap or the supply side. The study carried out by Rizwan et al. (2018) has only discussed the perception of employees and graduates regarding skills required for a job. However, the study only takes the broad level of skills that do not include technical skills, non-technical, and interpersonal skills of engineering graduates. Also, the literature above shows that no study has discovered the industry-academia linkages and the reasons behind the gap between industry and academia in the engineering sector. Moreover, the study carried out in Pakistan has not explored the relation between the academic performance of graduates and their skillset. Most of the studies carried out in Pakistan have analyzed skill gaps for business graduates. Therefore, this study analyzes the skill gap among engineering graduates from the perspective of both employers and graduates. Moreover, to the best of my knowledge, no study has analyzed the skill gap from an academic/faculty perspective. However, it is very important to know what academia says about the reasons for the low skills of fresh graduates and how they can be improved. Therefore, the present study also explored the skill gap from academia’s perspective.

## **2.6 Policy Context**

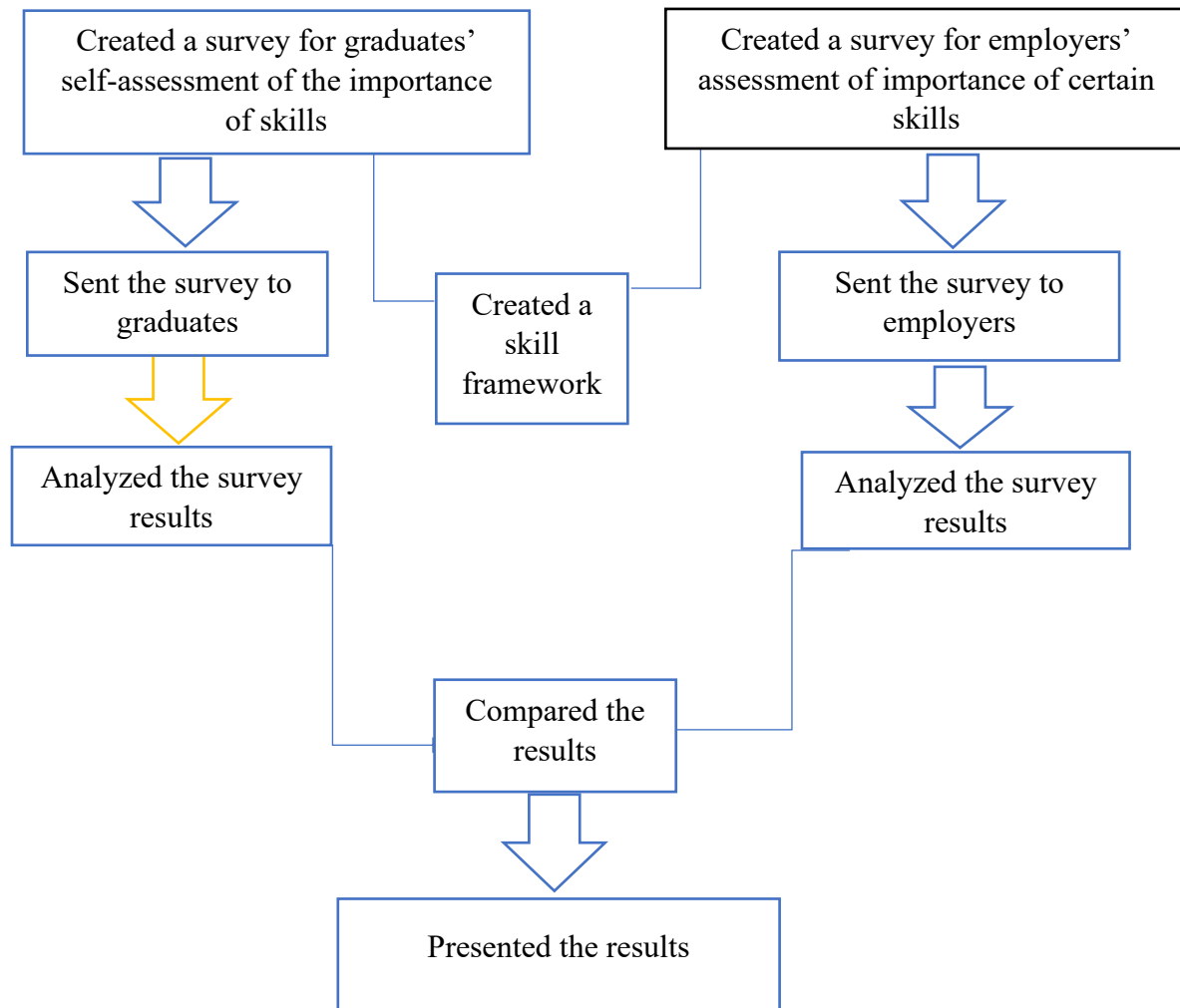
This study was conducted to investigate gaps in skills being encountered by engineering graduates. It would provide policy input to both higher education institutions and employers. Input from three major stakeholders, fresh graduates, academia, and employers would help concerned institutions to introduce possible interventions to reduce this skill gap and will also help employers understand the educational institutions' limitations and what role they can play to lessen this gap. Therefore, the thesis would be an important step in bridging the gap between the skills possessed by engineering graduates and the ones required by the labor market. It can provide policy input to both higher education institutions and employers.

## Chapter 3. Methodology

### 3.1 Research Strategy

The study was based on mixed-method design. For a comprehensive understanding of the issue, both qualitative and quantitative analysis was done to analyze the responses of engineering graduates and employers. Mixed method research design integrates both qualitative and quantitative approaches, combining their strengths to achieve a more comprehensive understanding. This approach incorporates diverse perspectives, data collection methods, and analytical techniques to provide a broader and deeper insight, while also allowing for cross-validation and corroboration of findings (Schoonenboom & Johnson, 2017). In this research, I have used quantitative approach to analyze the results and then a qualitative approach to build on quantitative data results to examine the issue in more detail.

*Figure 3: Overview of Methodology*



Firstly, we asked engineering graduates regarding their satisfaction with technical skills, general skills and communication skills. Then we asked employers regarding their importance with technical skills, general skills and communication skills as prescribed by PEC. Also, we asked the employers regarding their satisfaction with technical, general and communication skills or engineering skills. Lastly, We recorded the views of the academic community regarding the persistence of skill and lack of university-academia linkages.

For this purpose, we created a skill framework for engineering graduates and used the framework to design one or two different surveys to ask employers about the importance of skills for the company or the need for specific skills. Also, we asked graduates and employers regarding their satisfaction with the skills as prescribed by PEC. The framework includes technical, general and communication skills. Technical competence is the expertise that is necessary for the execution of engineering processes, including the understanding of the programs commonly used in engineering, comprehension of core concepts in engineering, and the capability to implement quantitative and scientific data to their tasks. In contrast to technical skills, interpersonal and cognitive skills that are vital in an engineering position can be grouped into general and communication skills. These are communication, working in a team, critical thinking, and being able to lead a group (Mohtadi et al., 2014).

Male et al. (2011) have also emphasized the requirement of genetic competency in the aspect of technical competency and others. Their work suggests the idea of an adequate set of competencies that allows engineers to fulfill not only the technical but also the project and social tasks as members of teams and organizations. Also, the Pakistan Engineering Council (PEC) has elaborated a list of desirable characteristics to be developed in engineers. As mentioned above, there are nine skills that a practitioner should master as per the PEC's official guidelines: fundamentals of engineering, knowledge application, and skill, global competency, information technology, interdisciplinary proficiency, innovativeness, multicultural communication, and personal/moral integrity. The skills specified by the PEC are used as the major reference framework in the development of the questionnaire regarding the required skill. Moreover, we also consulted the relevant literature such as Azami Zaharim et al (2008) and Blom and Saeki (2011) in detail which have focused on the engineers in developing their questionnaires. To understand the alignment and

comparability with the country's established standards of engineering competency for the professionals in Pakistan, we consulted the skill framework of PEC.

### **3.2 Quantitative Method:**

Quantitative methods allow the social behavior and perceptions of the population to be quantified. The quantitative method helps to investigate research questions as to which skill is more important for recent graduates and employers in engineering firms. The quantitative method is used first to analyze the responses from engineering graduates. Also, it is used to analyze the perspective of the employers (Schoonenboom & Johnson, 2017).

We have collected quantitative data through surveys. The survey method provides the perspective of respondents' behaviors, opinions, and attitudes. A survey method is a data collection process or technique in which the researcher gathers data for the study by asking questions to a predetermined population or a sample group. The survey is used to gather information about the characteristics, actions, or opinions of respondents (Hasan, 2024).

We have analyzed the data collected from both graduates and employers to identify the skill gap and the need to bridge the gap between academia and industry. We have studied the skill gap from the following three perspectives.

#### **3.2.1 Skill gap from Graduates' Perspective:**

The skill gap from employers' perspective is measured by the average difference between the expectation/importance of employers and their satisfaction level of specific skills of fresh graduates. Azami Zaharim et al. (2008) has also used the method below to calculate skill gaps for engineering graduates.

$$\text{Mean Gap of Employability skills of Graduates} = \frac{\sum_{i=1}^n [(\text{Importance} - \text{satisfaction level})]}{n}$$

Here expectations/importance means the skills that the employers want to see in the graduates and satisfaction level means the employer ascribes importance to the skill set of graduates.

Moreover, the study has also analyzed the mean differences in skill gap across the genders, across different types of universities, and across the CGPA of graduates.

### **3.2.2 Skill Gap from Employer's Perspective:**

The study measures the skill gap from both employers' and graduates' perspectives. That is the difference between skills demanded by employers and the skills that are gained by graduates. McKenney and Handley (2019) has also used the method below to calculate skill gap.

$$\text{Skills Required} - \text{Skills Gained} = \text{GAP}$$

Here, the skills required represent the skills that a specific company or firm needs from the graduates. The skills gained represent the skills that graduates have acquired throughout their academic careers.

### **3.3 Qualitative Method:**

We have used qualitative method to evaluate the responses that we collected from the academia. Qualitative method provides abundant data about real-life situations and people (Eyisi, 2016). Moreover, it highlights the human side of behavior, experience, and events, thus a pertinent method for our research. Qualitative analysis finds patterns and meanings in data that might otherwise be ignored, and which give a complete picture of the investigated phenomenon (Eyisi, 2016). After collecting quantitative data from graduates and employers, we conducted open-ended interviews with the heads of the engineering departments in universities to obtain their perspective regarding this skill gap. The methods and tools used by analysts while collecting data are crucial to the stage being accessed. The best way to do so is for analysts is to frame a thematic framework. Thematic framework organizes collected data based on major themes, categories and concepts. After data is collected from interviews, themes are generated through manual coding and are further divided into main themes and subthemes (Lewis et al., 2003). For the above reasons, we also used thematic analysis method to analyze the data collected from interviews.

