

UNLEASHING THE POTENTIAL OF PAKISTAN'S IT INDUSTRY: BUILDING FOR MASSIVE SOFTWARE EXPORT GROWTH

Naveed Arshad, Waqar Ahmad, and Kashif Manzoor

(CGP # 05-157)

4TH RASTA CONFERENCE

Tuesday, September 03 & Wednesday, September 04, 2024

Roomy Signature Hotel, Islamabad

This document is unedited author's version submitted to RASTA.



RESEARCH FOR SOCIAL TRANSFORMATION & ADVANCEMENT

Competitive Grants Programme for Policy-oriented Research

Pakistan Institute of Development Economics

ABSTRACT

In the current industrial revolution, often referred to as Industry 4.0, the IT sector is the backbone of any country's economy. It drives innovation, efficiency, and growth by enabling seamless communication, data management, and fostering new business models and digital services. This study delves into the potential of Pakistan's IT industry, focusing on strategies to significantly boost software export growth. In the first stage, extensive interviews and expert opinions are gathered from industry representatives of various reputable IT companies in Pakistan. In the second stage, related articles and reports compiled by credible sources on the topic are analyzed. In the third stage, a comparative matrix based on 16 key parameters is developed to investigate the current standing of the country. In the fourth stage, detailed challenges are identified, and comprehensive policy recommendations are developed to fully monetize our IT export potential. The study identifies the multi-faceted challenges including inadequate infrastructure, skill gaps, and complex regulatory frameworks, which have hindered the industry's ability to compete globally. The results reveal that while Pakistan's software exports have shown growth in recent years, they remain below par compared to most of the countries with comparable dynamics. The analysis underscores the need for strategic interventions to unlock the industry's full potential. Based on strategic recommendations, a comprehensive framework has been proposed that deals with multi-faceted key measures at both government and industry levels. It emphasizes the importance of government support in creating a conducive environment for IT growth. By addressing these challenges and implementing the proposed mechanism of strategic recommendations, Pakistan can significantly enhance its software exports.

PREFACE

In an era defined by rapid technological advancements and digital transformation, the IT industry stands at the forefront of innovation and economic growth. The global software exports reveal a stark contrast between countries, with Pakistan's contributions often overshadowed by those of its competitors. This study embarks on a comprehensive exploration of the factors shaping the trajectory of Pakistan's software export sector. This report delves into the dynamics of Pakistan's software export industry, aiming to uncover the factors influencing its growth and competitiveness. Our research encompasses a multifaceted approach involving data collection, statistical analysis, case studies, surveys, interviews, and comparative analysis. The purpose of this study is to identify key contributors to the industry's development and propose strategic recommendations to enhance its position in the global market, particularly in the context of the fifth industrial revolution.

This document delves into the elaborate dynamics of the industry, analyzing the challenges and opportunities that define Pakistan's current position and future potential in the global market. Through thorough data collection, interviews with experts' opinions, and a performance matrix as well as policy recommendations, the study offers a holistic view of the industry's landscape, highlighting both the achievements and the areas in need of strategic intervention.

The methodology employed spans a blend of quantitative and qualitative research, incorporating surveys, interviews, and comparative analyses to draw a comprehensive picture of the industry's state. The insights gleaned from leading IT companies in Pakistan, such as NetSol Technologies, Systems Limited, Confiz Limited, and other Small and Medium Enterprises (SMEs), provide a granular understanding of the operational, strategic, and infrastructural challenges faced by these entities.

As the world transitions into the 5th industrial revolution, marked by the convergence of digital, and physical phenomena, the imperative for Pakistan to harness emerging technologies such as artificial intelligence (AI), blockchain, and cybersecurity has never been more critical. This report not only identifies the current impediments but also lays down strategic recommendations to foster innovation, enhance skills, and promote sustainable growth in the IT sector.

We extend our gratitude to the numerous industry stakeholders including notable IT firms whose invaluable contributions have enriched this study. It is our hope that the findings and recommendations herein will serve as a catalyst for policy makers, industry leaders, and educational institutions to collaboratively build a robust and competitive IT ecosystem in Pakistan.

This study is a testament to the collaborative efforts of all contributors, whose assistance and insights have been instrumental in shaping the findings and recommendations presented herein. We hope that this research will serve as a valuable resource for policymakers, industry leaders, and academics, fostering informed decision-making and strategic planning for the sustained growth of Pakistan's software exports.

TABLE OF CONTENTS

ABSTRACT	i
PREFACE	ii
TABLE OF CONTENTS.....	iii
LIST OF FIGURES	vii
ABBREVIATIONS.....	viii
INTRODUCTION	1
LITERATURE REVIEW	3
2.1 International Experiences	4
2.1.1 India.....	4
2.1.2 China	4
2.1.3 Bangladesh	4
2.1.4 Argentina.....	5
2.2 Scope and Objectives	6
RESEARCH METHODOLOGY	7
3.1 Data Research	7
3.2 Analysis of Local and Regional Policies.....	7
3.3 Identification of Key IT Companies and Training Institutions	8
3.4 Surveys and Interviews	8
3.5 Experts Opinion and Performance Matrix	8
3.6 Key Challenges Identification.....	8
3.7 Compilation of Key Findings.....	8
3.8 Policy Recommendations.....	9
COMPARATIVE MATRICES OF EVALUATING COUNTRIES BASED ON MACRO-INDICATORS	10
4.1 Population and Cost of Living	10
4.2 Programmer Ranking and Literacy Rate	10
4.3 English Proficiency and GDP	11
4.4 Ease of Doing Business and Economic Stability	12
4.5 Existing IT Infrastructure and Brain Drain.....	12
4.6 Travel Restrictions and Passport Ranking.....	13
4.7 Education Perspective.....	13

4.8 Corruption Perception	14
4.9 Political and Economic Complexity	14
MAJOR CHALLENGES	16
5.1 National-level Challenges.....	16
5.1.1 Political and Economic Instability	16
5.1.2 Poor Tracking, and Operational Hygiene.....	16
5.1.3 Limited Focus on Building the IT Industry.....	16
5.2 Industry-focus Challenges	16
5.2.1 Incoherent and Poorly Thought-Through Strategies.....	16
5.2.2 Either a Sales-Heavy or an Engineering-Heavy Focus.....	16
5.2.3 Lack of Inorganic Growth	17
5.2.4 Investing in Growth from Profits	17
5.2.5 Non-Existent or Inefficient Board of Directors.....	17
5.2.6 Customer Churn	17
5.2.7 Wealth Sharing Formula	17
5.2.8 Founder’s Syndrome	17
5.2.9 Founders’ Lack of Pressure to Grow	18
5.2.10 Inefficient, Non-Scalable Engineering Excellence and People Policies.....	18
5.3 Multidimensional Challenges	18
5.3.1 Dependency on Limited Commoditized Growth Avenues.....	18
5.3.2 Poor Engineering, Economics, and Network/Negotiation Skills.....	18
5.3.3 Talent Challenges.....	18
RESULTS AND FINDINGS	19
CONCLUSION.....	21
POLICY RECOMMENDATIONS	22
8.1 Policy Recommendations for Government.....	22
Diversifying IT Services and Foster Innovation.....	22
Integrating Multidisciplinary Education and Professional Development.....	22
Balancing Engineering and Sales.....	22
Curriculum Alignment	22
Taxation on Human Capital	23

Increase the Holding Capability of Dollar Account	23
Government Procurement	23
Strong Governance and Effective Boards.....	24
Gap between Low-skilled and High-skilled Workers.....	24
Encourage International Companies to Open Offices in Pakistan	24
Focus on Intrapreneurship vs. Entrepreneurship.....	24
Encourage the Companies to List Themselves in the Stock Exchange	25
Define the IT Sector as a Niche.....	25
Promote Local Development of Systems.....	25
8.2 Strategic Recommendations for Industry	25
Workforce Training.....	25
Overcoming Founder’s Syndrome	25
Leverage Emerging Technologies	26
Promote Research and Development	26
Offer Internship Opportunities	26
Focus on Product Development in Addition to Servicing	26
Revaluation of Operations and Strategies in the Context of Generative AI	26
Assist in Enabling Startups Culture in Universities.....	27
REFERENCES.....	28
APPENDICES.....	31
Appendix A	31
A 1. Meeting and Survey with IT-based Companies	31
A.1.1 GlowLogix	31
A.1.2 Thermalog	31
A.1.3 KytherTek.....	32
A.1.4 Zaheen Systems.....	32
A.1.5 Al-Basirr Technologies.....	33
A.1.6 WarisTech.....	33
A.1.7 ByteEvo.....	33
A.1.8 Rapix	34
A.1.9 XYLEXA	34

A.1.10 Rapidev 34

A.1.11 Global Tech Consulting 35

A.1.12 Data Pilot 35

A.1.13 Amazon Seller Society 36

A.1.14 The Creative Street 36

A.1.15 Safasha Business Solutions 36

A.1.16 NetSol Technologies Limited 37

A.1.17 Empathise 37

Appendix B 38

LIST OF FIGURES

<i>Figure 1 Pakistan software’s services export (country-wise)</i>	<i>1</i>
<i>Figure 2 Description of the project and proposed methodology</i>	<i>7</i>
<i>Figure 3 Performance metrics based on population and cost of living in evaluating countries</i>	<i>10</i>
<i>Figure 4 Performance metrics based on programmer ranking and literacy rate in evaluating countries</i>	<i>11</i>
<i>Figure 5 Performance metrics based on English proficiency and GDP in evaluating countries.....</i>	<i>11</i>
<i>Figure 6 Performance metrics based on Ease of doing business and economic stability in evaluating countries</i>	<i>12</i>
<i>Figure 7 Performance metrics based on existing software development companies and brain drain in evaluating countries.....</i>	<i>12</i>
<i>Figure 8 Performance metrics based on travel restrictions and passport ranking in evaluating countries</i>	<i>13</i>
<i>Figure 9 Performance metrics based on the number of universities in evaluating countries</i>	<i>13</i>
<i>Figure 10 Performance metrics based on corruption perception index in evaluating countries</i>	<i>14</i>
<i>Figure 11 Performance metrics based on political stability and economic complexity index in evaluating countries.....</i>	<i>15</i>

ABBREVIATIONS

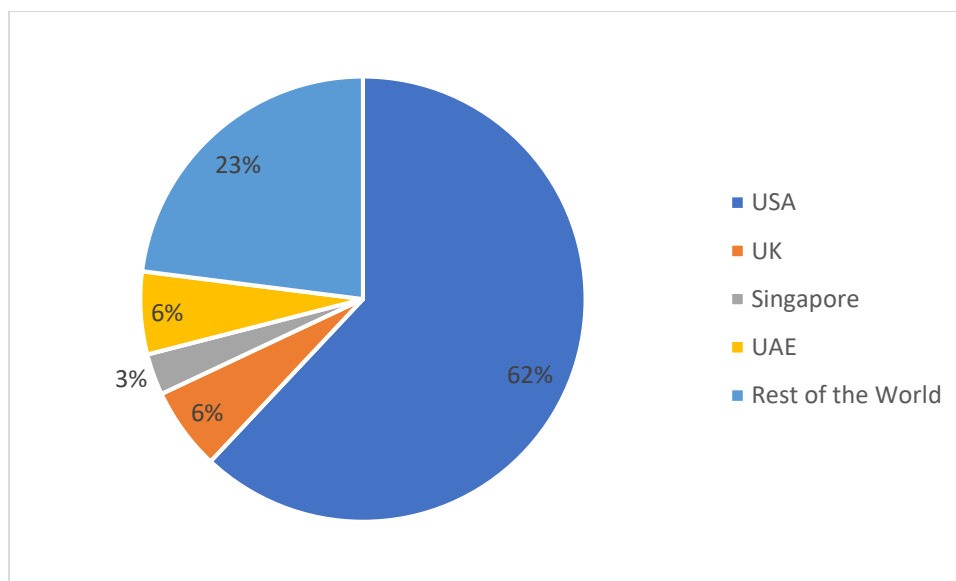
AI	Artificial Intelligence
BPO	Business Process Outsourcing
CAGR	Compound Annual Growth Rate
GDP	Gross Domestic Product
HEC	Higher Education Commission
ICT	Information and Communications Technology
NASSCOM	National Association of Software and Service Companies
PSEB	Pakistan Software Export Board
P@SHA	Pakistan Software Houses Association
PITS	Pakistan Information Technology Strategy
R&D	Research and Development
SMEs	Small and Medium Enterprises

INTRODUCTION

The digital age has transformed how businesses operate, leading to a surge in demand for software solutions, IT services, and technological innovations. In the current industrial revolution, IT exports are the backbone of any country's economy. Countries that invest in and prioritize their IT sectors can harness significant economic benefits, including job creation, increased foreign exchange earnings, and improved global competitiveness (Chen et al., 2023), (Paschek et al., 2017). Moreover, a robust IT export industry fosters innovation, enhances productivity across various sectors, and drives sustainable economic growth (OECD, 2019). As technology continues to evolve, the strategic development of IT exports will be crucial for nations aiming to secure a strong position in the global market (McKinsey, 2021).

