Assessing the Demand for Skill-based Education in Pakistan: Insights from Google Trends Data

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Abstract

This paper looks at the demand for skills training in Pakistan and uses Google Trends to estimate public interest in vocational training. Over 60% of Pakistan's population is believed to be under the age of 30, and faced with substantial youth unemployment, there are legitimate calls for well-planned skills-building programs. Notwithstanding the demand, Pakistan's TVET system is still in its infancy, as indicated by low participation rates. With digital platforms, and particularly search engine data, there's a new way to "see" demand. The discoveries illustrate an increase in public interest in upskilling, particularly in the IT and healthcare sectors, following 2020, a period parallel to the global surge in digital learning and remote work. But there are regional differences in search, with urban areas and those with deeper internet penetration much more engaged than rural areas. This study finds an escalation in cyber-search interest alongside a decrease in official enrollment, suggesting a need for targeted support to gain access to and enhance vocational education, especially in poor areas. Policymakers and educators can use the findings to develop more efficient skill-based education packages that meet Pakistan's evolving labor-market needs.

Keywords: Vocational Education, Skill Development, Google Trends, Youth Unemployment, Pakistan

1. Introduction

Pakistan has to figure out how to leverage its growing young population as a demographic dividend. With over 60% of its current population under 30 and a youth unemployment rate of 11-13%, there has not been a better time when the skills shortage has been more urgent (Ali, 2023). But the country's formal TVET system is weak, with fewer than 6% of the young population enrolled in technical training (Altaf et al., 2024). This low enrollment in TVETs reflects a continuing skills deficit, leaving many young people untrained and unable to meet the demands of the labor force (Powell, Muronda, & Tini, 2024). It is therefore important to understand the demand for a skilling-led education and how it's changing, especially in light of emerging global challenges such as technological advances, COVID-19, and evolving economic requirements that are redefining the world of work (Kaushik, 2020).

Digital trace data, such as search engine monitoring, is a promising approach for gaining insight into public interest across different educational paths (Hakimi, Eynon, & Murphy, 2021). Internet penetration in Pakistan has increased in the past few years, and online searching is becoming a tool for people seeking educational opportunities, such as skill-based training (Rafiq-uz-Zaman & Nadeem, 2024). Monitoring search trends can help us understand whether interest in vocational training is growing, leveling off, or decreasing (Ullah, Ullah, & Manirahari, 2025). Although digital platforms such as Google Trends have been used to explore people's interests across different areas of education worldwide, little research has been conducted in the Pakistani context, especially in vocational education (Ullah, Sikandar, Jihad, & Maaz, n.d.). This research, therefore, seeks to bridge this gap by exploring the demand for skill-based education in Pakistan using Google Trends data (Ullah, Ullah, & Manirahari, 2025). The study aims to assess whether interest in learning a trade is on the rise or decline, and what other measures of thinking about education and the economy in the country at large are. The results are anticipated to have important implications for policymakers, educators, and industry in Pakistan regarding the development of skill-based education, which is more closely aligned with the changing requirements of the Pakistani workforce (Rafiq-uz-Zaman & Nadeem, 2025).

2. Literature Review

2.1. Vocational and Skill-based Education in Pakistan

The role of technical and vocational education and training (TVET) in Pakistan has been recognized as a priority to curb youth unemployment and provide avenues to productive employment. For example, Nooruddin (2017) study found that Pakistan's formal TVET system remains underdeveloped and

suffers from structural problems, including mismatches between demand and supply, poor governance traditions, and weak quality control. A more recent study by Ashraf, Xu, and Xiang (2024) highlighted that, despite policy documents and institutional structures mushrooming over the last 20 years, major challenges remain, including infrastructure deficiencies, gender disparities, and instructional quality issues. Furthermore, a review of skill development in Pakistan during 2015–24 that synthesized findings suggested that the "brand equity" of vocational training was low and public perception poor, with demand for such programs limited (Alam, Reza, Ogawa, & Ahsan, 2024).

Regarding the participation factor, a PSLM-based study found that demographic characteristics, such as age, sex, and urban-rural residence, affect TVE demand in Pakistan (Khan & Ali, 2024). But the demand is still low on a micro level in terms of those opportunities compared to, as we all know, the need that's out there." Moreover, while gaps and needs are identified by available skill-based education options, there are issues in accessing them.