### **3.4 Sampling/Unit of Data Collection**

In this study, we have analyzed the skill gap of engineering graduates in Rawalpindi and Islamabad. For this purpose, we used non-probability sampling. Non-probability sampling employs units which are purposefully selected to represent specific characteristics of a group or community. Contrary to probability sampling, it doesn't strive to be statistically representative, which means that the likelihood of selecting each unit is unknown. Instead, the characteristics of

each unit act as the selection criteria. An investigator's sample is reliable, representative and general to sample's population (Sarantakos, 1998). We have used a purposive sampling for data collection to target our population, because when sample is small and informative, this sampling technique is used. So, our unit of data collection is recent engineering graduates or final-year students from Rawalpindi and Islamabad studying in different public and private universities. Also, we have interviewed the heads and chief executive officers of engineering firms to include and analyze their perspectives too. To get the perspective of the academia, we conducted interviews with heads of engineering institutes in public and private universities in Rawalpindi and Islamabad.

### **3.5 Description of Locale**

We have taken Islamabad and Rawalpindi as our locale because both public and private universities are present in ample quantity in these twin cities. These universities are NUST, UET Taxila, COMSATS, and IST. Also, universities in Rawalpindi and Islamabad offer engineering education in diverse engineering technologies. Moreover, there are many engineering firms in these cities offering job opportunities for engineering graduates of different technologies.

Responses have been collected from fresh engineering graduates or final year's engineering students, who are potential employees, studying in these cities and interviews have been conducted with different employers working in these cities.

## Chapter 4. Results

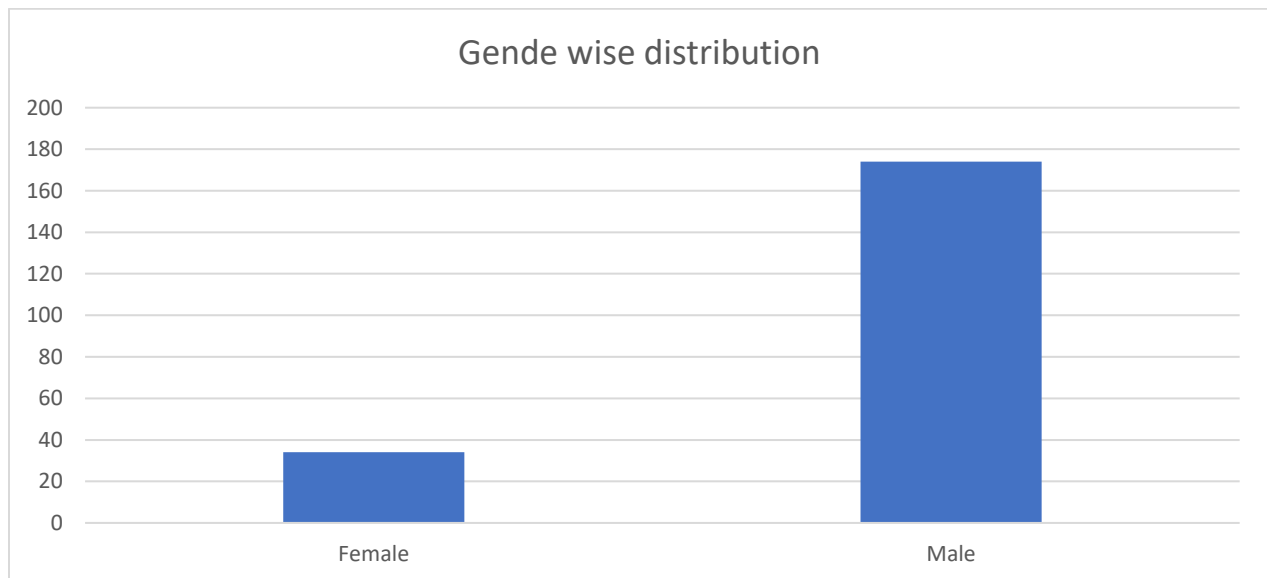
### 4.1 Quantitative Findings

Chapter 4 discusses the results of the first and second objective of the study. The purpose of this thesis was to explore the most important employability skills as perceived by the graduates and the most important employability skills as perceived by the employers. The first section of the study discussed graduates' satisfaction with the most important employability skills for engineering graduates. The second section of the study discussed the results of employers mean satisfaction and mean satisfaction with the skills of engineering graduates.

#### 4.1.1 Graduates' Perception:

In this part of the study, we have discussed engineering graduates' satisfaction with their employability skills. The sample size consisted of 210 students from engineering universities in Rawalpindi and Islamabad. In the study, 80 percent of the respondents were male while 20 percent of the respondents were female.

*Figure 4: Gender-wise sample size*



Out of 210 respondents, 58 were in civil engineering, 33 in electrical engineering, 47 in mechanical engineering, 27 in software engineering, 36 in computer science engineering, 02 in information

technology and data science engineering, 01 in aerospace engineering, industrial, environmental and structural engineering . The respondents are graduates of final year or MS and PhD students from the NUST, UET Taxila, Institute of Space Technology Islamabad, and COMSATS Islamabad. In the respondents, Sixty-Six (66) percent of the respondents had prior work experience and 34 percent of the respondents had not taken any internship or work experience. Most of the respondents were final-year engineering students. About 75 percent of the respondents were seeking job while 25 percent were not seeking any job. Also, 66 percent of the respondents had taken an online course while 34 percent of the respondents had not taken any online course. The table below shows the frequency of responses from different universities in Islamabad.

**Table 4: Frequency of Responses from University Graduates**

<b>University</b>	<b>Frequency</b>
COMSATS, Islamabad (Private)	21
IST (Private)	13
FAST (Private)	06
NUST (Private)	45
UET Taxila (Public)	117

Table 5 shows cronbach’s alpha test results. Cronbach’s Alpha analysis determines the internal reliability of systems which measure similar constructs by producing values between zero and one. Cronbach’s Alpha coefficient evaluates reliability through its score between 0 and 1 and higher values indicate better reliability. Research indicates that acceptable reliability exists when a coefficient exceeds 0.7 but values above 0.8 represent good to excellent reliability. Technical skills ( $\alpha = 0.85$ ) and general skills ( $\alpha = 0.88$ ) and communication skills ( $\alpha=0.76$ ) achieve high internal consistency scores through the test which demonstrates effective measurement of these skill categories.

**Table 5: Cronbach's Alpha Test**

Skills	Value
Technical skills	0.85
General skills	0.88
Communication skills	0.76

Table 6 shows the mean satisfaction with PEC skills based on the gender of the graduates. In technical skills, the mean satisfaction was same for all graduates. In general skills, the mean satisfaction was higher for male students and in communication skills, the mean satisfaction was higher for female graduates. The high performance of female graduates in communication skills can be attributed to the low enrollment of female in engineering disciplines in Pakistan.

**Table 6: Mean Satisfaction with Skills Based on Gender**

Gender	Technical Skills	General Skills	Communication Skills
Male	3.44	3.37	3.18
Female	3.44	3.28	3.43
Total	3.44	3.29	3.37

Table 7 shows the mean satisfaction of graduates from private, semi government and government universities. The data suggests that private universities' graduates were more satisfied with their technical, general and communication skills as compared to graduates of government and semi government universities . The reason behind this low satisfaction may be the unavailability of required expertise in government universities due to lack of resources.

**Table 7: Mean Satisfaction with Skills Based on University Type**

<b>University Type</b>	<b>Technical Skills</b>	<b>General Skills</b>	<b>Communication Skills</b>
Private	3.82	3.67	3.42
Government	3.47	3.18	3.45
Semi-government	3.41	3.48	3.12

To achieve the first objective of the research, the respondents were asked about their satisfaction level with the skills that are described as important by the Pakistan Engineering Council. These include technical skills, general skills and communication skills. The data below shows that most of the respondents were either satisfied or very satisfied with the technical skills prescribed by PEC. Also, some graduates were dissatisfied and very dissatisfied with their technical skills. The table 7 below shows the mean satisfaction level of respondents against each skill. Graduates were more satisfied with “Basic computer know-how (MS Word, Excel, PowerPoint)”, having a mean satisfaction of M=3.78. The graduates were least satisfied with “Having in-depth technical competence in a specific engineering discipline” with a mean satisfaction of M=3.30. Satisfaction level for “Ability to design a system, component, or process to meet desired needs” was second highest with a mean value of M=3.56 followed by “Ability to apply technical skills (e.g., basic programming skills)” having a mean value of M=3.55, “Having competency in application and practical-oriented engineering” (M=3.54), “Having competency in theoretical engineering and the ability to carry out research”(M=3.41), “Ability to apply knowledge of mathematics, science, and engineering” (3.40), “Ability to use appropriate and modern tools, equipment, and technologies (excluding computers)” (M=3.40), “Advanced computer skills (e.g., MS Visio, AutoCAD, spreadsheets, databases)” (M=3.35), “Ability to design and conduct experiments, as well as to analyze and interpret data” (M=3.31), “Ability to identify, formulate, and solve technical/engineering problems” (M=3.30).

**Table 8: Mean and Standard Deviation of Satisfaction with Technical Skills**

<b>Technical Skill</b>	<b>Mean Satisfaction Level</b>	<b>Standard Deviation</b>
Ability to apply knowledge of mathematics, science, and engineering	3.40	1.19
Ability to use appropriate and modern tools, equipment, and technologies (excluding computers)	3.40	1.27
Ability to identify, formulate, and solve technical/engineering problems	3.30	1.27
Ability to design a system, component, or process to meet desired needs	3.56	1.21
Ability to design and conduct experiments, as well as to analyze and interpret data	3.31	1.30
Having in-depth technical competence in a specific engineering discipline	3.30	1.32
Having competency in application and practical-oriented engineering	3.54	1.17
Having competency in theoretical engineering and the ability to carry out research	3.41	1.16
Basic computer know-how (e.g., MS Word, Excel, PowerPoint)	3.78	1.27
Ability to apply technical skills (e.g., basic programming skills)	3.55	1.18

Advanced computer skills (e.g., MS Visio, AutoCAD, spreadsheets, databases)	3.35	1.31
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The graduates were also asked about their satisfaction with general skills as prescribed by the Pakistan Engineering Council. Table 8 shows that the mean satisfaction level was high for “Integrity” (M=3.63) followed by “Willingness to learn” (M=3.63). In general skills, the satisfaction level was lowest for “Knowledge of contemporary issues” (M=3.38) followed by “Flexibility” (M=3.41). The overall mean satisfaction level for general skills was consistent across all skills.