Pakistan is ranked 2nd most financially attractive location worldwide for IT-related offshore services (GOP, 2022a). The IT industry in Pakistan has witnessed significant growth, marked by an increasing recognition of outsourcing opportunities and a burgeoning startup ecosystem. The government's multipronged efforts and encouraging policies have contributed somewhat to the industry's growth. The IT sector is now the second-largest sector in Pakistan's economy after trading (GOP, 2020). However, the industry faces challenges that are common to emerging IT markets. Issues such as inadequate infrastructure and internet connectivity, a skills gap, complex regulatory frameworks, and cybersecurity concerns persist. Additionally, access to finance remains a hurdle for many startups, and the global perception of Pakistan can impact international collaborations. Despite these challenges, the IT sector in Pakistan has displayed resilience, and concerted efforts to address these issues could contribute to its sustained development. Bridging the skills gap, improving infrastructure, simplifying regulations, enhancing cybersecurity measures, and promoting a positive global image are crucial for the continued success of the IT industry in Pakistan.

Figure 1 Pakistan software's services export (country-wise)



Source: SBP (2023).

In 2022, Pakistan exported \$2.6 billion worth of software services and products. However, when compared to similar economies such as Argentina (\$9 billion), Egypt (\$5 billion), Vietnam (\$9 billion), and the Philippines (\$26.9 billion), Pakistan's software exports appear less remarkable. The overall export of IT in terms of percentage around the world is shown in Figure 1. From a global trade standpoint, Pakistan's contribution to global exports of Computer Services remains modest, but it has shown growth, rising from 0.17% in 2017 to 0.3% by 2021 (SBP, 2023). However, assessments of Pakistan's export markets and individual firm exports indicate significant potential for enhancement.

This study seeks to examine the factors influencing the growth and competitiveness of Pakistan's software export industry and outlines strategies for enhancing its global market position in anticipation of the upcoming fifth industrial revolution. The primary objectives of this study include identifying key contributors to the industry's growth and competitiveness. These factors encompass governmental policies, educational and training initiatives, innovation and research and development (R&D) efforts, and market dynamics. Additionally, the study aims to explore potential strategies for advancing the industry, incorporating technologies such as artificial intelligence (AI), smart contracts, augmented and virtual reality, big data and cloud computing, robotics, cybersecurity, blockchain, and other relevant advancements. Ultimately, the research endeavors to offer recommendations that can guide policies and practices aimed at fortifying Pakistan's software export industry, fostering economic growth in the context of the fifth industrial revolution.

LITERATURE REVIEW

In the short term, Pakistan's export growth is highly dependent on the expansion of software exports. The government of Pakistan is taking concrete steps for the adoption of the latest IT tools for the improvement of national IT infrastructure that can raise the growth and productivity of the nation. To boost software exports, the Ministry of Commerce has developed a software development export strategy for 2023-27 (GOP, 2022b). To achieve the development of the software services sector in Pakistan, this strategy provides a roadmap and plan of action geared to achieve the objectives including strengthening Pakistan's software sector's global market positioning and international competitiveness, improving the talent availability for growth and competitiveness, improve business climate for software firms to compete and grow, and strengthen innovation and upgrading in the software sector.

The IT industry in Pakistan has faced its share of challenges, hindering the nation's progress toward becoming a regional IT hub. One major obstacle stems from geopolitical issues, contributing to a negative image that dissuades major international IT companies from establishing their development and production offices in the country. While some Pakistani software companies have successfully collaborated internationally, the lack of direct foreign investment has impeded the realization of the country's full potential. This has led to a phenomenon known as "brain drain," where qualified IT professionals have migrated to the Middle East and North America in search of better technical opportunities and higher salaries.

Pakistan's entry into the global software development sector is relatively recent, presenting numerous challenges in competing with established global markets. Despite these hurdles, Pakistan's emerging software industry holds significant opportunities for growth and advancement. The study tried to provide an accurate portrayal of the country's software sector, highlighting its untapped potential (Shamsi & Nasir, 2016). In the short term, Pakistan's export growth is highly dependent on the expansion of software exports. The government of Pakistan is taking concrete steps for the adoption of the latest IT tools for the improvement of national IT infrastructure that can raise growth and productivity. To boost software exports, the Ministry of Commerce has developed a software development export strategy for 2023-27 (GOP, 2022b). To achieve the development of the software services sector in Pakistan, this strategy provides a roadmap and plan of action geared to achieve the objectives including strengthening Pakistan's software sector's global market positioning and international competitiveness, improving talent availability for growth and competitiveness, improving business climate for software firms to compete and grow, and strengthen innovation and upgrading in the software sector.

According to a report by the Pakistan Software Export Board (PSEB), the software industry in Pakistan has seen a compound annual growth rate (CAGR) of 26% over the past decade. This growth has been driven by a number of factors, including the availability of a large pool of skilled IT professionals, the government's support for the industry, and the low cost of doing business (GOP, 2020). Considering the Pakistani freelance market is the fastest growing market in the world, online freelancing has created a significant impact on the economic growth of Pakistan. It has created thousands of jobs, particularly for women. The online freelancer is now able to earn foreign currency which ultimately helps the country's economy (Ahsan et al., 2022). The growth in online freelancing

has significantly improved the technology infrastructure i.e., the availability of high-speed to far-flung areas of Pakistan (Malik et al., 2018).

Considering the Pakistani freelance market is the fastest growing market in the world, online freelancing has created a significant impact on the economic growth of Pakistan. It has created thousands of jobs, particularly for women. The online freelancer is now able to earn foreign currency which ultimately helps the country's economy. The growth in online freelancing has significantly improved the technology infrastructure i.e., the availability of high-speed to far-flung areas of Pakistan. However, while minimal infrastructure and institutional support are required for freelance work, freelancers still need to ensure they have the necessary skills, knowledge, and experience to provide high-quality services to their clients. They also need to be self-motivated and disciplined to manage their time and workload effectively (Qadir et al., 2019).

2.1 International Experiences

2.1.1 India

India is the topmost offshoring destination for IT companies across the world. The Indian IT & services industry's exponential growth in the last few decades has changed the perception of the world about India's IT knowledge and skills. The Indian government is spending around USD 144 billion on information technology to boost the economy (Mathur, n.d.). Technology adoption and encouraging policies like reducing trade barriers and import duties on high-tech products are key aspects in the evolution of the IT industry. Moreover, many other initiatives like special economic zones, export-oriented units, software technology parks, and foreign direct investment have assisted the IT industry in India in accomplishing a leading position around the world. The Indian IT sector has contributed around 9.3% of the country's GDP in 2021 compared to 1.2% in 2000. According to The National Association of Software and Service Companies (NASSCOM), the export of IT services (including hardware) stood at USD 75 billion in FY21 (IBEF, 2024).

2.1.2 China

The China IT industry has experienced impressive growth over the last two decades. The IT industry is one of the seven strategic industries that help the country become a world-class high-tech society. The IT industry in China is very large and complex and covers a range of subsectors, companies, and products. China has the most internet users reaching 900 million users in 2023 compared to 22 million users in 2000 (Ning, 2009). China's IT market is the 4th largest market in the world after USA, Japan, and Germany. The Chinese government has invested a total of USD 104.5 billion in the IT industry. China is the 2nd largest software outsourcing destination after India (China kpmgcom, 2016). The E-commerce and live-streaming industry in the IT sector is the largest in the world. The e-commerce industry grew by 10.4% in 2022 because of the rapid transition from traditional retail to online shopping. With this transition, the e-commerce industry is expected to reach USD 3.3 trillion between 2021 to 2025. The software sector achieves revenue growth of 14% in 2022 and is expected to grow at 28% in 2023 (Interesse 2023).

2.1.3 Bangladesh

Currently, the software industry is one of the most favorable industries in Bangladesh. With the government's support and young talented professionals, the software industry has seen sharp

growth during the last few decades (Shinkai & Hossain, 2011). The software industry is not only contributing to the Bangladesh national economy but also creating job opportunities for graduates. There are 4500 software and ICT-based companies registered in Bangladesh employing over 300,000 software developers and exporting services of around USD 1.18 billion annually (UNCTAD, 2019). The Bangladesh government aims to create a 'Digital Bangladesh' movement that supports digitization in various ways like building research centers and waiving the taxes for software developing organizations (Mazumdar & Alharahsheh, 2020). Due to these initiatives, software companies in the Netherlands have been closely working with software companies in Bangladesh for software development and IT services for more than two decades. The reduction in cost through cheap labor and availability of IT professionals makes Bangladesh a suitable destination for software outsourcing (Paul, 2022).

Bangladesh has recognized that the software industry is the 'thrust sector' for the economy. Many strategic plans have been prepared to enable Bangladesh to embrace the information age and become an important player in the global software market. For software industry development, technology parks are being established around the country to ensure a knowledge-based industry. These parks provide a range of services to companies and investors. The major aim of these parks is to attract foreign companies to set up operations and to transfer the technology to the local industries (Tjia, 2003).

2.1.4 Argentina

It is indeed impressive to see Argentina's software industry achieving remarkable growth over the last two decades. While it may be smaller than some of the largest software industries in the world, it has been able to carve out a niche for itself and establish a competitive advantage in certain areas (Stamm et al., 2001). One of the main factors contributing to this growth is time zone compatibility with the US and Europe. This allows companies in Argentina to work closely with clients in these regions and to provide responsive and agile software development services. The use of agile methodologies has been particularly successful in this context, as it emphasizes close collaboration between developers and stakeholders and requires frequent communication and interaction. Argentina has a strong educational system and a large pool of talented and skilled software engineers, which has helped to attract foreign clients looking for high-quality software development services at a competitive price (Arora & Gambardella, 2005).

Active policies from local governments have also played a role in supporting the growth of the software industry. In recent years, the government and IT chambers of commerce and associations have worked together to promote the industry and create a favorable business environment for software companies (Barletta et al., 2013). The IT sector offers developing economies a chance to advance rapidly due to its transformative nature and lower entry barriers. It plays a crucial role in enhancing efficiency and productivity across both public and private sectors, potentially impacting various aspects of socio-economic life. However, the success of IT-led advancement depends on factors such as the absorptive capacities of individuals, businesses, and governments, effective coordination among stakeholders, and the availability and accessibility of IT infrastructure.

2.2 Scope and Objectives

The aim of this study is to identify the essential elements required to enhance the growth of Pakistan's software industry, enabling it to capitalize on the opportunities presented by the fifth industrial revolution. The objective is not only to embrace emerging technologies but also to position the country as a leader in specific niche technologies, establishing itself as the preferred destination for those advancements.

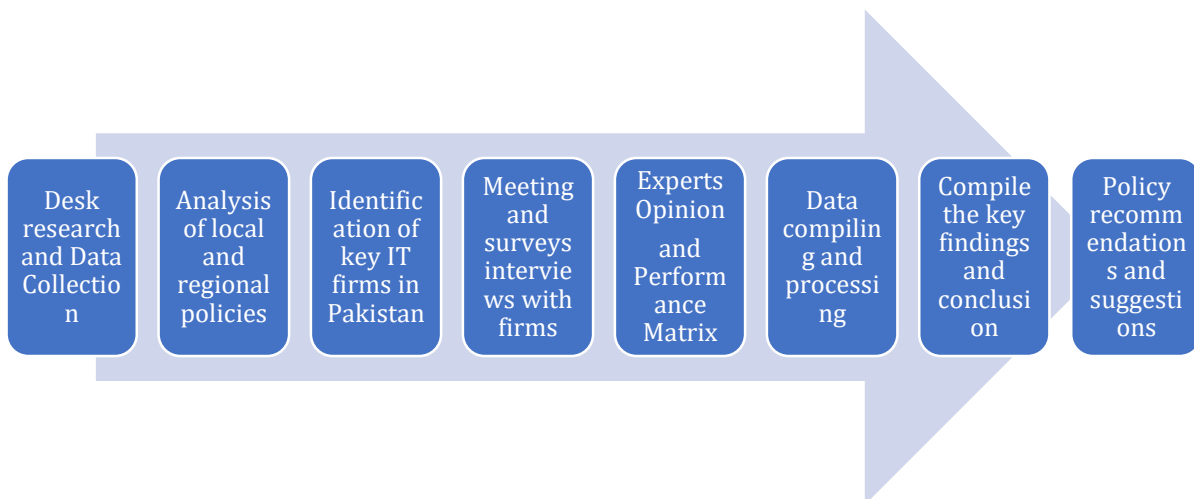
Our research question revolves around understanding the factors influencing the expansion and competitiveness of Pakistan's software export industry. We seek to explore ways to further develop the industry, enhancing its global market standing in the fifth industrial wave. This research addresses the challenges faced by Pakistan's software export industry, which, despite some promising growth, has not yet maximized its potential. Despite favorable conditions such as no income tax, minimal regulation, and no mandatory registration, the industry faces challenges that hinder its growth compared to other 'hard' exports. The study aims to pinpoint the factors contributing to the industry's growth and competitiveness, including government policies, education and training initiatives, innovation and R&D activities, and market dynamics. Additionally, we aim to investigate potential strategies for industry development, utilizing technologies such as AI, smart contracts, blockchain, augmented and virtual reality, big data and cloud, robotics, cybersecurity, and cyber safety to cultivate specialized expertise in software markets. The ultimate goal is to provide insights and recommendations that can guide policies and practices to strengthen Pakistan's software export industry and drive economic growth in the fifth industrial revolution.

