

Research Article

EVALUATING THE IMPACT OF TECHNICAL SKILLS ON THE EMPLOYABILITY OF GRADUATES FROM THE NATIONAL UNIVERSITY OF SKILLS

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KEYWORDS

Technical Skills, Soft Skills, Employability, Vocational Education, Human Capital

ARTICLE HISTORY

Received Date: 26/04/2026

Revised Date: 30/04/2026

Accepted Date: 15/05/2026

Published Date: 30/05/2026

DOI: 10.69557/ujrra.v5i2.282

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ABSTRACT

The present study aims to examine the role of technical, soft, and digital skills in enhancing the employability of graduates from the National University of Skills. Utilizing a mixed methods approach and path analysis, both quantitative and qualitative data were collected and analyzed from graduates and employers. The results revealed that all three skill types significantly influence hiring opportunities and job sustainability, with soft skills playing the most pivotal role in adaptability to the workplace and professional growth. This finding aligns with human capital theory and the skill complementarity model. Qualitative analysis further indicated that weaknesses in communication, emotional regulation, and interview skills are among the primary factors hindering graduates' successful labor market integration. Correlation analysis showed positive relationships between technical, soft, and digital skills, suggesting synergistic learning potential among them. These findings are consistent with international studies, such as Barrera-Osorio & Kugler (2021) and Kuregyan & Khusainova (2022), which emphasize the necessity of integrated training to develop employability competencies. The study recommends that universities shift their curriculum design from solely technical training toward hybrid education that emphasizes interpersonal skills, problem-solving, and digital literacy. In doing so, the gap between educational outputs and labor market demands can be narrowed, thereby significantly reducing unemployment rates among graduates.

INTRODUCTION

Technological and structural transformations in global labor markets, particularly in the last decade, have led to a redefinition of the requirements for human employment; in such a way that merely possessing a university degree is no longer a guarantee of stable employment, but rather a set of competencies and practical skills must also be developed in the individual. In this regard, the role of technical and vocational education, as one of the main tools for human capital development, has gained increasing importance. One of the serious concerns of educational systems, especially skill-based universities, is the extent to which the education provided aligns with the real needs of the labor market and enhances graduates' employability. Numerous studies have shown that the gap between what is taught in educational environments and what the labor market demands is, in many countries, a major reason for the high unemployment rate among graduates (Mariano & Tantoco, 2023). On the other hand, despite the quantitative growth of vocational education institutions such as the National University of Skills, challenges such as outdated educational content, limited industry engagement, and insufficient mechanisms for evaluating the effectiveness of skills training persist. Particularly in Iran's unstable economic conditions and competitive labor market, graduates require skills that include not only the ability to perform specialized tasks but also flexibility, problem-solving, and adaptability to technological change. Empirical evidence shows that, across countries, including South Korea, graduates who have participated in skill-based programs integrated with structured internships have a higher likelihood of entering the labor market (Kim et al., 2022). This clearly highlights the importance of designing comprehensive technical education structures; structures that, on one hand, strengthen hard technical skills and, on the other hand, provide opportunities for the development of soft skills and workplace experience. Within this framework, the National University of Skills, as a strategic institution in Iran's higher vocational education system, has the mission of training competent human resources aligned with market needs. However, the key question is whether the training provided by this university actually increases graduates' employability. Findings from empirical studies indicate that, despite technical skills training, the lack of integration among theoretical knowledge, practical work, and effective interaction with employers reduces the effectiveness of education (Meneses, 2023). In other words, although many graduates obtain skill certificates, their mental readiness and ability to adapt to real work environments are not sufficiently developed. Furthermore, evidence shows that improving the effectiveness of technical education requires the design of continuous evaluation mechanisms, curriculum revision based on market feedback, and strengthening university–industry collaboration infrastructure (Barrera-Orsorio & Kugler, 2021). Accordingly, the present study aims to assess the effectiveness of the skill-based training provided at the National University of Skills in enhancing graduates' employability. The main research question is: Are the technical skills acquired at the National University of Skills aligned with the actual requirements of the Iranian labor market, and do they increase graduates' employability? In response to this question, the present article seeks, from both theoretical and empirical perspectives, to clarify the concept of employability and related frameworks for skill evaluation, and to examine the relationship between technical skills and employability based on field data. This study is designed based on human capital theory and person–organization job fit theory. It aims to provide evidence-based findings to assist policymakers, educational managers, and the National University of Skills in

optimizing vocational education structures.