2.2. Demand‑Side Perspectives and Public Interest

A better way to understand demand for skill-based education is to move beyond typical metrics like enrollment and instead get into the minds of prospective students as they consider, seek, or begin training. Pakistan's demand for TVET is typically weak, and therefore it is novel and useful to identify how the public interacts with these vocational offerings in digital media (e.g., online searches). Public indifference to skills training. The existing low demand for TVET has been identified as a significant challenge in Pakistan's TVET system, according to the International Labour Organization (ILO)'s "State of Skills" (International Labour Organization, 2022). Although the pressure on governments is starting to be felt, we have barely scratched the surface of this demand-driven trend: online interest in skill-building.

2.3. Use of Google Trends and Digital Trace Data in Education Research

Over the past decade, digital trace data, specifically, real-time search query data from tools such as Google Trends, has emerged as a promising approach for tracking public interest and behavioral signals. Arslan, Tiwari, and Piech (2020) have provided support for the utility of Google Trends data in capturing global trends in informal learning, suggesting that search activity can supplement traditional educational metrics with a timelier indicator of what is attracting public attention. However, as Rayhan (2024) indicates, although digital trace data offers a new way to examine demand, it also raises methodological issues, e.g., sample variability, normalization complexities, and the absence of demographic information.

In education, Google Trends has been employed to monitor interest, especially in online education, in the context of COVID-19. These works report significant changes in search interest, including increased public involvement in digital learning (Tan, Zhang, & Teng, 2024). However, regarding the Pakistani vocational education system, no research has utilized Google Trends data to estimate public interest in this type of education, making this study innovative in identifying potential demand for skill-based education through digital search behavior.

2.4. Identified Research Gaps

Several gaps in the literature can be identified:

• The greater part of vocational/skill-based education in Pakistan is also supply-side research-oriented on policy, governance, and infrastructure-related issues rather than the demand-side factors such as interest and public demand.

• Researchers have not sufficiently mitigated methodological limitations in employing Google Trends data (e.g., digital access bias and search term ambiguities) for the context of TVET in Pakistan.

2.5. Contribution of the Study

This research aims to fill this gap by using Google Trends data to measure public interest in skill-based education in Pakistan. By focusing on the demand side, we expect this study to make a valuable contribution to our understanding of how interest in VET and training needs are changing over time and to offer a complementary perspective, distinct from previous studies that relied mainly on enrollment data. The results of this study will add to the body of knowledge and provide an agenda for policymakers, educators, and industry concerning rapidly changing patterns in public interest and increasing demand for more focused vocational education programs in Pakistan.

3. Methodology

The paper uses Google Trends data to examine public interest in vocational and skills-based education in Pakistan (Mavragani, Ochoa, & Tsagarakis, 2018; Rizwan & Sohail, 2024). We collected data on all dates since January 2015. We will continue collecting until the provided end date of October 2025, using keywords related to vocational training, such as "vocational training Pakistan," "skill development Pakistan," and specific terms like "IT skills training Pakistan." The data were pulled from Pakistan and adjusted for search volume, allowing trends of interest across different keywords to be

compared. Underlying impulses in the data were mitigated using a 3-month moving average, and outliers that could skew the results were removed.

The time series analysis was conducted to depict trends in public concern throughout the 10-year period. We performed linear regression to estimate trend slopes for each search term and assess whether interest in skill-based education was increasing or decreasing. In addition, comparison results were reported between non-profile-specific and profile-specific skills-based terms, with external data such as enrollments and labor-market demand. The analysis of regional variation in internet searches holds the potential to shed light on localized patterns of demand for vocational education. Several limitations of this study should be noted: it may be subject to the digital divide, and there is a basic discordance between search interest and actual enrollment or participation in training courses.

4. Results

The Google Trends analysis reveals interest in skilled/vocational education in Pakistan from January 2015 to October 2025. The findings are consolidated a) in generic search trends and b) by different occupational skills, as well as c) regional differences in interest item searches. The table and figures below summarize the results.