Despite consistent software exports, we contend that Pakistan's IT sector has not reached its full potential. While it may be a standout performer among other export sectors domestically, on the international stage, Pakistan ranks 45th in terms of software exports, despite possessing several strengths (GOP, 2022b). Unlike export sectors such as textiles and sports goods, which are tied to the physical flow of inputs and outputs, the software industry faces minimal physical limitations. However, it has struggled to scale up. For instance, Systems Ltd in Pakistan, Tata, and WIPRO in India all began in the late seventies. However, Systems Ltd is a USD 189 million annual revenue company, whereas Tata Consulting Services (TCS) and WIPRO have an annual revenue of USD 26 billion and USD 11 billion respectively as of 2023. Furthermore, software exports appear resilient to geopolitical issues; for instance, despite ongoing conflict and political instability in Ukraine, its IT industry has experienced steady growth, exporting software services worth around USD 4 billion in the year 2021. To gauge the near-term potential of software exports, Pakistan should ideally be exporting at least USD 10 billion, especially when compared to India, which exports USD 156 billion in software services.

RESEARCH METHODOLOGY

Analyzing software exports from Pakistan and recommending future courses of action to increase software exports require a combination of quantitative and qualitative research methods. The methodology for the project is divided into various milestones, as illustrated in Figure 2. The study started with comprehensive desk research into published materials on the software industry in Pakistan and globally. This was followed by an analysis of local and regional policies, particularly those impacting the IT sector in South Asia. Key IT-related industries in Pakistan were identified and analyzed to gather relevant data. Subsequently, formal meetings and experts' opinions were conducted to administer surveys, involving representatives from various reputed companies in Pakistan including Confiz Limited, Systems Limited, NetSol Technologies, and others. A performance matrix will be developed based on 16 key parameters to analyse the current standings of the Pakistan with respect to other counties. The collected data underwent thorough processing and validation. Based on the findings from this analysis and performance matrix, a key challenge is identified and then a detailed policy recommendations were formulated for both government and industry that can provide a comprehensive understanding to develop a roadmap to enhance IT exports.

Figure 2 Description of the project and proposed methodology



3.1 Data Research

Data on the software industry in Pakistan, including information on the number of software firms, types of software exported, target markets, and revenue generated, has been gathered. This data was sourced from government reports provided by PSEB, industry associations such as P@SHA, and other relevant key sources.

3.2 Analysis of Local and Regional Policies

Local government policies are evaluated to identify the potential understanding of the challenges and operation of the IT industry. Based on these policies, an interview-survey-based questionnaire has been developed which is utilized to get insights from key IT companies. Moreover, case studies have been utilized to examine the individual software exporters in depth. More than 15 companies of varying sizes are selected to identify the strategies and best practices, as well as the challenges and

barriers they face. An oversight has been conducted and also looked to look at how they will be looking at being competitive in the fifth industrial revolution.

3.3 Identification of Key IT Companies and Training Institutions

In Pakistan, prominent IT companies include Systems Limited, NetSol Technologies, and Arbisoft, known for their software development and IT solutions. The burgeoning IT sector in Pakistan is witnessing growth, with a focus on innovation and talent development, positioning the country as a hub for technological advancement. In this study, 5 top-tier companies and 12 SMEs are selected in different cities of the country including Islamabad, Lahore, Peshawar, and Karachi to conduct the surveys and interviews. In the top-tier category, companies like Confiz Limited, System Limited, NetSol, and DataPilot are selected while in medium-tier categories, different SMEs like Rapidev, Amazon Seller Society, The Creative Street, and others are selected.

3.4 Surveys and Interviews

Surveys and interviews have been used to gather information from software exporters including top-tier companies and SMEs and experts from different top-tier IT organizations. Quantitative data on software exports from PSEB, PBS, SBP, and others have been gathered while interviews are used to gather qualitative insights on the experiences and perspectives of software companies. This approach is expected to gain the perspective of current international and national customers of software to assess their current and future inclinations in software development.

3.5 Experts Opinion and Performance Matrix

An expert opinion from Systems Limited and Confiz Limited is taken to develop a comparative performance matrix based on 16 different key parameters that are critical to boosting the IT industry of developing countries, especially Pakistan. These parameters are taken to identify the current standings of the country in IT exports. Based on experts' opinions, this matrix helped to identify the potential areas and challenges that can be fixed in the short term and the areas that require long-term effort. Based on this matrix, the major challenges are identified which later helped to develop strategic recommendations for both government and industry.

3.6 Key Challenges Identification

Based on the performance matrix and the comparative analysis of Pakistan with other countries of its scale, key challenges are identified which assisted in developing strategic key recommendations. The challenges are identified at both governmental and industry levels. Moreover, the challenges are divided based on the time span including the challenges which can be fixed in the short term and the challenges which require a long time and effort.

3.7 Compilation of Key Findings

In the second-last stage, the results and findings are compiled along with the concluding remarks. At this stage, again some statistics related to human resources and capability of current infrastructure as well as the operational nature of foreign organizations including TATA from India are collected to draw a thoughtful comparison of this study's findings, and based on these comprehensive discussions on the findings are presented.

3.8 Policy Recommendations

Finally, policy recommendations are developed which can help to develop a roadmap to enhance the IT sector infrastructure. These recommendations are developed under the two separate categories. In the first category, national-level recommendations have been developed that purely focus on suggestions and recommendations for government-related stakeholders. In the second category, strategic recommendations are developed for the industry itself. Based on these recommendations, both the government and the industry can mutually uplift Pakistan's IT sector.

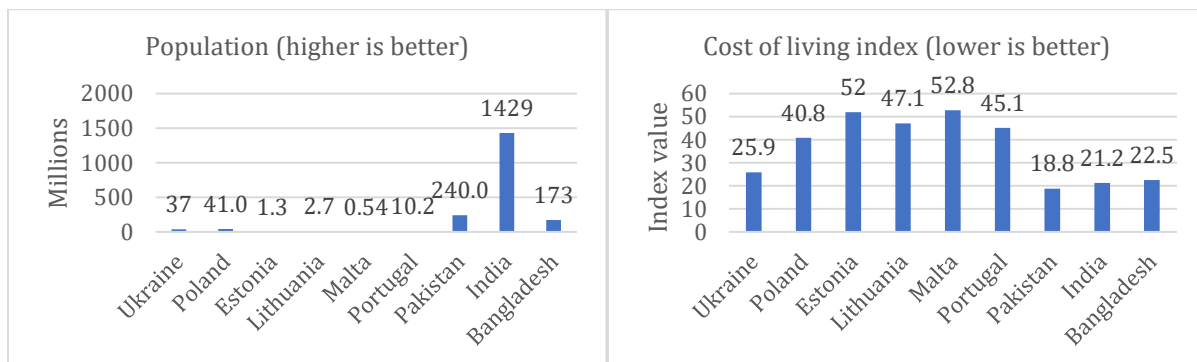
COMPARATIVE MATRICES OF EVALUATING COUNTRIES BASED ON MACRO-INDICATORS

A thorough analysis was conducted by developing comparative matrices to evaluate countries based on different macro indicators. These indicators play a vital role for IT companies when deciding where to outsource their work. The comparative analysis, with a complete description of Pakistan’s current standings with respect to different indicators, is summarized below in Subsections 4.1 to 4.9. These countries include Ukraine, Poland, Estonia, Lithuania, Malta, Portugal, India, and Bangladesh. They were selected to develop a performance matrix because they share many common scenarios with Pakistan. For example, like Pakistan, Ukraine is also facing challenges such as the war on terror and poor economic conditions over the past few decades. Similarly, Bangladesh shares geographical and socio-economic backgrounds with Pakistan.

4.1 Population and Cost of Living

As shown in Figure 3, with a population of almost 240 million, Pakistan offers a vast pool of talent and potential consumers for software products and services. On the other hand, managing and harnessing this demographic dividend effectively requires concerted efforts in education, training, and employment generation. Additionally, Pakistan's low cost of living can potentially offer a competitive advantage, making it an attractive destination for outsourcing and investment in the IT sector.

Figure 3 Performance metrics based on population and cost of living in evaluating countries

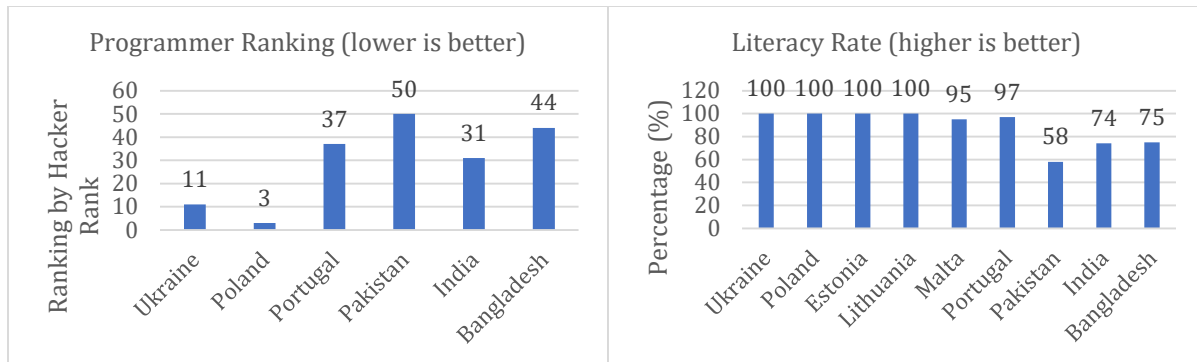


Sources: Numbeo (n.d.) & Worldometers (n.d.).

4.2 Programmer Ranking and Literacy Rate

The low ranking of Pakistani programmers according to Hacker ranking highlights the need for significant improvements in technical skills and expertise within the workforce, as shown in Figure 4. This stresses the importance of revamping the education system to focus on STEM education and providing opportunities for continuous learning and upskilling.

Figure 4 Performance metrics based on programmer ranking and literacy rate in evaluating countries



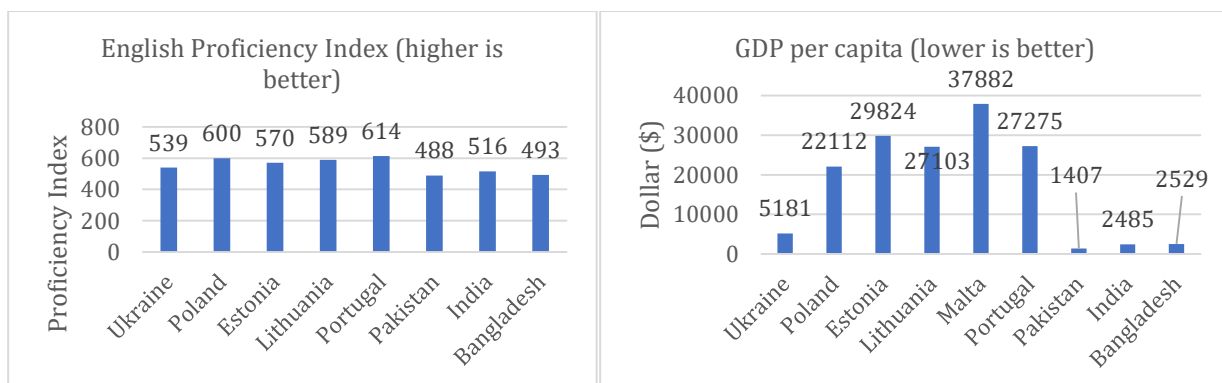
Sources: World Population Review (2024c) & Trikha (2016).

Moreover, addressing the relatively low literacy rate in Pakistan is imperative for ensuring broader access to quality education and creating a skilled workforce capable of competing on a global scale. Despite its demographic advantage, Pakistan faces challenges in programmer ranking and literacy rates.