**Table 9: Mean and Standard Deviation of Graduates’ Satisfaction with General Skills**

<b>General Skills</b>	<b>Mean Satisfaction</b>	<b>Standard Deviation</b>
Flexibility	3.41	1.14
Creativity	3.50	1.13
Empathy	3.56	1.13
Integrity	3.63	1.10
Self-discipline	3.49	1.16
Knowledge of contemporary issues	3.38	1.14
Self-motivated	3.56	1.18
Team Player	3.43	1.17
Willingness to learn	3.63	1.14
Understands and takes directions for work assignments	3.53	1.16
Take responsibility for his/her actions	3.60	1.15

The graduates were also asked about their satisfaction level with communication skills as prescribed by the Pakistan Engineering Council for engineering students. Table 10 shows that “Communication in English” has the highest mean satisfaction (M=3.47) followed by “Verbal communication” (M=3.38). The graduates show least satisfaction with “Written communication” (M=3.29) followed by “Reading (understands official emails and other correspondences)” (M=3.35).

**Table 10: Mean Satisfaction and Standard Deviation of Graduates with Communication Skills**

<b>Communication Skills</b>	<b>Mean Satisfaction</b>	<b>Standard Deviation</b>
Communication in English (can communicate fluently in English language both in verbal and written form)	3.47	1.22
Verbal Communication (knows how to effectively communicate with peers, subordinates, and seniors)	3.38	1.25
Reading (understands official emails and other correspondences)	3.35	1.39
Written Communication (knows how to write professional emails and letters)	3.29	1.33

Table 11 shows the difference in mean satisfaction scores for general skills for graduates who attended labs frequently compared to those who never or rarely attended the lab. This suggests

that graduates who attend labs have more chances of improving their skills than those who don't. Attending labs help in improving the technical, general as well as communication skills. Similarly, those graduates who don't attend labs have less probability of being more skillful.

***Table 11: Mean Satisfaction of General Skills of Graduates according to Lab Attendance***

<b>Lab Attendance</b>	<b>Mean Satisfaction</b>
Frequently	3.59
Often	3.60
Rarely_Never	3.30

Table 12 shows that the graduates who enrolled in online courses had greater mean satisfaction scores for general as well as communication skills. This shows that online courses play a considerable role in enhancing the skillset of graduates.

***Table 12: Mean Satisfaction of Technical and Communication Skills according to Online Course Enrollment***

<b>Online Course Enrolment</b>	<b>Mean Satisfaction (Technical Skills)</b>	<b>Mean Satisfaction (Communication Skills)</b>	<b>Total Mean Satisfaction</b>
Yes	3.50	3.40	3.44
No	3.41	3.31	3.34

Table 13 shows the descriptive statistics which suggest that seminars play a crucial role in enhancing the technical, general, and communication skills of the graduates. It helps them improve their employability and understand the dynamics of the market.

***Table 13: Mean Satisfaction of PEC Ascribed Skills According to Seminar Attendance***

<b>Seminar Attendance</b>	<b>Mean Satisfaction (Technical Skills)</b>	<b>Mean Satisfaction (General Skills)</b>	<b>Mean Satisfaction (Communication Skills)</b>	<b>Total Mean Satisfaction</b>
Frequently	3.58	3.41	3.51	3.58
Rarely	3.34	3.22	3.26	3.34

#### 4.2 Employer's Perception:

The second section of the quantitative data comprises the employer's perception regarding the PEC ascribed skills of engineering graduates. In this part, employers' perceptions regarding the importance and satisfaction level of graduate skills are shown. For this, 38 engineering firms in Rawalpindi and Islamabad were selected. Employers were asked about the number of fresh graduates they interviewed annually. Table 14 shows the list of organizations visited for collecting data.

**Table 14: List of Organizations**

<b>Organization</b>	<b>Position</b>	<b>Nature of Organization</b>	<b>Location</b>
Ufone (Telecom)	Supervisor/Manager	Private	Islamabad
Jazz (Telecom)	Manager	Private	Islamabad
Rastgar Engr Comp (Mechanical)	Employer	Manufacturing	Islamabad
Menhir (Civil)	Manager	Private	Islamabad
M.A Chaudry Enterprise (Civil)	Manager	Private	Islamabad
Power Consulting Engineering (Electrical)	Employer	Private	Islamabad
Tecdeps (IT)	Employer	Services	Islamabad
Dpl (It)	Manager	Services	Islamabad
Pixako Technologies (Pvt) Ltd (It)	Manager	Services	Islamabad
Omnisoftex Inc. (It)	Manager	Private	Islamabad
City Engineering Consultants (Manufacturing)	Manager	Private	Islamabad
Sab Engineering Consultants (Manufacturing)	Manager	Private	Islamabad
Zahir Khan & Brothers (Pvt) Ltd (ZKB) (Manufacturing)	Manager	Manufacturing	Islamabad

National Engineering Services Pakistan (Nespak)	Manager	Government	Rawalpindi
Wapda (Electrical)	Manager	Government	Rawalpindi
Pakistan Public Works Department (Mechanical)	Manager	Government	Rawalpindi
Petroleum Exploration Limited (Mining)	Employer	Private	Rawalpindi
Arching Limited (Civil)	Employer	Private	Rawalpindi
Wapda Subdivisional Office (Electrical)	Manager	Public	Islamabad
Khyber Grace (Pvt) Ltd	Manager	Private	Islamabad
Mill Engineering Experts(Mechanical)	Employer	Private	Rawalpindi
Water And Sanitation Agency (Civil)	Manager	Government	Rawalpindi
Diya Consults (Electrical)	Employer	Private	Islamabad
AH Group Of Companies (Civil)	Employer	Private	Islamabad
Sleek Designs Private Limited (Civil)	Employer	Private	Islamabad
IKEAN Engineering Services Private Limited (Electrical)	Manager	Private	Islamabad
Galaxy International Engineers And Builders	Manager	Private	Islamabad
Pect Engineering (Pvt) Ltd (Electrical)	Employer	Private	Islamabad
Water And Sanitation Agency (Electrical)	Manager	Government	Islamabad
Britlite Engineering (Electrical)	Manager	Private	Rawalpindi
Water And Sanitation Agency (Mechanical)	Manager	Government	Rawalpindi
Centangle Interactive (It)	Employer	Services	Islamabad

Protels Network Pakistan (Communication)	Manager	Private	Islamabad
Sarwar And Company (Pvt) Ltd (Mechanical)	Manager	Private	Rawalpindi
MEC Engineering Company (Mechanical)	Employer	Private	Rawalpindi
Ravi Green Engineering (PVT) Ltd	Employer	Private	Rawalpindi
Ideal Electrical And Mechanical Engineering (Mechanical)	Manager	Services	Rawalpindi
National Defense Complex (Mechanical)	Supervisor	Public-Private	Rawalpindi

**Table 15: Number of Fresh Graduates Interviewed Annually**

<b>Number Of Fresh Graduates Interviewed Annually</b>	<b>Frequency</b>
0-5	5
More than 20	13
10-20	14
Don't know	6

Table 16 shows the size of the engineering firms that were selected for collecting data regarding the employability skills of engineering graduates.

**Table 16: Respondent's Size of Organization**

<b>Employees</b>	<b>Frequency</b>
More than 300	10
100-200	11
50-100	17

Table 17 shows the distribution of engineering firms based on their type of technology. In the firms selected 9 provided civil engineering services, 9 of telecom and mechanical engineering, 08 of electrical engineering and 03 of manufacturing.

**Table 17: Type of Firms**

<b>Engineering technology</b>	<b>Frequency</b>
Civil Engineering	09
Telecom	09
Mechanical Engineering	09
Electrical Engineering	08
Manufacturing	03

Table 18 gives the distribution of firms based on their location. Since the study was carried out for twin cities, 15 of the firms were from Rawalpindi and 23 from Islamabad.

**Table 18: Distribution of Firms by Location**

<b>Location</b>	<b>Frequency</b>
Rawalpindi	15
Islamabad	23

#### **4.2.1 Importance of skills as perceived by employers:**

To achieve the second objective of the study, the employers were first asked about the importance of employability skills for engineering graduates. Almost all the employers responded that technical skills are very important for engineering graduates to get employment in engineering industries.

Table 19 below shows the importance of technical skills as perceived by employers of engineering firms in twin cities. The most important skill in technical skills was “Having competence in theoretical and research engineering” (M=3.63), indicating that employers place a high-value position on graduates who have a strong research and theoretical base. This suggests that industries also look for engineers who can solve problems and innovate, which is not purely limited to practical work. In addition, “Basic computer know-how (e.g., MS Word, Excel, PowerPoint)” (M=3.61), is ranked as the second most important skill by employers for engineering graduates.

Similarly, “Having competency in application and practical-oriented engineering” (M=3.58) is ranked as the third most important skill from the perspective of employers. This shows that while possessing a strong knowledge of theory is important, being able to execute the theory and knowledge into practice is just as important. On the other hand, “Ability to design a system, component, or process to meet desired needs” (M=3.32) is ranked as the least important skill by employers. This is because entry-level engineers are likely to be more focused on problem-solving and execution rather than design.

The standard deviation values indicate that “Having competency in application and practical-oriented engineering” (SD=0.49) and “Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)” (SD=0.58) have the least variance, implying that most respondents did not differ much in their opinion of importance on these two skills. In contrast, “Ability to design a system, component, or process to meet desired needs” has the lowest value of standard deviation at 0.83, meaning that most employers have diverse views when it comes to applying such skills.

**Table 19: Mean Importance of Technical Skills as Perceived by Employers**

<b>Rank</b>	<b>Technical Skills</b>	<b>Mean Importance</b>	<b>Standard Deviation</b>
1	Having competence in theoretical and research engineering	3.63	0.62
2	Basic computer know-how (e.g., MS Word, Excel, PowerPoint)	3.61	0.71
3	Having competency in application and practical-oriented engineering	3.58	0.49
4	Ability to use appropriate and modern tools, equipment, and technologies (other than computers)	3.50	0.60
5	Ability to design and conduct experiments, as well as to analyze and interpret data	3.50	0.72
6	Ability to apply technical skills (e.g., Basic programming skills)	3.50	0.55
7	Ability to apply knowledge of mathematics, science, and engineering	3.47	0.64
8	Having in-depth technical competence in a specific engineering discipline	3.39	0.63
9	Ability to identify, formulate, and solve technical problems	3.34	0.70
10	Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)	3.37	0.58

11	Ability to design a system, component, or process to meet desired needs	3.32	0.83
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Table 20 below shows the importance of general skills as perceived by employers of engineering firms in Rawalpindi and Islamabad. The most important skill rated by the employers is “Teamwork (Understands the importance of interpersonal relationships and uses them effectively)” (M=3.66) which indicates that collaboration and effective interpersonal relationships are important in engineering workplaces. Next in line are Flexibility (M=3.58), creativity (M=3.58), and willingness to learn (M=3.58), which illustrates that being adaptable, innovative, and a constant learner is significant in current engineering positions. This implies that companies appreciate engineers who can cope with new challenges and approach problems with new ideas.