THEORETICAL FOUNDATIONS

In the research literature on employability, technical skills, and vocational training, key terms and concepts have been defined in various ways, and clarifying their meanings is a necessary prerequisite for understanding the conceptual framework of the present study. First, the concept of “technical skill” in the context of vocational education and work environments is defined as specialized abilities for executing specific job tasks; these skills generally include working with tools, equipment, software, and technical processes that are directly aligned with industry needs. For example, programming ability in industrial environments, working with PLC systems in electrical engineering, or industrial welding in heavy industries are all classified under technical skills. These skills are mainly strengthened through practical training and field experience and are characterized by measurability. In many educational systems, especially in technical and vocational education, a major part of the curriculum is dedicated to developing such skills, as they are directly related to employability (Bosire & Kitainge, 2020). The concept of “employability” is among those that have attracted considerable attention in recent decades, particularly in higher education and labor market literature. In the simplest definition, employability refers to an individual’s ability to obtain, maintain, and advance in a job position in the labor market. This ability is not only dependent on technical and specialized skills but also encompasses soft skills, lifelong learning, adaptability to environmental changes, and professional behaviors. Employability is a dynamic, context-based concept influenced by individual factors (such as personality, motivation, and experience), organizational factors (such as employer needs and workplace culture), and institutional factors (such as economic and social policies). According to recent findings, graduates of vocational training programs who have their technical skills aligned with real labor market needs have higher employability rates (Bhatt et al., 2024). The concept of “vocational education” refers to a set of learning activities aimed at equipping learners with practical, applied, and job-related skills. Vocational education can be delivered through short-term courses, technical and vocational training centers, or skill-based university programs, such as the National University of Skills. The distinguishing feature of vocational education lies in its focus on “learning by doing” and “work-based learning.” In modern educational systems, vocational education is not limited to the transfer of technical skills; it also develops soft skills, problem-solving abilities, effective communication, and professional responsibility. Various studies indicate that systems that align their vocational education with real labor market information have been more successful in improving employability (Stephen, 2023). Within the theoretical framework of this study, two major theories are used: human capital theory and skills mismatch theory. Human capital theory, rooted in the works of Becker, Schultz, and Mincer, argues that investment in education—especially specialized education—leads to increased productivity and individual income. According to this theory, vocational education is an economic investment whose initial costs (time, energy, financial resources) are offset in the long term by increased income and job opportunities. In other words, acquired technical skills are intangible capital with market value. In labor market conditions where specific expertise is required, individuals with vocational training have a competitive advantage. Recent studies in the Philippines and Colombia show that graduates of vocational training programs have greater employment

opportunities and higher incomes than those without such training (Vandenberg & Laranjo, 2020; Barrera-Osorio & Kugler, 2020). On the other hand, the skills-mismatch theory, with a critical approach, emphasizes the gap between the skills available in the workforce and those required by the labor market. According to this theory, unemployment among vocational graduates does not necessarily indicate a lack of skills, but rather results from a mismatch between the type, level, and quality of the skills acquired and the real market needs. This mismatch can be horizontal (lack of alignment across fields or specialties) or vertical (lack of alignment across levels or skill depths). Research has shown that, in many countries, including India and Tanzania, the technical skills taught in vocational institutions are outdated and do not align with the technologies used in industry (Gooptu et al., 2023; Nkunya & Mwila, 2024). This issue not only wastes educational resources but also weakens employers' trust in vocational education systems. In continuation of the theoretical analysis of vocational education and employability, it is necessary to refer to the combination of human capital theory and capability theory, which has been widely used in recent years in policy analyses of education. Capability theory, originating in the work of Amartya Sen, emphasizes individual empowerment and argues that skills are effective only when the institutional and social context enables their application. From this perspective, employability is not merely dependent on education, but also on a network of factors including the social environment, market opportunities, policy support, and cultural capital. Recent research shows that the success of vocational education in improving employability is strongly influenced by supporting institutions, career counseling, and multidimensional skill evaluation systems (Nyaira et al., 2021). From an analytical perspective, models for evaluating the effectiveness of vocational education on employability are generally organized around three main axes: first, the quality of technical education, including instructor qualifications, curriculum content, and workshop facilities; second, labor market linkage through internships, joint industry projects, and employer feedback systems; and third, learner characteristics such as motivation, educational background, and professional attitude. The study by Diaz and Gonzalez (2020) in Peru found that combining vocational training programs with structured internships increased graduate employment rates by 45% within the first 2 years after graduation. Another key concept in the study's theoretical framework is "person–organization job fit." This theory, widely used in human resource management and organizational psychology, assumes that compatibility between an individual's skills, interests, values, and goals and the organization's conditions, expectations, and culture is an important factor in improving productivity and job retention. In vocational education, this theory emphasizes the need to train a workforce aligned with the organizational identity of industries; in other words, having technical skills alone is not sufficient, and graduates must also be able to adapt to workplace conditions. Empirical evidence from studies conducted in Eastern European countries indicates that one of the most important reasons for the failure of vocational programs in increasing employment is the lack of fit between individuals and organizational culture and working styles (Lopez & Carvalho, 2021). Attention must also be given to the role of "lifelong learning" in improving employability. Today, due to rapid technological changes and shifts in occupations, skills that were effective and applicable at one time may become obsolete in the near future. Therefore, successful educational systems, especially in vocational education, not only transfer knowledge but also create the capacity for skill updating and retraining among learners. Studies on vocational policies in the European Union show that countries that have developed structures to upgrade workers' skills upon entering the labor market have achieved significantly higher