4.3 English Proficiency and GDP

Improving English proficiency is crucial for Pakistan's successful integration into the global IT market, where English serves as the predominant language of communication. As depicted in Figure 5, Pakistan's relatively low GDP per capita highlights disparities in wealth distribution across the population. Strengthening English language skills through targeted training programs and educational reforms can play a pivotal role in bridging this gap. As, once every class of society has a reasonable command of English language skills, the wealth distribution will be uniform. Proficient English communication facilitates better engagement with international clients and partners, fostering smoother collaboration and enhancing the country's competitiveness in the global economy. By equipping more of its workforce with strong English capabilities, Pakistan can promote inclusive economic growth, ensuring that all segments of society have access to and benefit from opportunities in the burgeoning IT sector and beyond.

Figure 5 Performance metrics based on English proficiency and GDP in evaluating countries

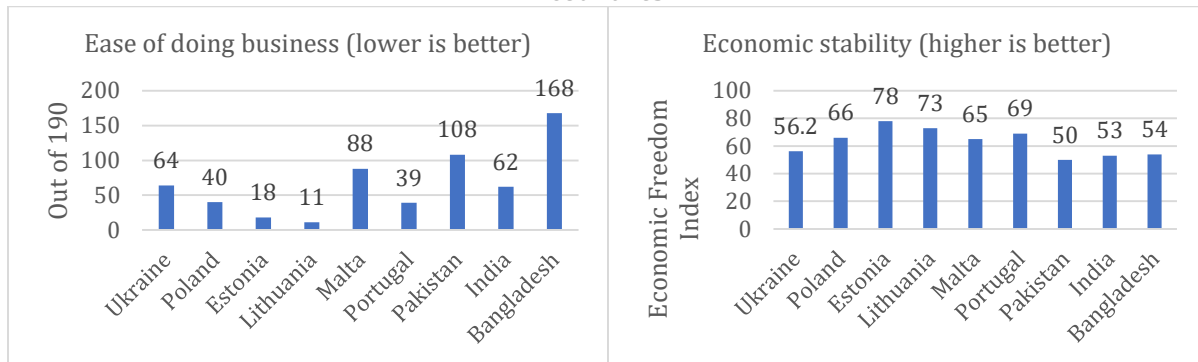


Sources: World Population Review (2024b) & World Bank (n.d.b).

4.4 Ease of Doing Business and Economic Stability

The comparative analysis based on ease of doing business and economic stability is shown in Figure 6. Improving Pakistan's ranking in ease of doing business requires reforms aimed at streamlining bureaucratic procedures, reducing red tape, and enhancing investor confidence. Creating a conducive business environment with clear regulatory frameworks and efficient dispute-resolution mechanisms is essential for attracting domestic and foreign investment in the IT sector. Moreover, ensuring economic stability through sound macroeconomic policies and fiscal discipline is crucial for fostering long-term sustainable growth.

Figure 6 Performance metrics based on Ease of doing business and economic stability in evaluating countries

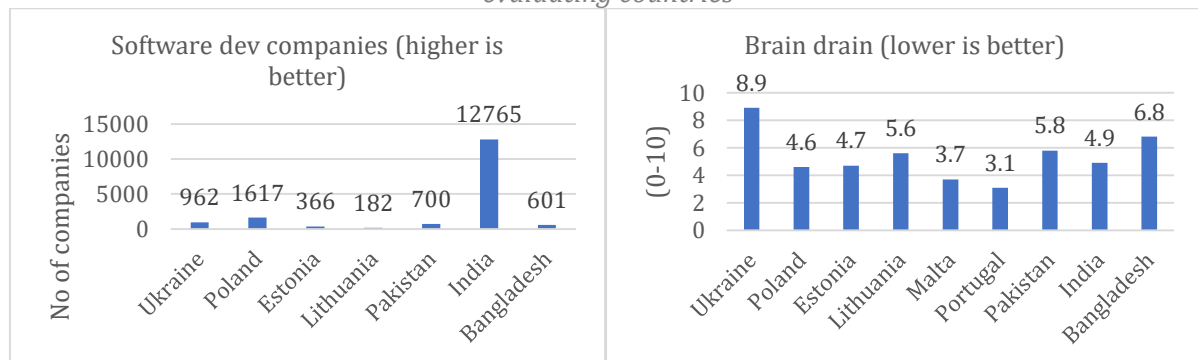


Sources: World Bank (n.d.a) & Heritage.org (n.d.).

4.5 Existing IT Infrastructure and Brain Drain

As shown in Figure 7, while Pakistan has seen a growth in the number of IT companies as compared to Estonia, Lithuania, and Bangladesh, there is a requirement to set up tier IT companies in Pakistan. The disparity between its IT ecosystem and those of neighboring countries indicates room for improvement. Strengthening the IT infrastructure, fostering innovation and entrepreneurship, and providing incentives for technology startups are key to nurturing a vibrant IT ecosystem. Additionally, addressing the brain drain phenomenon requires measures to retain and incentivize talented individuals, such as offering competitive salaries, career advancement opportunities, and a conducive work environment.

Figure 7 Performance metrics based on existing software development companies and brain drain in evaluating countries

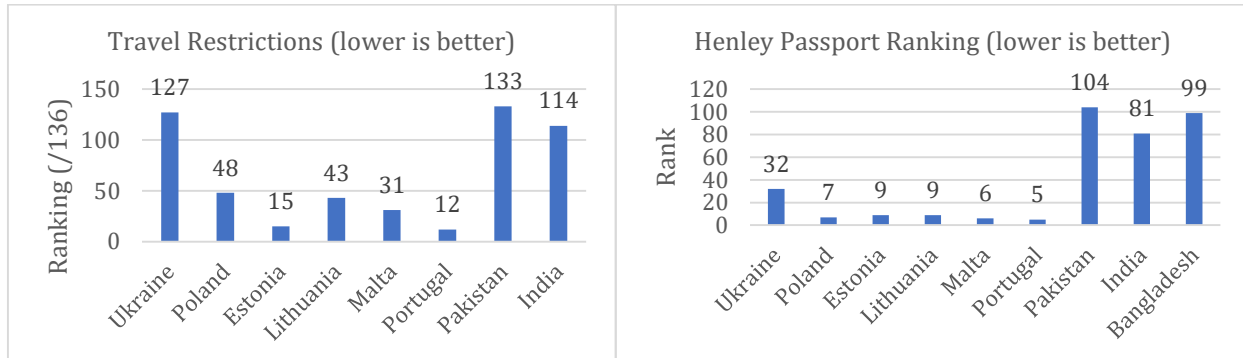


Sources: World Population Review (2024a) & Lusha (n.d.).

4.6 Travel Restrictions and Passport Ranking

High travel restrictions limit as shown in Figure 8, Pakistan's ability to engage in international business activities, attend conferences, and collaborate with global partners. Addressing these restrictions through diplomatic efforts, visa facilitation agreements, and improving border security measures can help enhance Pakistan's connectivity and integration into the global IT community. Moreover, improving Pakistan's passport ranking is essential for enhancing the mobility of its citizens and promoting cross-border exchanges of talent and ideas.

Figure 8 Performance metrics based on travel restrictions and passport ranking in evaluating countries

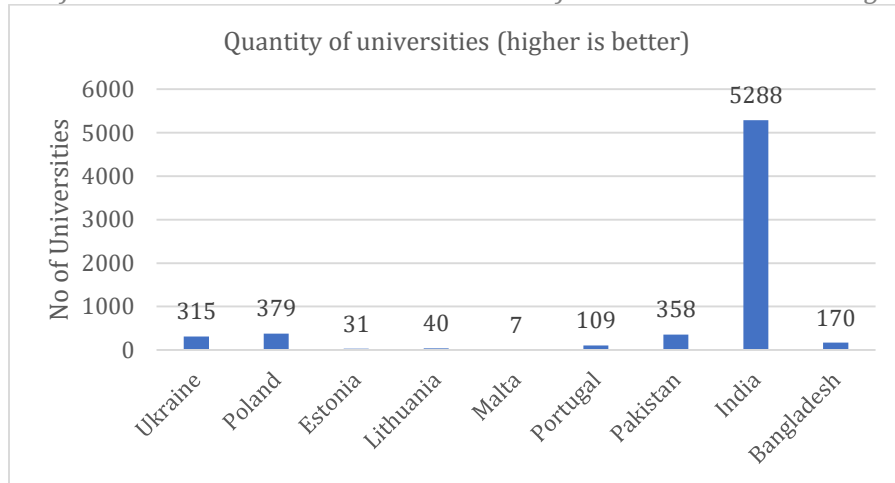


Source: Henley & Partners (n.d.).

4.7 Education Perspective

While Pakistan possesses a significant number of universities, as shown in Figure 9, ensuring the quality and relevance of education is crucial for producing skilled graduates who can meet the demands of the IT industry. Education plays a critical for shaping societal values and governance. Educated populations provide a skilled workforce adept in technological innovation and adaptation, crucial for advancing the IT sector. Investing in modernizing curricula, upgrading educational infrastructure, and promoting critical thinking and problem-solving skills are essential for fostering innovation and competitiveness.

Figure 9 Performance metrics based on the number of universities in evaluating countries

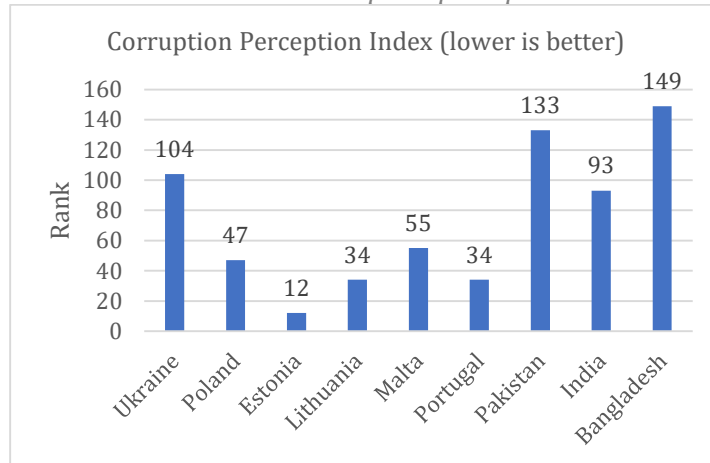


Source: FlagPictures (n.d.).

4.8 Corruption Perception

Unfortunately, according to the statistics shown in Figure 11, Pakistan is suffering from the highest corruption index as compared to other countries. Combating corruption is paramount for creating a level playing field and instilling trust in the business environment, both domestically and internationally. Corruption often leads to higher costs for businesses due to bribes, kickbacks, and other forms of unofficial payments. These additional costs can hinder the ability of IT companies to invest in growth. Corruption can create an uneven playing field where companies that engage in corrupt practices gain an unfair advantage over those that do not. This can discourage honest companies from entering or staying in the market, reducing overall industry competitiveness. Finally, on the whole, corruption damages the image of the country as a whole which makes difficult the trust of other countries and reputed IT organizations which consequently reduces the ways of collaboration.

Figure 10 Performance metrics based on corruption perception index in evaluating countries

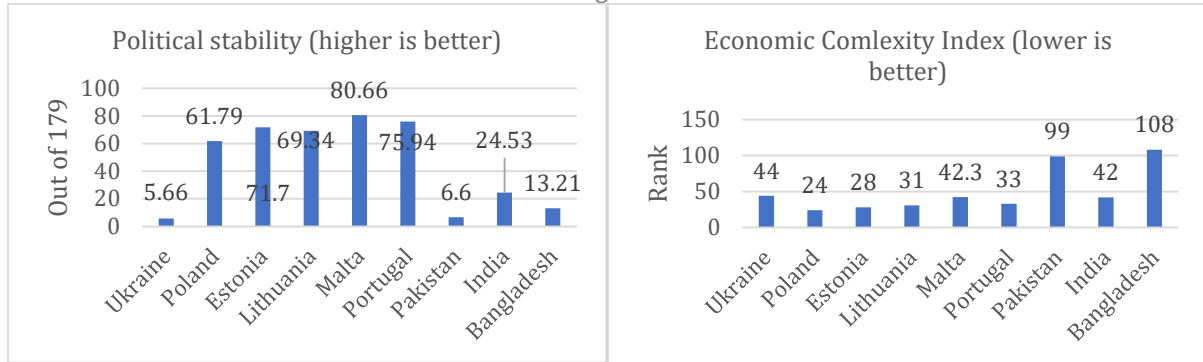


Source: Transparency International (n.d.).

4.9 Political and Economic Complexity

Based on the political and economic complexity index as shown in Figure 11, Pakistan faces significant challenges in both domains compared to other countries. High political complexity, often characterized by unstable governance, frequent changes in political leadership, and policy uncertainty, can create an unpredictable business environment. This unpredictability can deter foreign investment and complicate long-term planning for both local and international IT firms, thereby hindering the growth of IT exports. Similarly, economic complexity, which includes factors such as regulatory burdens, inefficient infrastructure, and difficulties in accessing finance, can further inhibit the growth of the IT sector. These economic hurdles can increase operational costs, reduce competitiveness, and limit the ability to scale up production and export activities. As seen from the above comparative matrices based on the top 16 critical parameters, as a country Pakistan's image is not up to the mark. However, a country has immense potential and has some good standings with respect to some parameters like cost of living, etc. To leverage the current potential of Pakistan, some key measures are necessary to take against the above-discussed challenges in the IT sector.