‘Self-discipline’ (M=3.53), “Take responsibility for his/her actions” (M=3.55), and “Understands and takes directions for work assignments proactively” (M=3.55) also take high scores, showing that the job market seems to prefer self-reliant engineers who can function independently as needed. It is also interesting to note that employer’s rate “Self-motivated (M=3.45) and display “Integrity (Understands/applies professional and ethical principles to decisions even when not supervised)” (M=3.47), which are important ethical attributes, but are not the most preferred skills. This may reflect the fact that these traits are regarded as basic rather than essential.

The lowest-rated skill by employers is “Knowledge of contemporary issues” (M=3.39). Even if this skill is less important than the others, it is still essential. Regardless, its standard deviation (0.59) indicates some variability in employer views.

**Table 20: Mean Importance of General Skills as Perceived by Employers**

Rank	General Skills	Mean Importance	Standard Deviation
1	Teamwork (Understands the importance of interpersonal relationships and uses them effectively)	3.66	0.53
2	Flexibility (responds well to change)	3.58	0.59

<b>3</b>	Creativity (Identifies new approaches to problems)	3.58	0.54
<b>4</b>	Willingness to learn (Life-long learning)	3.58	0.59
<b>5</b>	Self-discipline (exhibits self-control)	3.53	0.60
<b>6</b>	Understands and takes directions for work assignments proactively	3.55	0.50
<b>7</b>	Take responsibility for his/her actions	3.55	0.50
<b>8</b>	Empathy (understanding the problem or situation from another's perspective)	3.50	0.60
<b>9</b>	Self-motivated	3.45	0.59
<b>10</b>	Integrity (Understands/applies professional and ethical principles to decisions even when not supervised)	3.47	0.55
<b>11</b>	Knowledge of contemporary issues	3.39	0.59

Table 21 below shows the mean importance of communication skills as perceived by employers of engineering firms in twin cities. The mean importance score for all four communication skills suggests that considerable importance is attached to all four skills and that all skills have mean importance scores between 4.61 and 4.95. “Written communication (Knows how to write professional emails and letters)” (M=4.95) was rated to be the most important skill followed by “Communication in English (can communicate fluently in English both in verbal and written form)” (M = 4.87), Verbal communication (M = 4.68), and “Reading (understands official emails and other correspondences)” (M= 4.61). The low standard deviations suggest that employers’ ratings were close to one another and did not vary much within their perceptions of the importance of those skills. Given the context of the workplace, it appears that high scores were given for a reason and there are these communication skills that are crucial to the working environment, especially the written form and English level that would be indispensable for interacting and working with other professionals. The respondents may have perceived the moderately lower scores for the verbal communication and reading exercises as an indication that those, while still

valuable, were viewed as of lesser importance than the written form and English communication in the workplace. These findings also illustrate that there is a significant focus on communication skills within organizational settings.

**Table 21: Mean Importance of Communication Skills as Perceived by Employers**

<b>Communication Skills</b>	<b>Mean Importance</b>	<b>Standard Deviation</b>
written communication (Knows how to write professional emails and letters)	4.95	0.22
communication in English (can communicate fluently in English both in verbal and written form)	4.87	0.34
verbal communication (knows how to effectively communicate with peers, subordinates, and seniors)	4.68	0.52
Reading (understands official emails and other correspondences)	4.61	0.54

#### **4.2.2 Satisfaction of skills as perceived by employers:**

This section shows the employers’ satisfaction of the graduates’ employability skills. The respondents were also asked about their satisfaction level with the employability skills that new graduates possess.

Table 22 below shows the mean satisfaction of technical skills as perceived by employers of engineering firms. The data shows that employers have different opinions about the technical skills of engineering graduates. The employers were satisfied with graduates’ “Basic computer know-how (e.g., MS word, excel, PowerPoint)” (M=3.66), “Ability to use appropriate and modern tools, equipment, and technologies specific to their jobs (other than computers)” (M=3.61), and “Ability to apply knowledge of mathematics, science, and engineering” (M=3.44). The employers were least

satisfied by the graduate’s “Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)” (M=2.21) skills followed by “Having competency in application and practical-oriented engineering” (M=2.39) and the “Ability to apply technical skills (e.g., Basic programming skills)” (M=2.50). The wide standard deviations, especially in “Having competence in theoretical and research engineering” (SD=1.24) and “Having competency in application and practical-oriented engineering” (SD=1.05), indicate that graduates are not evenly prepared. This suggests that curriculum improvements are needed to focus more on applied learning, practical training, and advanced digital skills to meet industry needs.

**Table 22: Mean Satisfaction with Technical Skills as Perceived by Employers**

<b>Rank</b>	<b>Technical Skills</b>	<b>Mean Satisfaction</b>	<b>Standard Deviation</b>
1	Basic computer know-how (e.g., MS Word, Excel, PowerPoint)	3.66	0.93
2	Ability to use appropriate and modern tools, equipment, and technologies specific to their jobs (other than computers)	3.61	0.98
3	Ability to apply knowledge of mathematics, science, and engineering	3.44	0.94
4	Ability to identify, formulate, and solve technical problems	3.24	1.05
5	Ability to design a system, component, or process to meet desired needs	3.13	0.98
6	Ability to design and conduct experiments, as well as to analyze and interpret data	3.08	1.08
7	Having competence in theoretical and research engineering	2.87	1.24

8	Having in-depth technical competence in a specific engineering discipline	2.50	1.10
8	Ability to apply technical skills (e.g., Basic programming skills)	2.50	1.17
10	Having competency in application and practical-oriented engineering	2.39	1.05
11	Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)	2.21	0.57

Table 23 below shows the mean satisfaction score of general skills as perceived by employers of engineering firms in twin cities. Employers satisfaction level was highest for “Integrity (Understands/applies professional and ethical principles to decisions even when not supervised” (M=4.08,) indicating that employers place significant importance on ethical decision-making, even without supervision, followed by “Flexibility (responds well to change)” (M=3.92) and “Taking responsibility for his/her actions” (M=3.92) highlighting a preference for employees who can adapt to changes and are accountable for their actions. On the other hand, employers were least satisfied with graduates’ skills of “Teamwork (Understands the importance of interpersonal relationships and uses them effectively)” (M=3.08), suggesting that there might be room for improvement in collaborative abilities. Similarly, employers were 2<sup>nd</sup> least satisfied by graduate skills of “Creativity (Identifies new approaches to problems)” (M=3.08) followed by “Self-motivation” (M=3.43), signaling potential areas where engineering graduates may need further development to meet employer expectations. The standard deviations show considerable variability in some skills (e.g., creativity with 1.19), indicating inconsistent satisfaction levels, suggesting that while some employers may highly value certain skills, others may find them less critical.

**Table 23: Mean Satisfaction Score of General Skills as Perceived by Employers**

Rank	General Skills	Mean Satisfaction	Standard Deviation
1	Integrity (Understands/applies professional and ethical principles to decisions even when not supervised)	4.08	0.67
2	Flexibility (responds well to change)	3.92	0.63
3	Take responsibility for his/her actions	3.92	0.94
4	Empathy (understanding the problem or situation from another's perspective)	3.86	0.88
5	Understands and takes directions for work assignments proactively	3.81	1.01
6	Willingness to learn (Life-long learning)	3.62	0.91
7	Self-discipline (exhibits self-control)	3.59	1.04
8	Knowledge of contemporary issues	3.49	1.22
9	Self-motivated	3.43	1.11
10	Creativity (Identifies new approaches to problems)	3.22	1.19
11	Teamwork (Understands the importance of interpersonal relationships and uses them effectively)	3.08	1.13

Table 24 below shows the mean satisfaction level of communication skills brought by engineering graduates into the firms. It shows the mean satisfaction level of communication skills as perceived by employers of engineering firms in Rawalpindi and Islamabad. The table shows that employers were more satisfied with the graduate's skill of "Reading (understands official emails and other correspondences)" (M=2.63), suggesting that most employers were more satisfied with graduates'

ability to understand official emails and other correspondences. Despite the relatively high satisfaction, the standard deviation of 1.18 indicates some variability in responses, pointing to differing levels of proficiency among individuals, followed by graduates' skill of "Communication in English (can communicate fluently in the English language both in verbal and written form)" (M=2.50), indicating moderate satisfaction. The lower standard deviation of 0.55 suggests more consistency in how employers view the verbal communication skills of graduates.

On the other hand, the employers were least satisfied with the graduate's skill of "Written Communication (knows how to write professional emails and letters)" (M=2.18) by the graduates' skill of "Communication in English (can communicate fluently in the English language both in verbal and written form)" (M=2.39).

**Table 24: Mean Satisfaction Score of Communication Skills as Perceived by Employers**

<b>Rank</b>	<b>Communication Skills</b>	<b>Mean Satisfaction</b>	<b>Standard Deviation</b>
1	Reading (understands official emails and other correspondences)	2.63	1.18
2	Verbal Communication (knows how to effectively communicate with peers, subordinates, and seniors)	2.50	0.55
3	Communication in English (can communicate fluently in English language both in verbal and written form)	2.39	1.06
4	Written Communication (knows how to write professional emails and letters)	2.18	0.68

### 4.3 Gap Analysis

This study also aims to explore the skill gap of engineering graduates as perceived by employers. Firstly, we will measure the skill gap of engineering graduates in technical skills. Positive values in the table show the existence of skill gaps, meaning that employers find these skills important,

but graduates lack those skills. A higher positive means a higher skill gap. On the other hand, negative values show that there is no skill gap or that graduates perform well than employers expect. Table 24 below shows the mean skill gap for each technical skill as perceived by employers. The skill gap was highest in “Having competency in application and practical-oriented engineering” (1.19), followed by “Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)” (1.16), and “Ability to apply technical skills (e.g., Basic programming skills)” (1.00), highlighting critical areas for improvement. On the other hand, the skill gap was lowest for “Basic computer know-how (e.g., MS Word, Excel, PowerPoint)” (-0.05) followed by “Ability to use appropriate and modern tools, equipment, and technologies (other than computers)” (-0.11). Which suggests that graduates are well-prepared in these areas.