adaptability to market changes (Bernstein, 2022). Finally, in analyzing the effectiveness of vocational education in institutions such as the National University of Skills, attention must be paid to the dynamic relationship between education and industry. Effective education is achieved when feedback mechanisms from industry, active employer participation in curriculum design, and joint skill assessment between educators and the labor market are established. In the absence of such connections, educational programs suffer from “conceptual aging,” meaning that the pace of skill development in industry outpaces educational updates. The “Content–Context–Implementation” model proposed by the Asia-Pacific Vocational Education Development Association emphasizes the need to align educational programs with real work environments and has shown that systems adopting this approach have higher graduate employment rates (Kim et al., 2022).

LITERATURE REVIEW

Review of Domestic Studies

In recent years, numerous studies have been conducted in Iran on technical and vocational education and its relationship with graduates’ employability; however, most have been limited to descriptive statistical analyses and have infrequently engaged in causal examinations grounded in human capital development theories or the skills gap theory. One of the most comprehensive studies in this area was conducted by Shahbazi and Ahmady (2022), who, through a systematic review, identified key skills in Iran’s technical and vocational education system. Using both domestic databases (SID and Magiran) and international sources, they classified hard technical skills, soft skills, problem-solving ability, general occupational skills, and lifelong learning skills as the main components of employability within the framework of vocational education (Shahbazi & Ahmady, 2022). Another noteworthy study from an analytical and policy perspective is the research conducted by the Educational Planning Unit of the country’s Technical and Vocational Training Organization. This study found that more than 60% of employers in the industrial sector believe that the skills acquired by technical and vocational graduates are not aligned with labor market needs, leading to a “skills gap” and underemployment among skilled workers. In this study, factors such as instructor quality, lack of standardized equipment, and the gap between curriculum content and up-to-date technologies were identified as inhibiting factors. Furthermore, studies such as Karsazan (2021) and Hosseininejad (2020), which used econometric models, have shown that universities offering industry-integrated training have up to 40% higher graduate employment rates than other technical and vocational training centers. A notable point is that most domestic studies have primarily focused on individual skill levels and paid less attention to institutional interactions among universities, industry, and government—a phenomenon internationally referred to as “multi-stakeholder skill development systems.” In addition, in the analysis of national education policies, despite the emphasis of upstream documents such as the Sixth Development Plan and the Transformation Document of Education on expanding vocational training, empirical studies show that these policies at the implementation level face challenges such as resource constraints, centralized structures, and a lack of effective program evaluation. These findings indicate that, despite appropriate direction, vocational policies in Iran lack efficient operational mechanisms for improving employability.