Figure 11 Performance metrics based on political stability and economic complexity index in evaluating countries



Sources: World Population Review (2024d) & Growth Lab (n.d.).

MAJOR CHALLENGES

The burgeoning IT industry in Pakistan faces a myriad of challenges that impede its growth and global competitiveness. These challenges span government-related issues, industry-specific hurdles, and hybrid obstacles that intertwine various facets of the sector. These challenges are drawn from the findings and potential interviews with the companies as well as the performance matrix. Addressing these critical areas is imperative for fostering a robust, innovative, and sustainable IT ecosystem capable of driving substantial economic development.

5.1 National-level Challenges

5.1.1 Political and Economic Instability

Political and economic instability introduces uncertainty for investors, leading to reduced funding for startups and infrastructure. It also undermines market confidence, delaying IT investments and impacting overall demand. Moreover, when a government begins to outline constructive roadmaps and policies, non-democratic elements may unlawfully attempt to destabilize it mid-tenure. Consequently, these policies often remain unfulfilled, creating a persistent gap in the IT sector when new governments take office and fail to continue their predecessors' initiatives. On the other hand, economic instability curtails government spending on essential digital infrastructure, affecting competitiveness. Currency fluctuations and trade barriers during political tensions can further hinder export viability and profitability.

5.1.2 Poor Tracking, and Operational Hygiene

An inadequate tracking mechanism and poor operational hygiene are prevalent issues within the IT industry. These deficiencies result in inefficiencies, reduced competitiveness, and subpar service delivery. Implementing stringent governance policies, regular performance tracking, and maintaining operational hygiene are critical to ensuring consistent quality and operational efficiency.

5.1.3 Limited Focus on Building the IT Industry

There is a noticeable lack of concerted effort to build and promote the IT industry as a whole. A coordinated approach involving government support, industry alliances, and educational institutions is needed to create a vibrant ecosystem. This ecosystem should support innovation, growth, and global competitiveness, thereby fostering a robust and sustainable IT industry.

5.2 Industry-focus Challenges

5.2.1 Incoherent and Poorly Thought-Through Strategies

Many IT firms in Pakistan suffer from incoherent and poorly developed strategic frameworks. This incoherence is often due to insufficient market research, lack of clear objectives, and a reactive rather than proactive approach to business planning. Without a coherent strategy, firms struggle to sustain growth and adapt to the dynamic nature of the global IT market, leading to missed opportunities and suboptimal performance.

5.2.2 Either a Sales-Heavy or an Engineering-Heavy Focus

There is a prevalent imbalance within IT firms between sales and engineering focus. Companies that prioritize sales may lack the technical robustness to deliver on promises, leading to customer

dissatisfaction. Conversely, firms that are engineering-heavy may struggle to market their products & services effectively, missing out on revenue opportunities. Achieving a balanced focus that integrates strong sales strategies with robust engineering capabilities is essential for sustainable success.

5.2.3 Lack of Inorganic Growth

The IT sector in Pakistan has shown limited engagement in mergers, acquisitions, and strategic alliances, which are critical for rapid expansion and competitiveness. Inorganic growth through these means enables firms to quickly scale their operations, acquire new technologies, and enter new markets. The lack of such strategic initiatives limits the industry's ability to grow beyond organic means and capitalize on global opportunities.

5.2.4 Investing in Growth from Profits

Relying solely on profits for reinvestment significantly constrains growth potential. IT firms require substantial and timely investments to scale their operations, innovate, and compete on a global scale. Limited reinvestment from profits delays expansion efforts and prevents companies from seizing emerging market opportunities, thereby hindering their competitive edge. Any new technology or business opportunity provides a narrow window of opportunities in the IT sector. Therefore, if companies are not agile and do not have instant capital, they may miss the opportunity or be unable to take full advantage of it.

5.2.5 Non-Existent or Inefficient Board of Directors

Many IT firms operate without a robust governance structure and an efficient board of directors. The absence of a strategic and oversight-focused board leads to poor decision-making, lack of accountability, and strategic misalignment. Establishing effective boards that provide strategic direction, ensure accountability, and drive operational excellence is crucial for sustainable growth.

5.2.6 Customer Churn

High customer churn rates reflect dissatisfaction with service delivery, often due to inconsistent quality, poor customer service, or lack of innovation. Retaining customers requires a strong focus on improving service quality, offering personalized solutions, and maintaining ongoing engagement. Reducing churn is essential for building long-term client relationships and sustaining revenue growth.

5.2.7 Wealth Sharing Formula

Inequitable wealth-sharing models within IT firms create internal discontent and reduce employee motivation. Implementing fair and transparent profit-sharing mechanisms can incentivize employees, enhance productivity, and foster loyalty. Equitable wealth sharing is essential for creating a motivated workforce and sustaining growth in the highly competitive IT sector.

5.2.8 Founder's Syndrome

Founder's syndrome, characterized by possessiveness and delegation/trust issues, is a significant barrier to growth in many IT firms. Founders who are unable or unwilling to delegate responsibilities and develop successors limit the firm's capacity to scale and attract high-potential leadership talent.

Overcoming this syndrome requires building a strong leadership team and establishing a culture of trust and delegation, enabling the firm to grow beyond the founder's direct control.

5.2.9 Founders' Lack of Pressure to Grow

Many founders lack external pressure to aggressively pursue growth, often due to self-satisfaction with current achievements. This complacency prevents firms from reaching their full potential. Establishing growth targets, external accountability, and fostering a culture of continuous improvement can drive more ambitious growth agendas and elevate the firm's competitive stance.

5.2.10 Inefficient, Non-Scalable Engineering Excellence and People Policies

Current engineering practices and people policies within many IT firms are inefficient and non-scalable. Implementing standardized best practices, continuous improvement frameworks, and scalable people management strategies is critical. These measures will drive engineering excellence, enhance productivity, and enable firms to scale operations effectively, supporting long-term growth and competitiveness in the global market.

5.3 Multidimensional Challenges

5.3.1 Dependency on Limited Commoditized Growth Avenues

Pakistan's IT industry has primarily relied on a narrow range of commoditized growth avenues such as BPO and basic software development services. While these sectors provided initial growth opportunities, they are prone to rapid saturation due to high competition and minimal differentiation. As global demand evolves towards more innovative and high-value IT services, this dependency on commoditized avenues constrains the industry's potential for sustainable expansion and value creation.

5.3.2 Poor Engineering, Economics, and Network/Negotiation Skills

The industry's talent pool demonstrates an imbalanced mix of expertise in Engineering, Economics, and Network/Negotiation skills. This imbalance restricts the ability to innovate and effectively compete in international markets. Engineering prowess alone cannot drive growth without complementary economic strategies and strong negotiation skills to forge and maintain global partnerships. Enhancing this skill mix is crucial for the holistic development of the IT sector.

5.3.3 Talent Challenges

The IT industry in Pakistan faces considerable talent challenges, including brain drain, skill gaps, and retention issues. The continuous migration of skilled professionals to other countries for better opportunities depletes the local talent pool. Addressing these challenges through robust talent development programs, upskilling initiatives, and creating attractive career prospects is essential to retaining and nurturing top talent within the country.

RESULTS AND FINDINGS

A comprehensive understanding, derived from top-level companies, SMEs, and expert opinions, indicates a strong demand for enhanced education and training programs to bridge the skill gap in Pakistan's IT sector. There is a clear call for academia-industry collaboration to align educational outcomes with market needs, alongside the necessity for government support in providing financial incentives and fostering a conducive environment for startups and emerging technology sectors.

A comparative analysis with other economies highlights Pakistan's competitive advantages and disadvantages. While Pakistan's IT sector is burgeoning, it lags in infrastructure, regulatory frameworks, and innovation ecosystems, emphasizing the need for policy reforms and investment in digital infrastructure to enhance competitiveness. Despite these challenges, Pakistan holds immense potential and has some competitive advantages, such as a low cost of living. Leveraging this potential requires addressing the discussed challenges in the IT sector. Several challenges impede the growth of Pakistan's IT sector, including reliance on commoditized growth avenues, imbalanced skill sets, incoherent strategic frameworks, and financial constraints. Additionally, travel restrictions, corruption perception, and education quality issues further complicate the landscape. Addressing these challenges necessitates a multifaceted approach encompassing education reform, regulatory improvements, investment promotion, talent retention, and anti-corruption measures.

Infrastructure challenges, such as poor internet connectivity and high operational costs, coupled with a significant skills gap in technical and professional areas, are noted barriers. Recommendations include modernizing curricula, enhancing practical training, and fostering industry-academia collaboration to ensure a steady supply of skilled graduates. The role of government support is crucial, with companies advocating for financial incentives, tax benefits, and initiatives to create a supportive ecosystem for startups. Additionally, fostering international collaborations and staying aligned with global market trends is critical for maintaining competitiveness. Financial constraints, such as funding issues and increased operational costs, are common concerns among surveyed companies. Recommendations to mitigate these challenges include government subsidies, improved access to financing, and policy measures to reduce operational costs. Strategic recommendations emphasize the importance of balancing sales and engineering efforts, promoting inorganic growth through mergers and acquisitions, and enhancing strategic planning within firms. These measures are essential for fostering a resilient and competitive IT sector capable of sustained growth and innovation.

Three main components underpin any IT industry: human capital, power/electricity provision, and hardware assets. Given the lack of significant operational costs associated with hardware assets, human capital becomes the primary component of the industry. According to the P@SHA report on the greater skills gap divide in 2022, Pakistan produces 10,000 IT or tech graduates every year, but only 10% are employable (P@SHA, 2023b). To achieve a target of \$10 billion in exports, requiring 280,000 engineers, it would take 110 years at the current rate. The primary issue is the insufficient supply of human resources, making it a supply-constrained industry. As a result, companies often secure contracts and sales but struggle to find the necessary human resources (engineers and other IT/CS/tech experts) in the local market. Consequently, these companies end up poaching talent from other firms. Fresh graduates join a company and, after six months of gaining expertise through

company investment, receive job offers from other companies. This cycle continues, leading to inefficiencies in the supply chain.

Additionally, various taxes on human capital reduce the cost, ultimately decreasing sales and making the industry less competitive. Brain drain further depletes the existing human capital, reducing the competency of the local IT industry compared to other countries. In contrast, companies in other countries, such as TATA and Infosys in India, can collaborate with major companies like Microsoft and Google. In Pakistan, the government's efforts to incentivize the freelance market while disincentivizing major IT companies discourage large companies from establishing a presence in the country, resulting in a lack of significant partnerships with major companies like Microsoft. Moreover, the absence of taxes on freelancers leads many IT-related SMEs to become holding companies in other countries to offer tax-free salaries to their employees. This approach keeps the complete profit in the banks of those countries, while only the costs are borne by Pakistan.

CONCLUSION

This study has underscored the significant potential and challenges faced by Pakistan's IT industry in its quest for massive software export growth. The key findings indicate that while Pakistan's IT sector has shown promising growth, it remains underutilized compared to its global peers. The country's software exports, although growing, are still dwarfed by those of countries like India, Vietnam, and the Philippines. It identifies significant issues such as political and economic instability, limited government focuses on building the IT industry, incoherent industry strategies, and a significant skills gap between graduates and industry requirements. Despite these challenges, the IT sector in Pakistan has substantial potential for growth, provided there are targeted policy interventions and strategic industry practices. Strategic recommendations include diversifying IT services, fostering innovation, integrating multidisciplinary education and professional development, balancing engineering and sales efforts, and addressing the founder's syndrome. It also emphasizes the importance of strong governance, effective boards, and workforce training to bridge the gap between low-skilled and high-skilled workers. Encouraging international companies to open offices in Pakistan and promoting companies to list themselves on the stock exchange is crucial for long-term growth. By addressing these challenges, the collaborative efforts of policymakers at the government level, industry leaders, and educational institutions are essential in building a robust and competitive IT ecosystem.

POLICY RECOMMENDATIONS

In order to propel Pakistan's IT industry into a robust era of sustainable growth and global competitiveness, strategic policy interventions are essential across short and long-term horizons. By aligning these initiatives with international standards and nurturing a conducive environment, Pakistan can leverage its IT potential to attract global investments, empower local talent, and establish itself as a significant player in the global technology landscape which will help to increase the IT export level in the international market.