4.1. Overall Trends in Interest in Skill-based Education

The analysis of Google Trends shows that, in general, interest in skill-based education in Pakistan has grown, especially since 2020. This increase in search activity largely aligns with the global shift towards digital learning, intensified by the COVID-19 pandemic. Following the rise in searches for terms like 'vocational training Pakistan' and 'skill development Pakistan,' it is evident that searches for these terms have risen dramatically due to the growing demand for skills, including IT and technical training.
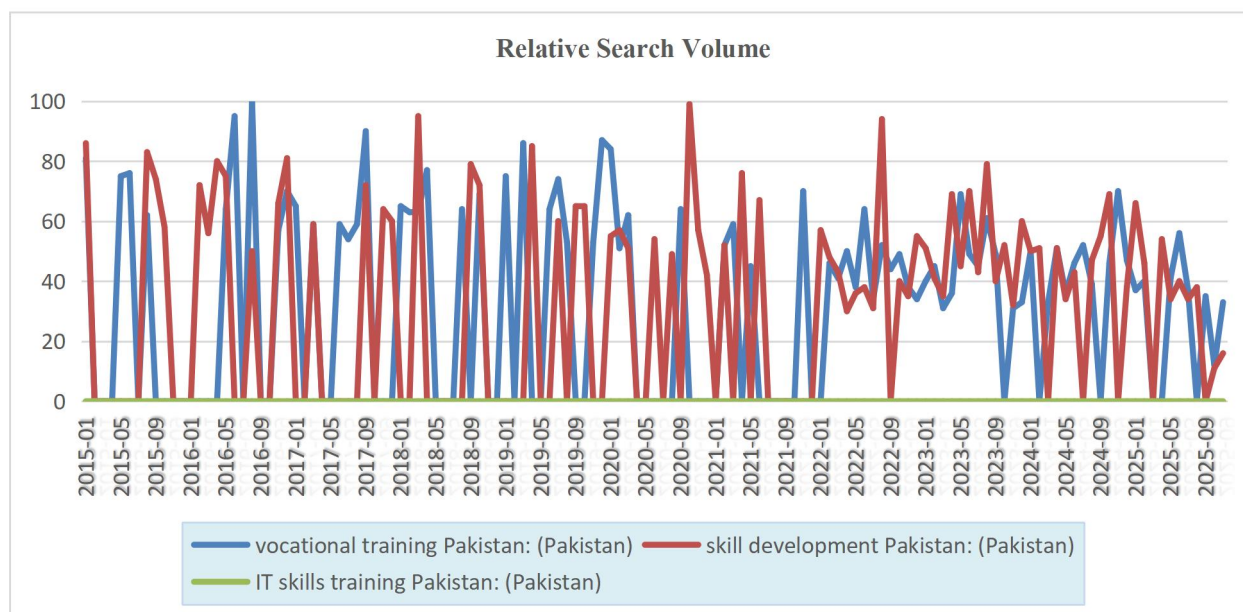
Graph 1: Time-series Trend of Skill-based Education in Pakistan

Graph 1 displays the overall trend for the search term "vocational training Pakistan" from 2015 to 2025. The graph illustrates a steady increase in search interest, with noticeable peaks during 2020-2022, reflecting the global shift toward online and skill-based learning. The 3-month moving average smooths seasonal fluctuations, revealing the long-term growth in public interest.

2. Interest in Specific Vocational Skills

After further analysis, it can be seen that other skill groups have experienced higher positive search interest rates than others. It is important to note that IT skills training has the highest search volume especially after 2020. The medical field has not been left behind either; this is particularly because of the ongoing global health crisis.

Table 1: Search Terms and Increasing Search Volume for Skill-based Education in Pakistan

Search Term	2015-2020 Trend	2020-2025 Trend	Peak Search Period	Observations
Vocational Training Pakistan	Moderate increase	Significant rise	Post-2020 (COVID-19)	Strong correlation with global shifts towards skill development.
Skill Development Pakistan	Steady growth	Accelerated increase	2021-2022	Driven by increased online learning options and digital skills.
IT Skills Training Pakistan	Gradual increase	Sharp increase	2020-2022	Surge during digital transformation and remote work boom.

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Healthcare Training Pakistan	Slow increase	Steady rise	2020-2025	Impacted by the COVID-19 pandemic, increasing health sector demand.
Coding Training Pakistan	Low interest	Rapid growth	2020-2022	Reflects increased focus on programming and tech skills.
Construction Skills Pakistan	Minimal increase	Gradual increase	2019-2021	Increasing interest, especially in urban and industrial areas.