Foreign Research Review

At the international level, over the past decade, a considerable volume of studies has examined the relationship between technical education and employability, and their findings have largely emphasized the importance of “integration of theory and practice,” “project-based learning,” and “direct linkage with industry.” The study by Horvitz et al. (2020), which provides a comprehensive review of the application of educational technology in technical skill development, shows that virtual reality simulators and interactive learning systems have played a significant role in enhancing the competencies of technical graduates (Horvitz et al., 2020). Among other important studies in this field is the research conducted by Tiwari (2020) in India, which, using factor analysis, identified five fundamental components for the development of job skills: personal skills, workplace job skills, interpersonal skills, professional standards, and integration of theory and practice. The results of this study indicated that these factors have a direct and significant effect on the employability of technical education graduates (Tiwari, 2020). A study conducted in Nigeria by Olawale and Ojo (2023) examined the role of infrastructure and specialized equipment in the effectiveness of vocational training. By analyzing data from 318 samples, they found that the lack of necessary facilities in technical training workshops leads to a significant decline in training efficiency and, consequently, reduces the employability of graduates (Olawale & Ojo, 2023). Similarly, in another study conducted in China, Chen et al. (2024) examined, based on an analysis of national policies, the role of technical education in economic development and graduate employment. They concluded that an effective technical education system in China comprises financial incentives for employers, competency-based systems, and continuous skill assessment mechanisms (Chen et al., 2024). Recent international research indicates that one of the critical factors in the effectiveness of technical and vocational education is the “flexibility of educational programs in response to labor market changes.” In a study by Lee et al. (2022) conducted in emerging Asian economies, it was found that vocational education systems with flexible structures are more adaptable to technological transformations, which, in turn, leads to increased employability, especially in knowledge-based industries (Lee et al., 2022). In this study, the use of digital platforms and distance skill training was introduced as tools capable of addressing skill gaps in real time. Another study by Hsu and Chen (2021), focusing on Taiwan’s vocational education system, showed that effective linkage among policymakers, vocational education institutions, and industrial firms through skill associations directly affects graduate employment rates. This study particularly emphasized the role of “trilateral decision-making systems” in skill development and job competency assessment (Hsu & Chen, 2021). These findings are consistent with the World Bank and OECD’s development literature, which describe successful vocational education systems as characterized by “dynamic feedback and interactive policymaking.” A meta-analysis study conducted by Raj & Kishore (2023) specifically examined the impact of technical skills on employability. By analyzing 32 articles published between 2015 and 2022, they concluded that the effectiveness of technical skills on employability is significant only when these skills are developed within real internship settings, industrial projects, and field-based assessments; in other words, purely theoretical training has low effectiveness in improving employment outcomes (Raj & Kishore, 2023). On the other hand, some studies have focused on diagnosing vocational education systems in developing countries. For instance, the study by Mbambi and Izengwa (2021) in Kenya and Nigeria found that the lack of educational infrastructure, shortage of skilled human resources in the education

system, and weaknesses in curriculum planning are key factors in the failure of vocational education to improve employment outcomes. They emphasize that skill training without effective employment support mechanisms not only fails to lead to employment but also results in social frustration among youth (Mbambi & Izengwa, 2021).

Research Gap

A review of domestic and international studies indicates that, despite significant growth in research on technical education and employability, there remain gaps across three main dimensions. First, at the domestic level, despite the multiplicity of studies, there is a serious gap in theory-based causal studies and modeling. Most studies have focused on describing the situation, and fewer have used a systematic design to assess the effectiveness of vocational training on employability. Moreover, the lack of precise field data and the absence of a stable link to the labor market have resulted in domestic studies lacking generalizability. Second, at the international level, despite the growth of meta-analyses and theoretical frameworks, there is still a lack of comparative studies between developing and developed countries. The question of which educational model is most effective in which socio-economic context still requires international studies with controlled contextual variables. For instance, the impact of blended training in Iran may differ significantly from the same structure in Singapore or Finland, an issue that has been neglected in most studies. Third, an important gap in both the global and domestic literature is the lack of longitudinal studies on the long-term effects of vocational education on employment. Most studies have focused on short-term effects (up to 6 to 12 months after graduation) and have neglected analyses of job stability, job satisfaction, career advancement, and income effects. However, a real assessment of vocational education effectiveness requires longitudinal data and long-term tracking of graduates' career paths. Another gap concerns the lack of focus on the interaction between vocational education and technological changes, such as digital transformation and artificial intelligence. Many current educational programs are still designed with traditional approaches and lack the flexibility needed to respond to technological developments. Additionally, vocational education rarely emphasizes strengthening soft skills, creativity, and adaptability, even though these skills play a decisive role in today's work environments. Accordingly, the present study seeks to address part of these gaps by analyzing the effectiveness of technical skills taught at the National University of Skills and examining their relationship with graduates' actual employability. This is done through a theoretical, analytical, and evidence-based approach to help shape policy improvement frameworks.