8.1 Policy Recommendations for Government

Diversifying IT Services and Foster Innovation

It is imperative to diversify IT services and products in order to avoid reliance on constrained, commoditized growth routes. The value proposition of the sector can be considerably improved by promoting innovation in fields like cloud computing, blockchain, artificial intelligence, and cybersecurity. IT can be further improved by putting a special effort into the IoT and Embedded Systems as these are also the hot areas in today's era of digitalization. However, heavy-duty on the hardware and imbedded components imports are impeding development in this area. The government can boost this area by revising the heavy-duty policies and providing a sort of relaxation on the imports. For this, a strong innovation environment will be promoted by offering tax exemptions, grants, and subsidies to IT companies that choose to enter certain high-growth prospective areas. Additionally, creating innovation centers and technology parks with cutting-edge facilities and boosting industry-academia collaboration for research and development in emerging technologies can draw in both domestic and foreign tech companies, fostering value creation and sustained growth.

Integrating Multidisciplinary Education and Professional Development

Academic institutions ought to incorporate multidisciplinary curricula that blend technical, economic, and interpersonal proficiencies. Together with incentives for effective implementation, government cooperation with educational institutions to develop curricula that integrate several subjects can guarantee a consistent supply of graduates who are well-rounded from both technical and interpersonal perspectives. Professional development programs will also help today's IT professionals stay competitive in the global economy.

Balancing Engineering and Sales

Encouraging IT companies to prioritize engineering and sales equally is essential for long-term success. A comprehensive strategy can be promoted via management training programs that stress the value of both technical and sales skills, as well as case studies and seminars on the effective fusion of both endeavors. Government-funded training programs can help IT workers develop dual skills by highlighting best practices and giving IT companies a forum to discuss tactics and experiences.

Curriculum Alignment

The curriculum should be focused and aligned with both international standards and our local industry requirements. Apart from imparting fundamental knowledge, there is a need for agility in the Higher Education Commission's (HEC) curriculum revision process to enable universities to

promptly adapt their course offerings. However, ensuring the availability of highly qualified instructors at every institution for core courses remains a challenge. To address this, a hybrid model of course delivery could be implemented, leveraging online courses from reputable platforms like LUMSx and others. Looking ahead, industry-specific knowledge will outweigh purely technical coding skills. Developing industry-relevant courses can be facilitated through closer collaboration with industry experts in curriculum design. Assessment methods should also evolve towards more comprehensive mechanisms, such as the testing protocols used by Confiz Limited, to accurately gauge the preparedness of graduates and align them with appropriate career paths. This approach will establish a benchmark to assess the proficiency of graduates from various universities.

Taxation on Human Capital

Various taxes on human capital reduce local cost competitiveness, ultimately decreasing sales and making the industry less competitive globally. Brain drain further depletes the existing human capital, diminishing the competency of the local IT industry compared to other nations. A high taxation regime on salaries often leads local companies to consider establishing holding entities in other countries, contributing to brain drain or resorting to illicit channels for financial transactions. Currently, a tax rate as high as 40% is imposed on salaries of 800k PKR (P@SHA, 2023a), a level unimaginable in Scandinavian countries at this salary range. If the government aims to bolster the IT industry, it should protect its workforce and implement a more lenient taxation policy. Viewing IT services as part of the international market rather than solely domestic can also enhance competitiveness.

Increase the Holding Capability of Dollar Account

To enhance the economic flexibility and stability of IT companies in Pakistan, it is essential to advocate for policies that support the expansion of dollar account capabilities within the country. Allowing IT companies to maintain dollar accounts domestically eliminates the need for opening accounts abroad, streamlining financial operations and reducing foreign exchange risks. By increasing the holding capability of these accounts, the government can empower IT firms to manage international transactions more efficiently, fostering a conducive environment for business growth and investment.

Government Procurement

In many government procurement cases, Pakistani companies receive no significant advantages. Often, conditions are imposed that exclude Pakistani companies from competing. For instance, consider the requirement to develop a wind forecasting system in Pakistan, a task purely within the realm of software services. The bidding conditions demand a company to have at least 10 years of experience, operations in at least 10 countries, and prior service to a 100 MW wind power plant. These stringent criteria effectively exclude Pakistani companies, even those with relevant experience in developing wind forecasting systems. Currently, Pakistani government procurement policies appear biased against local companies. It is crucial for the government to prioritize local companies, which would not only support their growth but also enable them to compete internationally.

Strong Governance and Effective Boards

Operating excellence in IT companies will be fueled by the promotion of strong governance frameworks and effective boards of directors. Accountability and strategic alignment can be improved by providing board members with training on best practices for governance and by providing government incentives to companies that adopt robust governance structures. Industry-wide high standards will be guaranteed by certification programs for board members and policies on corporate governance, strategic supervision, risk management, and moral leadership. It is imperative that IT organizations improve their governance, performance tracking, and operational hygiene.

Gap between Low-skilled and High-skilled Workers

The integration of AI has significantly impacted and reduced entry-level jobs. High-skilled workers can enhance their productivity by up to tenfold through the effective use of AI, whereas low-skilled workers may not achieve comparable gains. In India, the IT industry experienced substantial growth driven by BPO (Couto et al., 2019), which involved low-complexity tasks requiring minimal technical skills and training. However, with the advent of AI, the relevance of BPO is diminishing, and its prominence in Pakistan is also declining. In the near future, AI is expected to increasingly replace tasks at higher skill levels. According to the CEO of NVIDIA, a leading global IT firm, the emphasis should shift towards problem-solving and critical thinking skills rather than solely focusing on coding abilities. This sentiment is echoed by the CEO of Arbisoft, who highlights the skill gap among Pakistani fresh graduates. Furthermore, there should be an increased emphasis on cross-functional education to prepare graduates for diverse challenges. To mitigate brain drain and enhance the quality of local talent, there is a need for a scalable autonomous digital platform that can provide affordable university education to a broader audience of young learners. This scalability would reduce the cost of education and improve accessibility across the board.

Encourage International Companies to Open Offices in Pakistan

The government should encourage international companies to establish offices in Pakistan by creating a favorable business climate through regulatory reforms, tax incentives, and fostering relationships with global tech giants. Incentives are crucial in this regard. It's important to note that political and economic instability is not the primary reason hindering such initiatives. Many leading companies, such as Microsoft, have established offices in countries like Ukraine and Kenya, despite challenges in stability. To attract international companies, the government can adopt a strategy favoring companies that establish offices and invest in Pakistan. Furthermore, addressing the challenges faced by freelancers and SMEs operating abroad can be achieved by implementing balanced tax policies that encourage local operations while ensuring fair tax contributions.

Focus on Intrapreneurship vs. Entrepreneurship

Entrepreneurship is a sought-after idea worldwide and our government has also created various initiatives to spur entrepreneurship. However, on the flip side, it creates many small start-ups with limited avenues of growth. Similar to entrepreneurship the government should also focus on intrapreneurship where employees can find avenues to pursue new ideas within the bounds of their current employers. The same resources that the government is putting into entrepreneurship may be used for intrapreneurship which will likely result in new ideas. In this way the existing companies

do not have to put in all the financial resources but in case the idea succeeds the founders have an umbrella to grow the idea. In Europe, this kind of intrapreneurship happens through Horizon Europe and many other such programs and has successfully contributed to the growth of IT companies.

Encourage the Companies to List Themselves in the Stock Exchange

The government should encourage companies to list themselves on the stock exchange and open up opportunities for investment. To achieve this, rules and regulations should be streamlined and made more accommodating. Moreover, listing on the stock exchange enhances accountability and cultivates a culture of financial discipline among companies. This approach aligns with global best practices and appeals to institutional investors seeking diversified investment opportunities in Pakistan.

Define the IT Sector as a Niche

Pakistan should identify and prioritize the IT industry as a strategic niche for national development. By concentrating on this industry, the country may take advantage of its expanding tech skill pool and establish a strong digital economy. To be more specific, the government should choose an important segment of the IT industry—like finance, cybersecurity, or software development—and direct resources toward its expansion.

Promote Local Development of Systems

Pakistan should stop depending on costly imports from international businesses and instead invest in building local capacity to produce computer systems and related technologies. Through the development of a domestic manufacturing sector, the country could reduce costs, generate employment, and boost GDP. The initiative would improve Pakistan's technological independence while also making technology more accessible and cheaper for local companies and consumers. A good niche in manufacturing is IoT sector which has heavy duties and taxation on its required components like ICs, capacitors, resistors etc. It is strongly recommended to include IoT industry as part of the IT industry with the same set of incentives as IT industry.

8.2 Strategic Recommendations for Industry

Workforce Training

IT companies should be empowered to conduct their own training programs. The private industry should actively engage in talent development in Pakistan through investments aimed at balancing industry demand and workforce supply. However, this represents a significant financial commitment, which many companies may not be prepared to undertake alone. Only a few large organizations possess such capacity. To facilitate this process, the government could incentivize companies by offering free land, space, or other incentives. Existing technology zones or parks could be designated for companies that commit to establishing skill development centers alongside their operational activities. This approach would encourage private sector participation in skill enhancement while leveraging existing infrastructure.

Overcoming Founder's Syndrome

Growth requires addressing the founder's syndrome by promoting a culture of trust and delegating. Robust leadership teams can be created by providing leadership development programs that

emphasize delegation, trust-building, and business scalability; encouraging founders to mentor the upcoming generation of leaders; and easing the transfer of founders into advisory positions. Through these efforts, businesses will be able to expand beyond the founder's direct supervision and develop strong leadership teams. To achieve the industry's full potential, founders must feel pressure from the outside to pursue rapid expansion.

Leverage Emerging Technologies

The field of developing technologies like AI is currently propelling important developments in automation and analytics. Based on our conversations with companies, it seems like along with AI, blockchain technology is the way of the future. It provides decentralized security and transparency that goes beyond banking and can be used in industries like supply chain management and healthcare. Businesses should vary their efforts to incorporate blockchain and AI in order to handle this transformation successfully. Companies can fully utilize emerging technology to improve operational effectiveness and promote long-term success in a competitive IT market by adopting these strategies.

Promote Research and Development

Leading companies ought to establish internal research and development hubs, especially in domains where Pakistan may secure a competitive edge. Knowledge transfer and partnerships will be facilitated by the establishment of cutting-edge facilities, networking events, and funding for cooperation between company R&D centers and university institutions. Pakistan can establish a strong ecosystem that promotes innovation and establishes the nation as a leader in the global IT industry by concentrating on specialized fields like artificial intelligence, blockchain, and cybersecurity and cultivating connections with prominent global IT players.

Offer Internship Opportunities

Offering internships to recent graduates is a smart way for IT organizations to develop the skill sets of the next generation of workers. Every year, all major corporations, including medium-sized ones, ought to establish a policy on their summer internship programs. Companies may help students improve professionally and gain access to a pool of future employees who are already familiar with their organizational culture and processes by identifying and developing talent early on.

Focus on Product Development in Addition to Servicing

Companies should broaden their scope to incorporate both service and product development; successful companies like NetSol, which have persevered during difficult economic times, should serve as models. Companies can create new revenue streams, strengthen their market resilience, and become less dependent on external economic variables by investing in the development of innovative products.

Reevaluation of Operations and Strategies in the Context of Generative AI

Companies should reevaluate their operations and strategies in the context of developments in Generative AI. Companies can unleash new creative possibilities, optimize workflows, and greatly increase productivity by incorporating this state-of-the-art technology. Adopting generative AI can

boost decision-making skills, provide competitive advantages in the global market, and result in the development of more individualized and effective services.

Assist in Enabling Startups Culture in Universities

Companies should aggressively encourage and assist university startups. Companies may give aspiring entrepreneurs access to invaluable resources like funding, market knowledge, and mentoring by collaborating with academic institutions. Additionally, encouraging a startup culture at the university level can help close the knowledge gap between industry and academics, preparing the next generation of talent to meet market demands.