**Table 25: Skill Gap of Technical Skills**

<b>Technical Skills</b>	<b>Skill Gap</b>
Having competence in theoretical and research engineering	0.76
Basic computer know-how (e.g., MS Word, Excel, PowerPoint)	-0.05
Having competency in application and practical-oriented engineering	1.19
Ability to use appropriate and modern tools, equipment, and technologies (other than computers)	-0.11
Ability to design and conduct experiments, as well as to analyze and interpret data	0.42
Ability to apply technical skills (e.g., Basic programming skills)	1.00
Ability to apply knowledge of mathematics, science, and engineering	0.03
Having in-depth technical competence in a specific engineering discipline	0.89
Ability to identify, formulate, and solve technical problems	0.10
Advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases)	1.16
Ability to design a system, component, or process to meet desired needs	0.19

Table 26 shows the skill gap for general skills. The skill gap was lowest in overall general skills. For individual general skills, the skill gap was highest for “Teamwork (Understands the importance of interpersonal relationships)” (.58) followed by “Creativity (Identifies new approaches to problems)” (0.36). This means that graduates need to improve their teamwork skills and creativity to secure a place in the market. Employers deem these skills as important and are of the view that graduates lack these skills.

**Table 26: Skill Gap of General Skills**

<b>General Skills</b>	<b>Skill Gap</b>
Teamwork (Understands the importance of interpersonal relationships)	0.58
Flexibility (responds well to change)	-0.34
Creativity (Identifies new approaches to problems)	0.36
Willingness to learn (Life-long learning)	-0.04
Self-discipline (exhibits self-control)	-0.06
Understands and takes directions for work assignments proactively	-0.26
Take responsibility for his/her actions	-0.37
Empathy (understanding the problem from another's perspective)	-0.36
Self-motivated	0.02
Integrity (Understands/applies professional and ethical principles)	-0.61
Knowledge of contemporary issues	-0.10

Table 27 shows that the overall skill gap for engineering graduates in communication skills is highest. Specifically, the gap is highest in “Written Communication (Knows how to write

professional emails and letters)” (2.77) followed by “Communication in English (Can communicate fluently in English both in verbal and written form)” (2.48) followed by ‘Verbal Communication (Knows how to effectively communicate with peers, subordinates, and seniors)” (2.18) and “Reading (Understands official emails and other correspondences)” (1.98).

**Table 27: Skill Gap of Communication Skills**

<b>Skills</b>	<b>Skill Gap</b>
Written Communication (Knows how to write professional emails and letters)	2.77
Communication in English (Can communicate fluently in English both in verbal and written form)	2.48
Verbal Communication (Knows how to effectively communicate with peers, subordinates, and seniors)	2.18
Reading (Understands official emails and other correspondences)	1.98

#### **4.4 Skill Gap from Graduates’ and Employers’ Perspective:**

Table 28 shows that the skill gap was highest for “Having competency in theoretical engineering and research” (.22) followed by “Ability to design and conduct experiments, analyze and interpret data” (.19) followed by "Ability to use modern tools, equipment, and technologies (other than computers)” (.10). Although the overall skill gap for technical skills was low there is room for improvement in the above specific technical skills. On the other hand, the skill gap was negligible for “Ability to design a system, component or process to meet the desired need” (-0.24) followed by “Basic computer know-how” (-0.17) and “Ability to apply technical skills (e.g., basic programming)” (-0.05). It suggests that employers were satisfied with the above specific technical skills of the graduates.

**Table 28: Skill Gap of Technical Skills**

<b>Technical Skills</b>	<b>Skill Gap</b>
Having competency in theoretical engineering and research	0.22
Ability to design and conduct experiments, analyze and interpret data	0.19
Ability to use modern tools, equipment, and technologies (excluding computers)	0.10
Having in-depth technical competence in a specific engineering discipline	0.09
Ability to apply knowledge of mathematics, science, and engineering	0.07
Ability to identify, formulate, and solve technical problems	0.04
Having competency in application and practical-oriented engineering	0.04
Advanced computer skills (e.g., AutoCAD, Visio, databases)	0.02
Ability to apply technical skills (e.g., basic programming)	-0.05
Basic computer know-how (e.g., MS Word, Excel, PowerPoint)	-0.17
Ability to design a system, component, or process to meet desired needs	-0.24

Table 29 shows the skill gap for general skills. A comprehensive examination of non-technical competencies among engineering graduate students reveals several essential areas needing improvement. Skill gaps are largest for teamwork (0.23), flexibility (0.17), and creativity (0.08) showing engineering graduates face difficulties with collaboration and adaptation to change and innovative problem-solving. Engineering projects thrive on teamwork and adaptation because these skills remain vital across dynamic engineering environments. Results show that graduates have a strong reputation for “Willingness to learn (Life-long learning)” (-0.05) and “Take responsibility for his/her actions” (-0.05) and “Integrity (Understands and applies professional and ethical principles)” (-0.16). Educational institutions can use this information to focus on teamwork and adaptability instead of spending resources on already strong aspects. Engineering institutions should introduce more collaborative projects and real-world problem-solving activities along with

flexibility-focused training to address these gaps. Gaining proficiency in non-technical skills strengthens the alignment between academic graduates and employer expectations which leads to enhanced job prospects and workplace success.

**Table 29: Skill Gap for General Skills**

<b>General Skills</b>	<b>Skill Gap</b>
Teamwork (Understands the importance of interpersonal relationships and uses them effectively)	0.23
Flexibility (Responds well to change)	0.17
Creativity (Identifies new approaches to problems)	0.08
Self-discipline (Exhibits self-control)	0.04
Understands and takes directions for work assignments proactively	0.02
Knowledge of contemporary issues	0.01
Willingness to learn (Life-long learning)	-0.05
Take responsibility for his/her actions	-0.05
Empathy (Understanding the problem or situation from another's perspective)	-0.06
Self-motivated	-0.11
Integrity (Understands and applies professional and ethical principles)	-0.16

Table 30 shows that engineering graduates show substantial weaknesses in professional communication which emerge from communication skill gap analysis. The gap is found in “Written communication (Knows how to write professional emails and letters)” (1.66) among new engineers. The effectiveness of writing remains vital across professional settings because reporting and correspondence together with documentation tasks require it. The skill gap for “Communication in English (Can communicate fluently in English both in verbal and written

form)” (1.40) indicates substantial hurdles for engineers to express themselves smoothly through both spoken and written English forms. The technical and business communication landscape that uses English as its primary language may become a hindrance for engineering graduates to present complicated concepts successfully across international settings. The skill gap for “Verbal communication (Knows how to effectively communicate with peers, subordinates, and seniors)” (1.30) and “Reading (Understands official emails and other correspondences)” (1.26) indicate specific areas for extra focus since they affect peer relations and interactions with senior colleagues and professional document understanding. Lack of proficiency in these skills leads to difficulties in team communication as well as leadership roles and project requirements understanding. Educational programs for engineering graduates should offer specialized communication training that combines professional writing instruction with language learning classes alongside spoken communication exercises. The combination of peer feedback sessions along with presentations and technical discussions will enable students to practice and get confident in these areas so they can fulfill industry requirements through professional growth.

***Table 30: Skill Gap for Communication Skills***

<b>Communication Skills</b>	<b>Skill Gap</b>
Written communication (Knows how to write professional emails and letters)	1.66
Communication in English (Can communicate fluently in English both in verbal and written form)	1.40
Verbal communication (Knows how to effectively communicate with peers, subordinates, and seniors)	1.30
Reading (Understands official emails and other correspondences)	1.26

#### 4.5 Qualitative Findings

To satisfy the third objective of the research, interviews were conducted with the heads of departments of engineering institutes and employers in Rawalpindi and Islamabad. 7 interviews were conducted with heads of departments and 38 with employers of engineering graduates.

*Table 31: Respondents to the Interview*

<b>Organization Name</b>	<b>Relationship to Graduates</b>	<b>Type of Organization</b>	<b>Location</b>
Ufone (Telecom)	Supervisor/Manager	Private	Islamabad
Jazz (Telecom)	Manager	Private	Islamabad
Rastgar Engr Company (Mechanical)	Employer	Manufacturing	Islamabad
Menhir (Civil)	Manager	Private	Islamabad
M.A Chaudry Enterprise (Civil)	Manager	Private	Islamabad
Power Consulting Engineering (Electrical)	Employer	Private	Islamabad
Tecdeps (IT)	Employer	Services	Islamabad
Dpl (It)	Manager	Services	Islamabad
Pixako Technologies (Pvt) Ltd (It)	Manager	Services	Islamabad
Omnisoftex Inc. (It)	Manager	Private	Islamabad
City Engineering Consultants (Manufacturing)	Manager	Private	Islamabad

Sab Engineering Consultants (Manufacturing)	Manager	Private	Islamabad	
Zahir Khan & Brothers (Pvt) Ltd (ZKB) (Manufacturing)	Manager	Manufacturing	Islamabad	
National Engineering Services Pakistan (Nespak)	Manager	Government	Rawalpindi	
Wapda (Electrical)	Manager	Government	Rawalpindi	
Pakistan Public Works Department (Mechanical)	Manager	Government	Rawalpindi	
Petroleum Exploration Limited (Mining)	Employer	Private	Rawalpindi	
Arching Limited (Civil)	Employer	Private	Rawalpindi	
Wapda Subdivisional Office (Electrical)	Manager	Public	Islamabad	
Khyber Grace (Pvt) Ltd	Manager	Private	Islamabad	
Mill Engineering Experts (Mechanical)	Employer	Private	Rawalpindi	
Water And Sanitation Agency (Civil)	Manager	Government	Rawalpindi	
Diya Consults (Electrical)	Employer	Private	Islamabad	
AH Group of Companies (Civil)	Employer	Private	Islamabad	

Sleek Designs Private Limited (Civil)	Employer	Private	Islamabad
IKEAN Engineering Services Private Limited (Electrical)	Manager	Private	Islamabad
Galaxy International Engineers and Builders	Manager	Private	Islamabad
Pect Engineering (Pvt) Ltd (Electrical)	Employer	Private	Islamabad
Water And Sanitation Agency (Electrical)	Manager	Government	Islamabad
Britlite Engineering (Electrical)	Manager	Private	Rawalpindi
Water And Sanitation Agency (Mechanical)	Manager	Government	Rawalpindi
Centangle Interactive (It)	Employer	Services	Islamabad
Protels Network Pakistan (Communication)	Manager	Private	Islamabad
Sarwar And Company (Pvt) Ltd (Mechanical)	Manager	Private	Rawalpindi
MEC engineering company (Mechanical)	Employer	Private	Rawalpindi
Ravi Green Engineering (PVT) ltd	Employer	Private	Rawalpindi

Ideal Electrical and Mechanical engineering (Mechanical)	Manager	Services	Rawalpindi
National Defense Complex (Mechanical)	Supervisor	Public-Private	Rawalpindi

The following are the major themes that emerged from the findings:

- a. The reputation of the university
- b. Shortage of candidates whose skills match the requirements of the job
- c. Lack of participation in seminars arranged by the university
- d. Research cooperation agreements with university students

#### **4.5.1 The Reputation of the University:**

Almost all the respondents responded that the reputation of the university is an important factor in the recruitment of graduates in the firms. They responded that graduates of well-reputed universities are well apt in the assignments assigned to them. They also responded that graduates having studied or worked abroad have more chance of getting a job in their firms.