**3. Regional Variations in Demand for Vocational Education**

Regional analysis reveals differences in search interest across Pakistan's provinces. The highest search volumes are observed in cities such as Karachi, Lahore, and Islamabad, which could be attributed to the fact that internet connectivity and knowledge of vocational training programs are more widespread there. On the one hand, the interest in rural areas, especially in Sindh and Balochistan, is relatively lower, which can be explained by factors such as limited internet access and limited exposure to skill development programs.
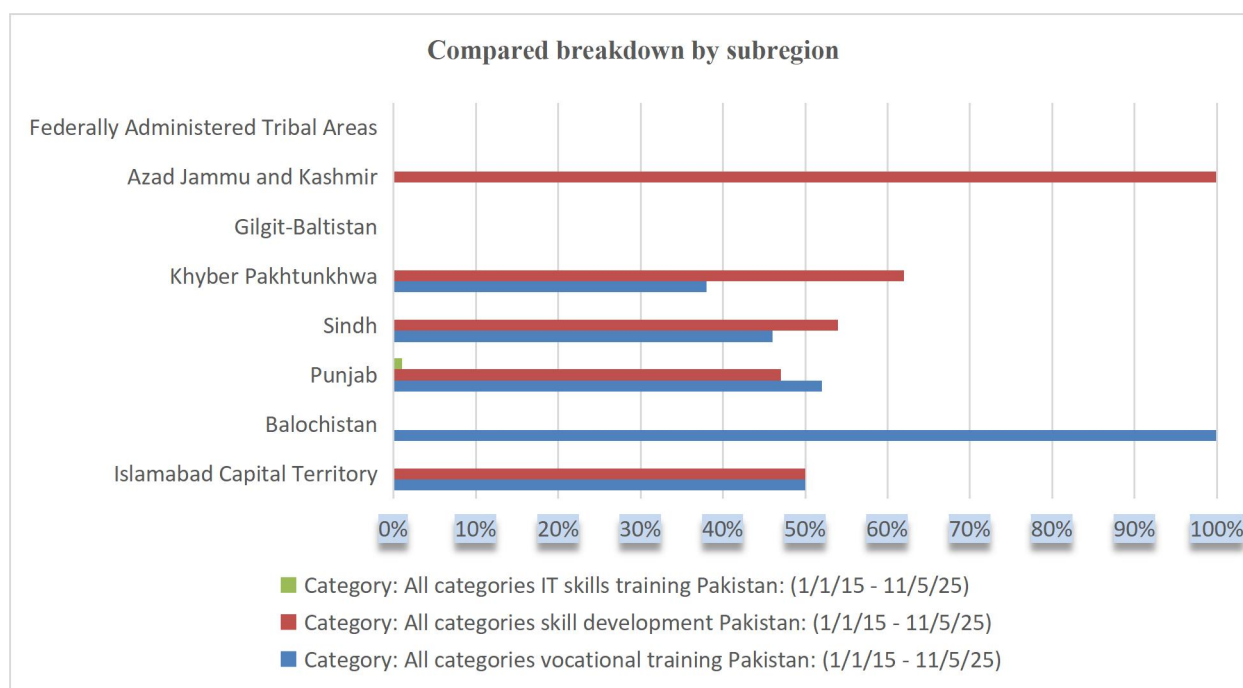
Graph 2,3: Regional Comparison of Search Interest for Vocational Training

Compared breakdown by subregion — Google Trends

● vocational training Pakistan   ● skill development Pakistan
● IT skills training Pakistan
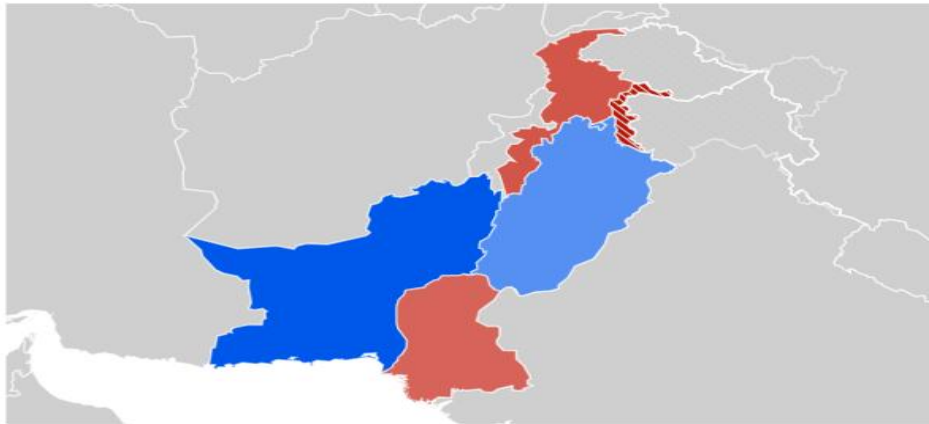
Graphs 2 and 3 compares the search volumes for "vocational training" across major regions of Pakistan (Karachi, Lahore, Islamabad, Sindh, and Balochistan). The graph shows that Karachi and Lahore have significantly higher search interest, reflecting urban demand for skill development programs. In contrast, Balochistan and Sindh have comparatively lower search volumes, indicating regional disparities in interest.