REFERENCES

- Ahsan, M. N., Rafiq, M., Hassan, M., & Gohar, N. (2022). Impact of Online Freelancing on Economic Growth of Developing Countries Like Pakistan. *Asian Journal of Management, Entrepreneurship and Social Science*, 2(02), 209–228.
- Arora, A., & Gambardella, A. (2005). The globalization of the software industry: perspectives and opportunities for developed and developing countries. *Innovation Policy and the Economy*, 5, 1–32.
- Barletta, F., Pereira, M., Yoguel, G., & Robert, V. (2013). *Argentina: recent dynamics in the software and IT services industry*.
- Chen, W., Du, X., Lan, W., Wu, W., & Zhao, M. (2023). How can digital economy development empower high-quality economic development? *Technological and Economic Development of Economy*, 29(4), 1168–1194–1168–1194. <https://doi.org/10.3846/TEDE.2023.18784>
- China kpmgcom, K. (2016). *Secti on di vi der CHI NA OUTLOOK 2016*.
- Couto, V., Fernandez-Stark, K., & Center, D. G. V. C. (2019). Pakistan in the Offshore Services Global Value Chain. *Duke University Global Value Chains Center, Durham, NC*. <https://gvcc.duke.edu/Wp-Content/Uploads/PakistanOffshoreServicesGVC.Pdf>.
- FlagPictures. (n.d.). *Total number of universities in each country*. <https://www.flagpictures.com/countries/number-of-universities/>
- GOP (Government of Pakistan). (2020). Pakistan's IT industry overview 2020. Pakistan Software Export Board, Ministry of Information Technology & Telecommunication.
- GOP (Government of Pakistan). (2022a, December 12). *OIC delegation calls on Federal Minister for IT & Telecom Syed Amin Ul Haque* [News]. <https://moitt.gov.pk/NewsDetail/NDhkMTNjYTYtOTQyYi00NWZhLWI3Y2ItNzkwYTFkNzNkODI0>
- GOP (Government of Pakistan). (2022b). *Pakistan export strategy: Software development 2023-2027*. https://tdap.gov.pk/wp-content/uploads/2022/08/Software-Development-Export-Strategy-Pakistan-3_web.pdf
- Growth Lab. (n.d.). *Country & product complexity rankings*. <https://atlas.cid.harvard.edu/rankings>
- Henley & Partners. (n.d.). *The Henley passport index*. <https://www.henleyglobal.com/passport-index/ranking>
- Heritage.org. (n.d.). *Index of economic freedom*. <https://www.heritage.org/index/pages/all-country-scores>
- IBEF (India Brand Equity Foundation). (2024, May). *Information technology india, top IT companies in India*. <https://www.ibef.org/industry/information-technology-india>
- Interesse, G. (2023, January 12). 5 key industries to watch in China in 2023. *China Briefing*. <https://www.china-briefing.com/about-us/overview.html>

- Lusha. (n.d.). *Software development companies*. <https://www.lusha.com/company-search/software-development/021d3a8f4f/>
- Malik, F., Nicholson, B., & Heeks, R. (2018). Understanding the development implications of online outsourcing: A study of digital labor platforms in Pakistan. *Development Informatics Working Paper*, 73.
- Mathur, R. (n.d.). *Impact of Business Cycles on Information Technology Industry- An Indian Perspective*. <https://www.researchgate.net/publication/380068396>
- Mazumdar, A., & Alharahsheh, H. H. (2020). Digital Bangladesh–vision 2021: what is the digital Bangladesh concept. *South Asian Research Journal of Engineering and Technology*, 2(1), 6–9.
- McKinsey. (2021). *The future of work after COVID-19*. McKinsey Global Institute. <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19#/>
- Ning, L. (2009). China's Leadership in the World ICT Industry: A Successful Story of Its. *Pacific Affairs*, 82(1), 67–91.
- Numbeo. (n.d.). *Cost of living index by country 2024 mid-year*. <https://www.numbeo.com/cost-of-living/rankings-by-country.jsp>
- OECD. (2019). *Measuring the Digital Transformation*. <https://doi.org/10.1787/9789264311992-en>
- P@SHA. (2023a). Pakistan's guide to becoming a tech destination [Policy paper]. P@SHA. <https://www.pasha.org.pk/wp-content/uploads/Budget-Recommendations-2023-by-P@SHA.pdf>
- P@SHA. (2023b). *The great divide: The industry-academia skill gap report 2022*. Islamabad: P@SHA <https://www.pasha.org.pk/publications/the-great-divide-the-industry-academia-skill-gap-report-2022/>
- Paschek, D., Trusculescu, A., Mateescu, A., & Draghici, A. (2017). Business process as a service-a flexible approach for it service management and business process outsourcing. *Management Challenges in a Network Economy: Proceedings of the MakeLearn and TIIM International Conference*, 195–203.
- Paul, N. (2022). *Analysis of Trending Hi-Tech and Software Industry in Bangladesh*.
- Qadir, U., ud Din, M., & Ghani, E. (2019). *Competitiveness in Pakistan: A Case Study of the ICT Industry*. Pakistan Institute of Development Economics.
- SBP (State Bank of Pakistan). (2023). *State Bank of Pakistan half year report 2022-23*. Karachi: SBP.
- Shamsi, J. A., & Nasir, Z. (2016). Unleashing the Pakistan software industry: Growth prospects and challenges. *IT Professional*, 18(5), 12–14.
- Shinkai, N., & Hossain, M. (2011). Productivity and performance of IT sector in Bangladesh: Evidence from the firm level Data. *The Bangladesh Development Studies*, 1–22.
- Stamm, A., Kasumovic, A., & Krämer, F. (2001). *The Software Industry in Argentina: Perspectives of a High-tech Sector in a Low-tech Country*. GDI.

- Tjia, P. (2003). The software industry in Bangladesh and its links to The Netherlands. *The Electronic Journal of Information Systems in Developing Countries*, 13(1), 1–8.
- Transparency International. (n.d.). *Corruption perception index*. <https://www.transparency.org/en/cpi/2023>
- Trikha, R. (2016, August 25). Which country would win in the programming Olympics? *HackerRank*. <https://www.hackerrank.com/blog/which-country-would-win-in-the-programming-olympics/>
- UNCTAD (United Nations Trade and Development). (2019, July 25). *Bangladesh creates fertile ground for e-commerce growth* [News]. <https://unctad.org/news/bangladesh-creates-fertile-ground-e-commerce-growth>
- World Bank. (n.d.a). *Ease of doing business rank*. <https://data.worldbank.org/indicator/IC.BUS.EASE.XQ?skipRedirection=true&view=map>
- World Bank. (n.d.b). *GDP per capita*. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
- World Population Review. (2024a). *Brain drain countries 2024*. <https://worldpopulationreview.com/country-rankings/brain-drain-countries>
- World Population Review. (2024b). *EF English proficiency index by country 2024*. <https://worldpopulationreview.com/country-rankings/ef-english-proficiency-index-by-country>
- World Population Review. (2024c). *Literacy rate by country 2024*. <https://worldpopulationreview.com/country-rankings/literacy-rate-by-country>
- World Population Review. (2024d). *Political stability by country 2024*. <https://worldpopulationreview.com/country-rankings/political-stability-by-country>
- Worldometers. (n.d.). *Countries in the world by population (2024)*. <https://www.worldometers.info/world-population/population-by-country/>

APPENDICES

Appendix A

A 1. Meeting and Survey with IT-based Companies

The major companies like NetSol technologies, Systems limited, Confiz limited, and other SMEs are considered. For SMEs, we visited the different technology zones in Pakistan including National Science and Technology Park (NSTP) located in NUST and National Incubation Center (NIC), Lahore. Engaging in meetings and surveys with IT-based companies in Pakistan has provided valuable insights into the industry's dynamics. The survey was offered in three different modes including in-person meetings with a company representative and the company's office, online meetings, and questionnaires in the form of Google forms. The survey questions are attached in Appendix B. Interactions with key players have unveiled trends in software development, cybersecurity, and digital innovation. These sessions also highlight the industry's collaborative spirit, emphasizing the importance of knowledge-sharing and partnerships. The survey outcomes will contribute to a comprehensive understanding of the challenges and opportunities shaping the IT landscape in Pakistan. The individual insights provided by each company representative are summarized below.

A.1.1 GlowLogix

Glowlogix, a small-sized IT company established in 2014 with a workforce of 30 employees spanning both technical and non-technical domains, primarily focuses on website development and HR-related software. Presently, the company specializes in attendance modules, though it faces limitations by not extending its capabilities to check-in and check-out systems. Furthermore, Glowlogix has yet to introduce an AI-based recruitment system, such as CV-parsing.

Despite not receiving government incentives, Glowlogix reports satisfactory achievements in meeting its targets. Looking ahead, the company demonstrates a commitment to staying abreast of new trends and market perspectives, evident in its outlined 5-year plan. However, the company identifies a lack of skills in academia and proposes a revision of academic programs to address this issue.

Glowlogix recommends making internships a mandatory component of degree programs and calls for government support to facilitate easy internships with stipends. Beyond education, the company envisions post-graduation platforms where fresh graduates can align themselves with market trends and actively implement theoretical concepts acquired during their academic journey.

A.1.2 Thermalog

Thermalog, a company established in 2021 with a workforce of 5 employees, specializes in temperature monitoring systems for food safety in the Australian market, encompassing both IT and hardware solutions. Financially, each hardware device costs 4000/AUD, and recent sales indicate the purchase of 6 devices over the last two months.

The company faces workforce challenges, including a lack of professional grooming, minimal engagement with the industry, deficient basic coding skills, and a shortage of work ethics and time management abilities. To address these issues, Thermalog recommends educators and lab engineers possess knowledge and experience in the actual industry.

Thermalog highlights government support as crucial, advocating for allowances to hire PEC-certified engineers, concessions for startups like NSTP, and tax benefits on hardware imports by exempting custom duties. The company suggests monitoring hiring management in Pakistan and prioritizing professional experience over a Ph.D. degree in the hiring process.

In alignment with its 5-year plan, Thermalog plans to strengthen its sales team to boost overall sales. The company underscores the urgency for professional grooming, calling for business startup subsidies. Furthermore, Thermalog urges relaxation in freelancing market restrictions and proposes the inclusion of payment platforms like PayPal for international transactions.

A.1.3 KytherTek

KytherTek, established three years ago with a team comprising 3 technical and 2 non-technical employees, specializes in smart hardware development for industrial and home automation, prioritizing local products without a direct connection to dollar export. The company faces economic challenges such as payment difficulties for importing components and a prolonged export cycle.

Furthermore, KytherTek encounters local and socio-political instability, compounded by concerns about an aggressive taxation regime. Advocating for the deregulation of the IT sector to spur significant economic growth, the company notes a medium-level skill set in the industry. Recognizing the potential of new graduates as more aggressive and adept at self-learning, KytherTek emphasizes the need for a supportive policy framework for the IT sector, urging companies to operate with a reasonable level of freedom. Despite setting targets three years ago, KytherTek acknowledges that these goals have not been achieved.

Current IT sector trends include inbound work and dollarized projects, with KytherTek recognized as a proficient hardware design house involved in assembling and manufacturing at least two projects from abroad. In terms of recommendations, the company suggests a strategic focus on more in-depth studies over superficial measures and encourages decision-makers to adopt 2nd or 3rd order thinking for more effective outcomes.

A.1.4 Zaheen Systems

Zaheen Systems, founded three years ago, specializes in AI model training and machine learning. The company faces financial challenges, citing issues with funding. Despite acknowledging AI opportunities, Zaheen Systems notes a significant gap in AI-specific training from universities. In response, the company advocates for government support and underscores the importance of curriculum development with a practical focus. Zaheen Systems also outlines its future plans and initiatives in collaboration with educational institutions. Currently, the company receives limited support from NUST.

Looking ahead, Zaheen Systems envisions a 5-year plan involving product export. The company emphasizes collaboration with universities, urging a practical equipment focus in educational programs and a consistent syllabus with free education. Notably, Zaheen Systems observes the absence of a comprehensive government plan for the short-term, mid-term, and long-term.

A.1.5 Al-Basirr Technologies

Al-Basirr Technologies, a mobile application development company with a workforce of 15-20 employees, primarily serves clients in England's small industry sector. The company faces challenges related to an underdeveloped work environment and reported issues within its employee-to-employee culture. Financial concerns, including an increased burden and decreased salaries, are noted. Despite achieving 70-80% of set targets, Al-Basirr Technologies identifies a lack of collaboration for students and emphasizes the need for government support, particularly in the form of NSTP-type opportunities.

Additionally, the company recommends providing advantages for startups to encourage growth. Notably, Al-Basirr Technologies observes a general lack of government support for incubation centers, leading to the closure of many such facilities. In conclusion, the company advocates for an increase in the number of NSTP-type technology centers for enhanced support within the sector.

A.1.6 WarisTech

Established in 2012, WarisTech, a small-medium-sized company with 15 employees, specializes in providing web development, mobile development, and optimization services to off-shore clients. The company faces financial challenges, including payment issues and difficulties with payment gateway implementation in the banking sector. Notably, there is a limitation on holding funds in USD, leading companies to keep remittances in foreign countries. WarisTech observes an opportunity for automation, hindered by the current low buying power.

Despite a significant increase in internet content over the last 4-5 years, students are deemed ready for industry-level work at their graduation level, and the current university curriculum is considered suitable for servicing purposes. Looking forward, WarisTech explores avenues like product development in its 5-year plan. The company recommends improvements in the banking sector, advocating for a free hand on remittances and dollars in the account.

A.1.7 ByteEvo

Founded in 2014, ByteEvo is a small-sized IT company specializing in touch-screen product software, particularly embedded Android solutions designed for the health and fitness industry. With a workforce of 7 technical employees, the company operates on an export-focused business model. ByteEvo faces challenges, including customs issues related to equipment import and a lack of supportive infrastructure for gyms in Pakistan.