#### **4.5.2 Shortage of Candidates whose Skills Match with the Requirements of Job:**

The respondents were of the view that they face difficulty in recruiting the right people for any given job. When asked about the reason for this predicament, they responded that they have difficulty recruiting the right people due to the shortage of candidates with the right skills for the job. Also, the employers of the view that candidates don't possess the adequate training required for performing a task.

#### **4.5.3 Research Cooperation Agreements with University Students:**

The employers were asked about the frequency of their entering into research cooperation agreements with engineering universities in Rawalpindi and Islamabad. 32 of the employers responded that they rarely enter into research cooperation agreements with engineering universities

or use their technical services. Only 06 of the employers responded that they sometimes enter into research cooperation agreements with engineering universities or use their technical services.

#### 4.6 Academia Responses:

To satisfy the 3<sup>rd</sup> objective of the study and to elaborate on the reasons behind the lack of university-industry linkages and to know the reasons behind the skills gaps of graduates, interviews were conducted with heads of departments of academic institutions. Interviews were conducted with heads of departments in Rawalpindi and Islamabad.

**Table 32: Respondents to the Interview**

Respondents	Institution	Position	Location
A	Quaid e Azam University Islamabad	Head of Department (IT)	Islamabad
B	UET Taxila	Head of department (Civil Engineering)	Rawalpindi
C	NUST	Head of department (Mechanical Department)	Islamabad
D	UET Taxila	Head of department (Electrical Engineering)	Islamabad
E	Pakistan Engineering Council	PEC Member from KPK	Islamabad
F	COMSATS, Islamabad	Head of Computer engineering department	Islamabad

G	IST	Head of Electrical Engineering department	Islamabad
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Major themes that emerged from the findings with academia are the following:

1. Universities lack linkages with industry
2. Important skills for graduates
3. By-directional relationship

#### **4.6.1 Universities Lack in Linkages with Industry:**

The qualitative objective of the thesis was to determine the reasons behind the persistence of the skill gap among engineering graduates. One of the factors identified behind the lack of university academia linkages was the failure of universities to attract industries.

*“The projects that final year students undertake are mere replication. They don’t go for innovation due to a lack of support from the university. This is the reason that academic institutions don’t attract the interest of industries. (Employer C)*

*“The universities need to do more workshops in partnership with industries. Currently, there is a gap between university and industry. The research projects that universities are not industry oriented. Similarly, industries don’t use universities research facilities, and both operate in silos.” (Employer A)*

*“Graduates often lack in practical exposure due to too much focus of universities on theory. This is the reason that industries often struggle to recruit candidates that can apply their knowledge to real-world problems. (Employer B)*

*“Engineering programs must be more focused on hands-on training with industry experts. Right now, graduates often lack the actual understanding of industry challenges. (Employer D)*

*“There is a huge communication gap between the industries and universities. This gap translates into the prevalence of skill gap. There is a need to train new employees to ensure that their skills match the needs of industry. (Employer E)*

*“Final-year students need to work on industry-sponsored projects to enhance their skillset. It will help them gain relevant skills and improve their employment opportunities. (Employer F)*

*“Universities need to encourage problem-solving and creativity rather over reliance on theoretical learning. Right now, students often hesitate to take initiatives and go for innovation due to lack of support from industry. (Employer G)*

#### **4.6.2 Important Skills for Graduates**

The heads of academic institutions were also asked about the skills that help the career prospects of fresh engineering graduates. All the respondents responded that in the age of AI, the graduates need to be apt in technical skills, general skills, and communication skills. The graduates need to continuously enhance their skills to remain relevant in the job market.

*“The instructors have a prominent role in updating the skills of the graduates. The graduates should be able to use the tools required for engineering graduates. They should have strong technical skills because they are required to perform technical tasks. Along with technical skills, they should be able to have strong presentation skills and be able to effectively present their work. (Employer C”*

*“It is necessary for students to possess strong interpersonal and communication skills. They must have the skills to efficiently manage workload, have good organizational skills decision-making skills, and be able to bring innovation to the industry.” (Employer A)*

*“It is important for engineering graduates to not only have a strong grasp of technical concepts but also the ability to work in teams. The ability of problem-solving and adaptability are crucial new graduates in the face of quickly evolving new technologies.” (Employer B)*

*“With the rise of AI, universities need to equip students with both technical and business acumen. It is very important for new graduates to understand project management, budgeting, and market trends to contribute effectively to their organizations.” (Employer D)*

*“Technical expertise alone is not enough; new graduates should also be trained in critical thinking and analytical reasoning. They must possess the ability troubleshoot issues independently and propose innovative solutions.” (Employer E)*

*“New graduates should be equipped with a mindset of continuous learning. In the face of rapidly changing engineering technologies, those who stay updated with new tools and industry practices will have a competitive edge.” (Employer F)*

*“For new graduates, soft skills like teamwork, leadership, and adaptability are just as important as technical skills. Graduates should have the ability to work in diverse teams, take initiative, and handle challenges effectively in a professional setting.” (Employer G)*

#### **4.6.3 Bi-Directional Relationship:**

The respondents were of the view that university-industry linkages can be improved by establishing a bi-directional relationship between universities and industries. This will reduce the skill gap of engineering graduates and increase their employability skills.

*“The final year projects of university students should be based on industry. It will increase the linkages as well as prepare the students for employment in industries. For this purpose, the universities and industries must establish a bi-directional relationship.” (Employer B)*

*“The universities need to empower the ORIC (Office of Research, Innovation & Commercialization) department. It will increase innovation as well as connect graduates to the industry. Also, the ORIC should be empowered to arrange job fairs in universities.” (Employer A)*

*“The industries should collaborate with universities to enhance the skills of potential employees. Similarly, the universities should also work closely with industries to update the curriculum as well as prepare graduates for enhanced job prospects.” (Employer C)*

*“Universities need to invite industry leaders to conduct seminars and workshops. This initiative will help students to understand real-world engineering challenges and will bridge the gap between academia and industry.” (Employer D)*

*“Hands-on experience will enhance the technical skills of engineering graduates and will increase their employment prospects. Hence, there is a need for more internship opportunities for engineering students in industries to ensure bi-directional relationship.” (Employer E)*

*“Joint ventures of universities and industries will lead innovation and practical solutions for industrial challenges. This type of collaboration will ensure that engineering graduates gain necessary exposure to industry-relevant technologies.” (Employer F)*

*“In the changing technological landscape, there is a need for curriculum overhauling. There is a need for co-designing of the curriculum with industry input to ensure that it aligns with current job market demands. Also, universities need to frequently update course content based on emerging industry trends.” (Employer G)*

A summary of the themes identified is represented below in Table 33.

**Table 33: Summary of Themes**

Universities Lack Linkages with Industry	<ul style="list-style-type: none"> <li>• Students don’t go for innovation due to a lack of support from the university.</li> <li>• The research projects that universities undertake are not industry-oriented</li> <li>• There should be online availability of knowledge and digital knowledge sharing from university websites.</li> </ul>
Important Skills for Graduates	<ul style="list-style-type: none"> <li>• The graduates need to continuously enhance their skills to remain relevant in the job market.</li> <li>• Having a sound knowledge of software use, graduates should be able to work in Microsoft Office and able to handle official emails along with AI and social media handling</li> <li>• Along with technical skills, they should be able to have strong presentation skills and be able to effectively present their work.</li> </ul>
Bi- Directional Relationship	<ul style="list-style-type: none"> <li>• The universities need to empower the ORIC (Office of Research, Innovation &amp; Commercialization) department.</li> <li>• Universities and industries must establish a bi-directional relationship.</li> <li>• The universities should also work closely with industries to update the curriculum as well as prepare graduates for enhanced job prospects.</li> </ul>

## **Chapter 5. Discussion**

### **5.1 Quantitative Study:**

The study has explored the skill gaps for engineering graduates in Rawalpindi and Islamabad. The study includes both the responses of graduates and employers. Findings show that there exists a skill gap for engineering graduates in technical skills, general skills, and communication skills. Employers and graduates both agree on the fact that skills are very important for getting employment in the market. The results of the study confirms the findings of work of (Rizwan et al., 2018).

#### **5.1.1 Graduate Satisfaction Levels of PEC Prescribed Skills**

To address the 1<sup>st</sup> objective of the research, the fresh engineering graduates were asked about their satisfaction level with the skills that are described as important by the Pakistan Engineering Council. Graduates were asked about their satisfaction level with the skills that universities provide them. Most of the graduates were satisfied with most of the technical skills, communication and general skills as prescribed by the PEC. The results are in line with (Azami Zaharim et al., 2008) findings that graduates were dissatisfied with some of their skills. These include their ability to design and conduct experiments, as well as analyzing and interpreting data, ability to identify, formulate, and solve technical/engineering problems, and having in-depth technical competence in a specific engineering discipline. In general skills the graduates were least satisfied with the ability to be a team player, have flexibility and possess knowledge of contemporary issues. These results are also in line with findings of (Sarin, 2019) that establishes that graduates often rate themselves low in general skills due to inability to communicate effectively and lack of focus of curricula on enhancing general skills of graduates.

#### **5.1.2 Employer Perceptions of PEC Prescribed Skills**

To address the second objective of the research, the perception of employers regarding the skills of engineering graduates was also explored. Mirza et al., (2014) in his study shows that engineering graduates lack technical skills, general skills and perform very poorly in communication skills.