Discussion

The findings of this research highlight that interest in vocational and skills-based education in Pakistan has grown among the population; this is confirmed by the increased number of search results for terms related to skills development (especially after the COVID-19 pandemic). The rise in online search traffic, especially for IT skills, reflects a broader global shift toward distance education and telecommuting, which has heightened the urgency of technological skills. The latter trend aligns with international research that emphasizes a shift towards online education and skill development, particularly in response to economic disruption (Webb, McQuaid, & Webster, 2021; Zhang, Carter Jr, Qian, Yang, Rujimora, & Wen, 2022). Nevertheless, even with the above positive developments, the decision to pursue formal vocational education and training (TVET) remains low, indicating a significant disparity between popular interest and actual participation. Such disjunction may be explained by several obstacles, such as limited access to high-quality training services, particularly in rural areas where infrastructure and internet connectivity are often insufficient (Synowiec, 2021).

The regional inequalities reported in this paper only make it more difficult to develop skills in Pakistan. Cities such as Karachi, Lahore, and Islamabad are much more interested in vocational training due to greater internet access and a stronger sense of educational opportunities. Conversely, rural regions, including Balochistan and Sindh, have significantly lower search interest, which aligns with earlier studies that show rural Pakistan continues to struggle with access to the digital realm and exposure to

vocational training (Ali, Rahman, & Karsidi, 2024). These results indicate that although demand for vocational skills is increasing, urgent action is needed to reduce regional disparities and improve access to online courses, especially in underserved regions. This gap should be bridged by policymakers through specific interventions that ensure rural people are not left behind in the digital revolution of skills.

The research makes a vital contribution to the literature by using Google Trends data to evaluate public interest in vocational education in Pakistan, a region that has not been extensively examined in previous studies (Rehman, Huang, Sarwar, Fatima, & Maqbool, 2024). This study provides a more up-to-date, granular perspective on public interest, via demand-side variables such as search behaviour, than conventional enrolment data. Further studies are imperative to build on these findings and examine the factors behind online curiosity in vocational training, as well as how digital media can be used to boost interest in skill development programs (Zafar & Aleem, 2023). Since the relevance of vocational education has become an important factor in overcoming youth unemployment, particularly in the face of an increasingly digital economy, the results of this research would be extremely helpful in shaping educational policy and enhancing the efficiency of skills-based education programs in Pakistan (Rashid, Fatima, Iftikhar, Usman, & Raza, 2025).

Conclusion

this report makes a significant contribution to the existing knowledge on the changing demand of vocational and skills based education in Pakistan, which is a nation with serious issues of youth unemployment and skills gap. Based on Google Trends data, the given research provides a fresh insight into the increased interest of people in skill development, especially regarding the global changes of the COVID-19 pandemic and the rise in the use of digital technologies. The results demonstrate a significant growth in search activities, particularly in IT and healthcare-related skills, which can have a change in the way the population interacts with vocational training. Nevertheless, the research also highlights the ongoing struggles especially the regional differences in interest and availability to quality training as urban areas exhibit high rates of engagement than the rural areas.

Such a gap between the increasing interest online and the low formal registration of TVET programs indicates that specific actions are needed to close the gap between the demand and the actual involvement. Strategies to enhance digital access and awareness, particularly in underserved areas, should be emphasized by policymakers and other educational stakeholders to provide equal opportunities to all groups of the Pakistan population. In the end, the conclusion indicates that although there is an increase in the demand of skill-based education, there should be an attempt to

transform this interest into actual educational outputs. Further studies can be conducted on the role in which digital platforms can further promote skill building so that the expanding labor force in Pakistan can be trained on the skills required to succeed in a fast-evolving economy.

Author Contributions

Conceptualization, S.U. and A.U.; Methodology, S.U.; Data curation and analysis, S.U.; Visualization, S.U.; Writing – original draft preparation, S.U.; Writing – review and editing, A.U. and M.Z.; Supervision, A.U.; Project administration, M.Z.
All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement

Not applicable. The study did not involve humans or animals.

Informed Consent Statement

Not applicable. No human participants were involved in this study.

Data Availability Statement

The data used in this study were obtained from **Google Trends** (https://trends.google.com), publicly accessible at no cost. Processed data supporting the findings are available from the corresponding author upon reasonable request.

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