In terms of technical skills, the company requires expertise in Android and IOS development, C++, Java, web development, and React skills, including React Native. The economic landscape influences ByteEvo, as the prevailing situation prompts good talent to prefer opportunities abroad. While recognizing the quality of graduates from renowned institutions like FAST and NUST, ByteEvo expresses concerns about the lack of a positive space for graduates from other universities.

Looking ahead, ByteEvo outlines a 5-year plan to expand its operations by focusing on mobile app development. The company provides recommendations for curriculum development, addressing interpersonal skills, and encouraging practical experience.

A.1.8 Rapix

Rapix, a multifaceted IT company, strategically focuses on three key verticals: hardware R&D, AI-based software R&D, and renewable energy. The company operates primarily in software exporting, targeting markets in the Middle East, including Saudi Arabia, Oman, and Muscat. However, Rapix faces challenges in hardware import, particularly issues related to taxes, with a notable observation that the predominant focus is on IT, with little attention given to hardware aspects. Despite this, Rapix identifies promising opportunities in top-notch sectors such as AI and cybersecurity. The company advocates for the teaching of relevant skills at the university level, emphasizing the need for a revision of the outdated curriculum to meet market demands.

While Rapix acknowledges commendable government support for the IT industry, exemplified by initiatives like the P@SHA awards, it notes a significant gap in support for hardware production houses. Rapix attributes its success to strategic talent acquisition and hiring individuals with the right skills for the company's diverse operations. In terms of market trends, Rapix identifies AI and blockchain as dominant forces.

A.1.9 XYLEXA

Established five years ago, XYLEXA stands as an AI product-based company specializing in medical products, with a workforce ranging from 10 to 12 employees. Focused on early disease detection, particularly in breast and chest cancer, and blockages in arteries, XYLEXA's products aim to facilitate early-stage diagnosis, supporting doctors and radiologists in their work. However, the company has faced a significant challenge in involving doctors, who harbor skepticism about AI tools potentially replacing their roles in the medical field. In terms of workforce expectations, XYLEXA looks for basic knowledge of Python and machine learning from fresh graduates, recognizing that while universities contribute to making graduates market-ready, there exists a notable gap between theoretical understanding and practical implementation skills.

Despite the innovative strides made by XYLEXA, the company notes insufficient government support, particularly in terms of establishing IT parks. Looking towards the future, XYLEXA outlines a 5-year plan to export its medical products to the US market, demonstrating a commitment to expanding its global presence.

A.1.10 Rapidev

Rapidev, operating as a conglomerate with three primary verticals—software development, defense R&D, and commercial R&D specializing in energy-efficient products—stands at the forefront of AI and ML-based products. With a clientele extending across Pakistan, Asian countries, Gulf countries, and the Middle East, the company boasts a workforce of 170, covering both technical and non-technical roles. Recognizing the future as AI-driven, Rapidev underscores the necessity to equip students with AI expertise, notably highlighting the scarcity of specialists, especially in computer vision and satellite image processing, within Pakistan.

The company addresses the substantial gap between academic curricula and industry demands, proposing collaboration between university representatives and industry professionals during course content development. Rapidev advocates for enhanced facilitation for SMEs and private industries, urging the government to provide certifications and courses. With ambitious growth plans

aiming for a tenfold expansion in the next three years, Rapidev attributes its success to a well-trained human capital and suggests the government's involvement in developing the Human Development Index (HDI).

The company further emphasizes the need for an entrepreneurial culture, startup support, and reduction of tax compulsions. Proposing the establishment of technology parks in major cities, Rapidev envisions a privatization strategy for these hubs to bolster the IT landscape in Pakistan.

A.1.11 Global Tech Consulting

Global Tech Consulting, a web development company with a workforce consisting of 7 technical and 3 non-technical members, has been operating for 5 years and is characterized as a small-sized entity, generating a monthly revenue ranging from \$3000 to \$5000. Specializing in web development, the company faces challenges in acquiring sales and securing larger value projects. Despite operating in the IT industry in Pakistan, the company perceives limited opportunities in the broader sector.

Concerns are raised about the average skill levels of the workforce, particularly emphasizing the widespread lack of work ethics and dedication. While recognizing exceptions from a few universities, the company advocates for better education and training resources, especially in lucrative areas like AI. Regarding government involvement, Global Tech Consulting calls for minimal intervention, suggesting that the government's role should focus on ensuring an increased number of IT graduates and facilitating the industry to attract foreign currency. The assessment of Pakistan's technology infrastructure is described as average, and the company attributes its success factors to personal connections.

Looking forward, Global Tech Consulting expresses an intention to explore areas like AI and ML. The overall sentiment towards government involvement is cautious, emphasizing the importance of allowing the IT sector to grow naturally with limited macro-level policies aimed at improving educational resources and infrastructure.

A.1.12 Data Pilot

Data Pilot, a small-sized IT company specializing in data science projects, has been operating for three years, primarily offering software services. The company recommends a strategic shift for the IT industry, proposing a focus on building software 'products' alongside traditional service provision. In terms of educational emphasis, Data Pilot suggests prioritizing tools over fundamental subjects like compiler construction in IT education. While assessing university contributions, the company notes a partial fulfillment of the required skill set and expertise. Government intervention is sought with a call for increased salary packages for hands-on trainers and addressing infrastructure concerns such as reliable internet connectivity and low electricity costs.

The success of Data Pilot is attributed to targeting the latest technologies. The company identifies current trends in the global IT market, emphasizing the significance of investments in AI, Big Data, VR, and Security for export success by Pakistani IT companies. Additionally, recommendations include facilitating the export of technical human resources with the anticipation of valuable exposure upon their return. The study also advocates for the establishment of a freelance platform for Pakistan, drawing parallels with platforms like Upwork.

A.1.13 Amazon Seller Society

Amazon Seller Society, a specialized firm in PPC and Amazon Account Management operating in the Middle East, primarily in the UAE, provides crucial support and full account management for individuals and companies engaged in selling on Amazon in the region. Notably, the company highlights minimal domestic issues in its UAE base. However, it identifies challenges within the industry, specifically noting a lack of professionalism and dedication.

Additionally, there is an observed gap between industry requirements and academic offerings, signaling a need for improved alignment. The company commends past government initiatives to enhance connectivity in public places and underscores the overall affordability of connectivity. Recognizing the trends in the global IT market, the Amazon Seller Society advocates for a strategic shift, encouraging the industry to leapfrog traditional paths and embrace futuristic technologies, particularly AI and its sub-branches, to gain a competitive advantage on a global scale.

Riding the E-commerce and Amazon wave, the company anticipates growth in tandem with the expanding market. Moreover, it emphasizes the importance of connecting academia with the industry and proposes a focus on international tech collaborations as vital strategies to bridge existing gaps.

A.1.14 The Creative Street

Creative Street, an IT company with a workforce comprising 10 technical and 10 non-technical employees, has been in operation for two years, focusing on digital marketing and Shopify web development within the small-sized company. Specializing in offering home organization products through E-commerce platforms, the company encounters challenges related to exchange rates and awareness but identifies significant opportunities in the E-commerce sector.

Skill development within the company is predominantly self-taught, reflecting the absence of mentorship on a national scale. The assessment of universities providing necessary skills and expertise is considered minimal. Infrastructure challenges include poor internet connectivity, high costs, load shedding, and expensive video conferencing subscriptions. The success of The Creative Street is attributed to following international trends and leveraging digital marketing through influencers. Over the next five years, the company envisions transforming into a large-scale agency and actively contributing to spreading awareness about online work, freelancing, and remote job opportunities. Additionally, the Creative Street recommends the establishment of E-commerce Academies and the introduction of courses to address skill gaps within the industry.

A.1.15 Safasha Business Solutions

Safasha Business Solutions, an IT and Management Consultancy service with over four years of operational experience and a team of over 25 members specializes in the development of ERP and accounting applications. The company focuses on implementing customized ERP solutions locally and abroad, specifically in the off-the-shelf and customized ERP solutions domain. Challenges faced include issues with client requirements, financial effort falling short of the given scope, team switching, payment delays, and staff availability.

In global markets, Safasha Business Solutions identifies opportunities in AI, ML, Data Analytics, Open Cart, ERP, and RPA. The company advocates for certifications in emerging technologies at the

university and college levels, addressing the absence of practical-based training institutes for graduates. However, it expresses dissatisfaction with the skill set provided by universities. The company recommends government support through the development of IT centers, tax exemptions, and stipend payments for software houses hiring fresh candidates. Infrastructure challenges, encompassing connectivity, bandwidth, uncertain electricity availability, and high internet rates, prompt recommendations for low-cost internet, a national cloud infrastructure, and allied facilities.

Success factors include a focus on digital transformation, cloud infrastructure, and engagement in emerging technologies. Future strategies involve global expansion through either direct investments or partnerships with foreign entities, with a call for government support in company incorporation and investment protection. The company emphasizes the importance of partnerships with established brands and a focus on emerging technologies for future growth. Recommendations center around IT centers, cloud infrastructure, internet facilities, data security, investment protection, tax benefits, support for small entities, exemptions for small IT sectors, and comprehensive government support for international market entry.

A.1.16 NetSol Technologies Limited

NetSol Technologies, a global information technology company with nearly 28 years of industry experience and a workforce of 1700 resources, is dedicated to providing IT solutions and services to the financial and leasing sectors worldwide. The company highlights challenges in expanding its IT/software exports, citing concerns about stability within Pakistan and global geopolitical uncertainties, particularly involving China and the USA.

Key opportunities for the IT industry in Pakistan, as identified by NetSol, include professional services, managed services, AWS, and system maintenance. The company acknowledges the high quality of coding and problem-solving resources in Pakistan but identifies areas for improvement in terms of maturity, reliability, and professionalism within the local talent pool. NetSol Technologies suggests that universities are falling short in equipping students with the necessary skill set, leading proficient individuals to seek additional skills from online learning platforms.

The company recommends government support in increasing funding to universities for producing more graduates and allocating resources to research for achieving vertical growth. NetSol Technologies attributes its success to tax benefits and the availability of good and affordable resources in the market. Current trends in the global IT market, according to the company, include Artificial Intelligence, data sciences, machine learning, and low code / no code. In terms of government initiatives, Netsol Technologies emphasizes the need for efforts to increase the number of graduates and, if given ministerial powers, would focus on stabilizing the environment, enhancing security, facilitating international travel, and creating a foreign-friendly working environment.

The representative provided insights into Netsol Technologies' perspectives on challenges, opportunities, talent pool assessment, success factors, global IT trends, and government recommendations.

A.1.17 Empathise

Empathise, specializing in e-commerce tool development, has outlined several challenges in its survey responses. The company faces issues related to payments, encompassing payment processing

challenges, difficulties in creating payment accounts, issues with bank accounts, and challenges with the payment gateway itself. These challenges collectively impact the smooth functioning of the e-commerce tools developed by Empathise. The intricacies involved in payment-related processes, account creation, and payment gateways are critical aspects that the company is currently addressing to enhance the efficiency and effectiveness of its e-commerce solutions.

Appendix B

Unleashing the Potential of Pakistan's IT Industry: Building for Massive Software Export Growth

Approximate time for completing this survey: 10 minutes

This funded project aims to present an official report that will be presented to the Government of Pakistan via the PIDE platform. The primary objective is to identify key challenges and provide policy recommendations aimed at enhancing the IT sector in Pakistan.

1. Organization Name?
2. Representative Name?
3. Representative Contact Information (Email and/or Phone)?
4. Can you please describe your position and role within the company?
5. Can you provide a brief overview of your company? Number of employees (technical and non-technical), years in operation, and key areas of expertise within the IT sector)?
6. What is your company's current level of involvement in exports, both in terms of products and services? (Dollar value/range or small/medium/large category)
7. What is your specific area of focus in exports?
8. What challenges does your company currently face in expanding its IT/software exports, both within Pakistan and internationally?
9. In your opinion, what are the key opportunities for the IT industry in Pakistan to achieve significant export growth?
10. How would you describe the skill sets of the IT workforce in Pakistan, and what steps could be taken to enhance these skills for better global competitiveness?
11. Are there specific skill gaps or areas of improvement that you have identified within the local IT talent pool?
12. Do you think universities are providing the skill set and expertise to their graduates that are essential requirements in today's IT industry?
13. Do you believe the government is providing sufficient support to the IT industry? If not, what role do you think government policies play in supporting the growth of the IT industry in Pakistan?
14. How would you rate the existing technology infrastructure in Pakistan for supporting software development and export activities? (connectivity, bandwidth, energy cost, dependability etc.)?
15. What are the major factors that have contributed to the success of your company?
16. In your opinion, what are the current trends in the global IT market, and how can Pakistani IT companies align with these trends for export success?
17. How do you see your company evolving/growing in the next 5 years?

18. What are your brief recommendations for the government and policymakers that can contribute to the growth of the IT sector in Pakistan?
19. If you are made the minister of Pakistan's, IT sector and have full support from all the pillars of the state. What key measures would you like to take for the IT sector?