Employers ranked more satisfied with graduates' skills of basic computer know-how and competence in application and practical-oriented engineering. This suggests that while engineering employers value theoretical knowledge, they also prefer those graduates who can apply their

learning to real-world engineering problems. On the other hand, the satisfaction levels of employers for advanced computer skills and competency in application and practical-oriented This discrepancy between employer expectations and actual graduate competencies highlights a critical skill gap.

Employers were of the view that teamwork was the most important general skill for fresh engineering graduates, followed by flexibility and creativity. However, employers were least satisfied with these skills of the graduates. This predicament suggests that while employers highly value collaborative and innovative abilities, graduates may not be adequately prepared in these aspects.

The results indicate a significant skill gap in communication skills, of fresh graduates. In the view of the employers, graduates underperformed in written communication, verbal communication and communication in English as well as understanding and responding to official communications. Employers emphasized the need for strong writing abilities, including professional emails and reports, and the necessity for better English proficiency among graduates. These will enhance the employment prospect of the graduates.

## **5.2 Qualitative Study:**

To address the third objective of the research, interviews were conducted from the heads of academic institutions to explore the reasons behind the lack of university academic linkages. Also, the study explored the specific skills that are important for engineering graduates as perceived by academia. The findings show that all the employers agreed that organizations face difficulties in finding the right people for the job. The reason behind this precarious scenario as confirmed by employers is the shortage of skills that are necessary for any given job. The findings show that graduates lack the employability skills that are necessary for fresh engineering graduates.

In the view of the academic community, there is a shortage of links between universities and academia that is contributing to the skills gap among engineering graduates. The reason behind this is that the academia and industry operate in silos. Although HEC has established ORIC in all higher educational institutions, it is not active. The reason behind the inactivation of ORIC is the lack of government spending on R&D and the reduction of government grants and funds. Also,

the heads of academic institutions confirmed that industries don't collaborate with HEI to carry out research. Industries don't use the technical facilities of the HEI.

Similarly, when asked about specific skills that are important for engineering graduates, the academic community responded that graduates must consistently improve their skills to remain relevant in the changing market landscape. In the age of artificial intelligence, engineering graduates must be apt in the knowledge and use of artificial intelligence. They should also have skills in social media handling. Also, they should have a sound knowledge of computer software and should be able to know computer languages and programming. The graduates should have strong technical skills and should be able to understand and apply the concepts of their field of study. They should have the ability to work in Microsoft Office and present their work. The academic community as shown in the findings confirmed that along with technical skills, the graduates should have sound communication and presentation skills. These skills are as important for the graduates as technical skills.

### **5.3 Interpretation in Light of Existing Literature**

The findings of the study align with international studies that highlight skill gaps in engineering graduates. For instance, Sarin, (2019) found in his study that Indian engineering graduates lacked proficiency in both technical and soft skills. These findings aligned with skills gaps identified in Pakistani engineering graduates. Additionally, Ramadi et al., (2016) also emphasized the importance of communication, cooperation, and adaptability as important skills for engineers. Findings of the study show that Pakistan graduates lacked in these skills. S

The findings of the thesis also reaffirm the Human Capital Theory (Wuttaphan, 2017), which holds that investment in education and skill enhancement increases the productivity of the workforce. However, the presence of skill gaps in engineering graduates despite formal education suggests that Pakistan's engineering curriculum requires significant overhauling to incorporate industry-relevant skills and work integrated learning.

## **Chapter 6. Conclusion and Policy Recommendations**

### **6.1 Conclusion**

The thesis explored the perception of three stakeholders, graduates, employers, and the academic community regarding the skills prescribed by the Pakistan Engineering Council. The study explores the importance and satisfaction of technical skills, and general and communication skills as perceived by the employers and fresh graduates. Also, the thesis explored the views of the academic community regarding the persistence of the skill gap and the lack of linkages between university and academia. The data on employability skills was collected through surveys from graduates and employers and interviews were conducted from the academic community to confirm the reasons behind the persistence of the skill gap among engineering graduates.

Our results show that both graduates, employers, and the academic community confirmed that technical skills, general skills as well as communication skills are important for securing a place in the job market. These skills consist of the ability to apply knowledge of mathematics, science, and engineering, having competency in application and practical-oriented engineering, having the ability to design and conduct experiments, as well as to analyze and interpret data and advanced computer skills (e.g., Vision, AutoCAD, spreadsheets, databases), having in-depth technical competence in a specific engineering discipline and basic computer know-how (e.g., MS word, excel, PowerPoint). In general skills, the study confirmed that general skills are as important as technical skills. In communication skills, communication (Knowing how to write professional emails and letters) and reading (understanding official emails and other correspondences) are confirmed as important skills for engineering graduates. The experts from academia expressed its dissatisfaction with the lack of university academia linkages in the country. Also, they considered the knowledge and use of artificial intelligence, social media handling, knowledge of computer software, computer languages and programming, strong technical skills, Microsoft Office skills, and strong presentation skills as very important for engineering graduates. The findings of this study are useful for the Higher Education Commission, universities in Islamabad and Rawalpindi, and organizations that employ engineering graduates and final-year students of engineering technology. The study is special in the sense that it also explores the reasons behind the lack of university-industry linkages. It also sheds light on the curriculum and teaching techniques in engineering universities. Engineering universities need to revise curricula and adopt new teaching

methodologies that follow the requirements of engineering firms. Employers, HEIs, HEC, and PEC need to come together in a collaborative and proactive effort to make progress on these aspects.

## **6.2 Limitations & Future Research Recommendations**

The scope of this study is limited to engineering graduates and final-year students at engineering universities in Rawalpindi and Islamabad, so the findings on the significance of employability skills in other disciplines can't be generalized. Other disciplines have different exposure and needs. The study relied on a self-assessment of skills by final-year students themselves, and it is assumed all responded without bias. Anonymity and confidentiality were ensured to eliminate the biased responses of employers toward their organizations and employees. Future studies can explore a triangular approach including universities' approach towards employability by evaluating the effect of universities' programs and career services on increasing employability skills.

## **6.3 Policy Recommendations**

- There is a need for Work Integrated Learning (WIL) in higher education. Universities need to support students in securing internships. They need to give a considerable percentage of the final grade to completing internships and practical projects. There should be more focus on skill-based learning in HEI. Project-based learning, field projects, and internships are all important for successfully adopting WIL.
- Pakistani HEIs should also enhance their teaching methods. The methods of instruction need to focus more on experimental learning. It will help in increasing the theoretical knowledge of the graduates as well as the ability to apply the knowledge. These methods will increase the research skills and intriguing abilities of the students by learning the importance of applying the knowledge that they possess. It will also help in resolving the problem brought to the surface by the employers related to their dissatisfaction with a lack of important skills in technical, general, and communication skills.
- Industry and academia need to inform each other about their needs. There should be a mechanism to connect academia and industry proactively. It will offer academia an opportunity to revise the curricula and industry to enhance the pace of innovation. There is a need to establish a bi-directional relationship between industry and academia.

- It is imperative that professional education institutes in collaboration with the higher education commission and Pakistan Engineering Council, devise efficient tracking programs to ascertain and gauge the skill set requirements. Also, it is needed to enhance employment trends and opportunities revolving around the industry with the aid of studies accompanied by a concise career development plan.
- The ORIC department needs to be activated in all the HEIs. It will help in exposing the work of academia to industry. In this way, industry will be linked to the academia. It will in turn play a crucial role in enhancing the skills and capabilities of engineering graduates.
- To address the gap between academia and industry requirements, higher education institutions, in collaboration with engineering firms and professional bodies like PEC, need to introduce short-term, industry-endorsed certification programs. These certifications—offered during or right after undergraduate studies—will focus on practical applications such as CAD tools, project management software, or field-specific competencies (e.g., civil site surveying, embedded systems). Completion of such certifications should be recognized and valued by employers as evidence of job readiness.
- Introduce performance metrics in university faculty evaluation systems that reward collaboration with industry—such as co-developing curriculum modules, supervising industry-funded student projects, or facilitating internships. HEC and university administrations should allocate research funding and promotions not just based on publication output but also on measurable engagement with industry. This will align academic incentives with labor market relevance.
- HEIs need to do assessments about the needs of the industry frequently. They should revise their instruction as well as examination approaches to prepare the graduates for the needs of industry.

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## **Appendices**

### **Graduate Survey**

#### **Informed Consent**

I Waqas Ahmad is a student of MPhil Developmental Studies at Pakistan Institute of Development Economics bearing registration number PIDE2022FMPHILDS12. I am conducting this research to capture employers' perception regarding different skills which a graduate brings to their organization. Your participation in the study will provide valuable information on the topic. I assure you that the information gathered will be kept strictly confidential and will be used solely for educational and research purposes. The questionnaires will take approximately 10 minutes to complete. If you do not want to continue you can withdraw from study at any time.

Thanks,

Waqas Ahmad

#### **Section I: General**

1. Name of the respondent (optional):
2. Age
3. Gender
4. Do you have any work experience or taken internship:
5. What is your CGPA:
6. Name of the institution/university:
7. Engineering discipline technology:
8. Semester of study:

9. Do you have undertaken any online course:

10. Are you a student of:

Master's                      Bachelors

11. How often do you attend seminars or workshops during your graduation:

Rarely      Often      Frequently      Never

12. How often do you visit the lab in a week?

Rarely      Often      Frequently      Never

13. Are you seeking a job?

Yes              No

## **Section II: Skills and Abilities**

- 1** Below questionnaire measures the level of technical skills that that you may possess and bring to an organization. Please rate how you perceive the importance of each skill by encircling any value between “1” to “5”, with 1 showing low importance and 5 the highest.
- 2** Please rate the level of satisfaction regarding graduates’ employability in reference to these skills. For this please circle a value between “1” to “5” with 1 showing the lowest level of satisfaction and 5 the highest.

**Technical skills:**

Importance					Criteria	Satisfaction				
Very low			High			Very Dissatisfied			Satisfied	
1	2	3	4	5	Ability to apply knowledge of mathematics, science, and engineering.	1	2	3	4	5
1	2	3	4	5	Ability to use appropriate and modern tools, equipment, and technologies specific to their jobs (other than computers).	1	2	3	4	5
1	2	3	4	5	Ability to identify, formulate, and solve technical/engineering problems.	1	2	3	4	5
1	2	3	4	5	Ability to design a system, component, or process to meet desired needs.	1	2	3	4	5
1	2	3	4	5	Ability to design and conduct experiments, as well as to analyze and interpret data.	1	2	3	4	5
1	2	3	4	5	Having in-depth technical competence in a specific engineering discipline.	1	2	3	4	5
1	2	3	4	5	Having competency in application and practical oriented engineering.	1	2	3	4	5
1	2	3	4	5	Having the competency in theoretical engineering knowledge and ability to carry out research.	1	2	3	4	5
1	2	3	4	5	Basic computers know how	1	2	3	4	5

					(e.g., MS word, excel, PowerPoint)					
1	2	3	4	5	Ability to apply technical skills  (e.g., basic programming skills)	1	2	3	4	5
1	2	3	4	5	Advanced computer skills  (e.g., MS Visio, AutoCAD, spreadsheets, databases)	1	2	3	4	5

General skills

Importance					Satisfaction Level					
Very Low		High		Criteria	Very Dissatisfied		Satisfied			
1	2	3	4		1	2	3	4	5	
1	2	3	4	5	Flexibility  (responds well to change)	1	2	3	4	5
1	2	3	4	5	Creativity  (identifies new approaches to problems)	1	2	3	4	5
1	2	3	4	5	Empathy  (understands the problem or situations from other's perspective)	1	2	3	4	5
1	2	3	4	5	Integrity	1	2	3	4	5

					(understands/applies professional and ethical principles to decisions even when not supervised)					
1	2	3	4	5	Self-discipline (exhibits self-control)	1	2	3	4	5
1	2	3	4	5	Knowledge of contemporary issues	1	2	3	4	5
1	2	3	4	5	Self-motivated	1	2	3	4	5
1	2	3	4	5	Team Player (Understands importance of interpersonal relationships and uses them effectively)	1	2	3	4	5
1	2	3	4	5	Willingness to learn (Life-long learning)	1	2	3	4	5
1	2	3	4	5	Understands and takes directions for work assignments proactively	1	2	3	4	5
1	2	3	4	5	Takes responsibility for his/her actions	1	2	3	4	5

## Communication skills

Importance					Satisfaction Level					
Very					Very					
Low		High	Criteria		Dissatisfied Satisfied					
1	2	3	4	5	Written Communication (knows how to write professional emails and letters)	1	2	3	4	5
1	2	3	4	5	Communication in English (can communicate fluently in English language both in verbal and written form)	1	2	3	4	5
1	2	3	4	5	Verbal Communication (knows how to effectively communicate with peers, subordinates and seniors)	1	2	3	4	5
1	2	3	4	5	Reading (understands official emails and other correspondences)	1	2	3	4	5

## Employer survey

### Informed Consent

I Waqas Ahmad is a student of MPhil Developmental Studies at Pakistan Institute of Development Economics bearing registration number PIDE2022FMPHILDS12. I am conducting this research to capture employers' perception regarding different skills which a graduate brings to their organization. Your participation in the study will provide valuable information on the topic. I assure you that the information gathered will be kept strictly confidential and will be used solely for educational and research purposes. The questionnaires will take approximately 10 minutes to complete. If you do not want to continue you can withdraw from study at any time.

Thanks,

Waqas Ahmad

### Section I

Please encircle the statement that best describes your organization.

- I. Approximately how many people are employed full-time in your organization?  
50-100                      100-200                      Over 300
- II. Approximately how many graduates does your organization interview annually?  
0-5    10 -20    more than 20                      Don't know
- III. Approximately how many recent graduates are currently on your payroll?  
0-2   3-6    7-10    11-20   More than 20   Don't know
- IV. Approximately what percent of your annual new hires are graduates of engineering universities of twin cities?  
0-    10-25%    25-50%                      51-100%
- V. What is your relationship with the graduate(s)?

Employer            Supervisor/Manager    Other (please specify) \_\_\_\_\_

VI.    Which of the following categories best describes your type of organization?

- a. Government
- b. Non-Profit Organization (Public)
- c. Private organization
- d. Service
- e. Manufacturing
- f. Other (please specify)

VII.    In which city is your organization located?

Islamabad            Rawalpindi

**SECTION II: SKILLS**

- (i)    Below questionnaire measures the level of technical skills that graduates may bring to your organization. Please rate how you perceive the importance of each skill by encircling any value between “1” to “5”, with 1 showing low importance and 5 the highest.
- (ii)    Please rate the level of satisfaction with graduates’ employability in reference to these skills. For this please circle a value between “1” to “5” with 1 showing the lowest level of satisfaction and 5 the highest.

**Technical skills**

<b>Importance</b>	<b>Satisfaction Level</b>
-------------------	---------------------------

Very Low					Criteria	Very Dissatisfied				
1	2	3	4	5		1	2	3	4	5
1	2	3	4	5	Ability to apply knowledge of mathematics, science, and engineering	1	2	3	4	5
1	2	3	4	5	Ability to use appropriate and modern tools, equipment, and technologies specific to their jobs (other than computers)	1	2	3	4	5
1	2	3	4	5	Ability to identify, formulate, and solve technical/engineering problems	1	2	3	4	5
1	2	3	4	5	Ability to design a system, component, or process to meet desired needs	1	2	3	4	5
1	2	3	4	5	Ability to design and conduct experiments, as well as to analyze and interpret data	1	2	3	4	5
1	2	3	4	5	Having in-depth technical competence in a specific engineering discipline	1	2	3	4	5
1	2	3	4	5	Having competency in application and practical oriented engineering.	1	2	3	4	5
1	2	3	4	5	Having the competency in theoretical and research engineering.	1	2	3	4	5
1	2	3	4	5	Basic computers know how (e.g., MS word, excel, PowerPoint)	1	2	3	4	5
1	2	3	4	5	Ability to apply technical skills (e.g., basic programming skills)	1	2	3	4	5
1	2	3	4	5	Advanced computer skills	1	2	3	4	5

					(e.g., MS Visio, AutoCAD, spreadsheets, databases)					
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**General skills**

<b>Importance</b>						<b>Satisfaction Level</b>				
<b>Very</b>						<b>Very</b>				
<b>Low</b>	<b>High</b>				<b>Criteria</b>	<b>Dissatisfied</b>			<b>Satisfied</b>	
1	2	3	4	5		1	2	3	4	5
					Flexibility (responds well to change)					
					Creativity (identifies new approaches to problems)					
					Empathy (understands the problem or situations from other's perspective)					
					Integrity (understands/applies professional and ethical principles to decisions even when not supervised)					
					Self-discipline (exhibits self-control)					
					Knowledge of contemporary issues					
					Self-motivated					

1	2	3	4	5	Team player (Understands importance of interpersonal relationships and uses them effectively)	1	2	3	4	5
1	2	3	4	5	Willingness to learn (Life-long learning)	1	2	3	4	5
1	2	3	4	5	Understands and takes directions for work assignments proactively	1	2	3	4	5
1	2	3	4	5	Take responsibility for his/her actions	1	2	3	4	5

### Communication skills

Importance					Satisfaction Level					
Very Low					very Dissatisfied					
High					Satisfied					
					Criteria					
1	2	3	4	5	Written Communication (knows how to write professional emails and letters)	1	2	3	4	5
1	2	3	4	5	Communication in English (can communicate fluently in English language both in verbal and written form)	1	2	3	4	5
1	2	3	4	5	Verbal Communication	1	2	3	4	5

					(knows how to effectively communicate with peers, subordinates and seniors)					
1	2	3	4	5	Reading (understands official emails and other correspondences)	1	2	3	4	5

### SECTION III

#### RECRUITMENT & COORDINATION WITH UNIVERSITIES

**1. Rate from 1 to 5 the level of importance of the following factors in the recruitment of recent university graduates (0 indicates not at all important and 5 very important).**

(1) The reputation of the university where they studied      0 1 2 3 4 5

(2) Have studied or worked abroad                                      0 1 2 3 4 5

(3) Work placement/internships during studies                      0 1 2 3 4 5

**2. Have you faced any difficulties recruiting the right people for any given job?**

(1) Yes. Go on to question 2.1

(2) No

**2.1 If your answer to the previous question was “Yes”, state the main reasons. If necessary, choose more than one option.**

(1) Shortage of university graduates in each field.

(2) Shortage of candidates with the right skills for the job.

(3) Shortage of candidates willing to adapt to the work schedule

(4) Shortage of candidates willing to accept the salary

(5) Shortage of candidates having adequate training

(6) Other reasons. Specify \_\_\_\_\_

**3. Assess the frequency with which you participate in activities involving cooperation with universities.**

(1) Cooperation with universities in discussing and designing curricula

Never      Rarely      Sometimes      Often      N/A

(2) Recent graduate recruitment through university careers and information services

Never      Rarely      Sometimes      Often      N/A

**(3) Participation in seminars and conferences organized by a university**

Never      Rarely      Sometimes      Often      N/A

**(4) Offer of work placements/internships to university students**

Never      Rarely      Sometimes      Often      N/A

**(5) Research cooperation agreements and/or use of a university's technical services**

Never      Rarely      Sometimes      Often      N/A

**4. Rate from 1 to 5 the importance of the following actions by universities to enhance the employability of your graduate recruits (1 indicates unimportant and 5 very important).**

**(1) Run courses that are more relevant to the needs of enterprises**

0      1      2      3      4      5

**(2) Include practical classes in courses**

0      1      2      3      4      5

**(3) Include compulsory internship as an integral part of the curriculum**

0      1      2      3      4      5

**(4) Provide support to graduates after they have obtained their degree (facilitate relations between graduates and enterprises)**

0      1      2      3      4      5

**(5) Others. Specify (open-ended)**

## **Academia survey**

### **Informed consent**

I Waqas Ahmad is a student of MPhil Developmental Studies at Pakistan Institute of Development Economics bearing registration number PIDE2022FMPHILDS12. I am conducting this research to capture employers' perception regarding different skills which a graduate brings to their organization. Your participation in the study will provide valuable information for the topic. I assure you that the information gathered will be kept strictly confidential and will be used solely for educational and research purposes. The questionnaires will take approximately 10 minutes to complete. If you do not want to continue you can withdraw from the study at any time.

Thanks,

Waqas Ahmad

### **Section I**

#### **General information**

- 1. Name:**
- 2. Gender:**
- 3. Institute of occupation:**
- 4. Position:**
- 5. Years of teaching:**
- 6. Subject of expertise:**

### **Section II**

#### **Bridging academia industry gap**

1. How can academic curricula be aligned with the needs of industry without compromising academic rigor?
2. Identify the specific skills that are most essential for students to acquire to easily secure jobs on their graduation.

3. What measures can be taken by academic institutions to incorporate field-based practical experience into learning?
4. How can feedback from the industry be incorporated into the processes of academic research with the view to making academic research more practical?
5. How can academics and professionals from the industrial field develop respect and understanding for each other?