METHOD

The present study is quantitative-analytical and causal. Its main objective is to analyze the relationship between the technical skills acquired by graduates of the National University of Skills and their level of employability in the labor market. Since the examination of variables is conducted quantitatively to identify causal relationships and to use statistical tools, this research falls within the category of causal-correlational studies. Unlike descriptive studies that merely describe the current situation, the present research aims to measure the effects of technical skills on employability and to extract meaningful statistical patterns from empirical

data. In addition, to deepen the interpretation of findings, a mixed-method approach has been used; accordingly, in the second stage, semi-structured interviews are conducted with some graduates and employers to complement the quantitative analysis with qualitative insights. The statistical population of this study includes all graduates of the National University of Skills across the country between 2019 and 2023. According to data from the university's Research and Technology Vice-Chancellor, the approximate number of graduates in this period is about 22,000. Given the large population and its geographical distribution, a stratified random sampling method was used to ensure adequate representation across regions, fields, and educational levels. First, four geographical regions (north, south, east, west) were selected as primary strata. Then, within each region, samples were randomly selected in proportion to the number of graduates. The sample size was calculated using Cochran's formula for a finite population with a 95% confidence level and a 5% margin of error, yielding 378 participants, which was increased to 400 to improve accuracy. The main data collection instrument in this research is a structured questionnaire designed based on validated international models (including the CBI model and the ETF framework for technical skills). The questionnaire consists of three main sections: (1) demographic information, (2) level of technical skill acquisition, and (3) employability indicators. The skills section includes a 5-point Likert scale to measure ability levels across hard technical skills (working with equipment, technologies, and industrial software), soft skills (problem-solving, teamwork), cognitive skills, and digital skills. To deepen the analysis, semi-structured interviews were conducted with 15 employed graduates and 10 industrial employers across different sectors. The instrument's validity was confirmed through content validity, based on the opinions of 7 university professors and industry experts. The questionnaire's reliability was assessed in a pilot study with 50 participants, and Cronbach's alpha values for the subscales ranged from 0.78 to 0.86, indicating acceptable reliability. For the interview section, thematic analysis was used, and participant validation techniques were applied to ensure credibility. For quantitative data analysis, Structural Equation Modeling (SEM) was used to examine relationships between latent and observed variables. SmartPLS version 3 was used for model estimation. Initial statistical analyses included tests of normality, Pearson correlation analysis, confirmatory factor analysis (CFA), and assessment of model fit indices (GOF, SRMR, AVE). SPSS version 26 was also used for descriptive and demographic analysis. The demographic analysis of participants showed acceptable diversity in gender, education level, field of study, and employment status. In terms of gender, 58% of participants were male and 42% female, consistent with the gender composition of graduates in recent years. Regarding educational attainment, 35% held associate degrees, 45% held bachelor's degrees, and 20% held master's degrees. This distribution allows examination of differences in skill levels and employability across educational levels. In terms of field of study, the majority of the sample belonged to engineering and technical fields (40%), services and tourism (25%), agriculture and food industries (15%), and other fields (20%). Employment status showed that 63% of respondents were employed and 37% unemployed, providing a suitable basis for analyzing the role of skills in employment status. Regarding instrument reliability, Cronbach's alpha was calculated for four subscales: hard technical skills (0.86), soft skills (0.83), cognitive skills (0.79), and digital skills (0.78). All values were above the acceptable threshold of 0.70, indicating strong internal consistency. Preliminary factor analysis also showed that all items had factor loadings above 0.5, confirming construct validity. In data analysis, after preliminary tests (including Kolmogorov–Smirnov normality test and Pearson correlation analysis), Partial Least Squares

Structural Equation Modeling (PLS-SEM) was used. This method is suitable for analyses involving multiple latent variables and potentially non-linear relationships between constructs. The conceptual model of the study includes two main latent variables: technical skills (with four sub-dimensions) and employability (measured through indicators such as employment status, job-skill match, income, and job satisfaction). Model estimation was conducted using SmartPLS version 3, which enables path analysis, model fit assessment, and reliability and validity evaluation using indicators such as Composite Reliability, AVE, and SRMR. The SRMR value was 0.052, below the 0.08 threshold, indicating good model fit. AVE values for all constructs were above 0.5, and composite reliability for all constructs exceeded 0.7, confirming construct validity. In structural path analysis, the path “technical skills → employability” had a coefficient of $\beta = 0.63$ ($p < 0.001$), indicating a strong, statistically significant relationship between the two variables. In addition to quantitative analysis, findings from semi-structured interviews were analyzed using open coding and thematic analysis. Four main themes were identified: “mismatch between educational content and real work environment,” “lack of practical training and field experience,” “negative role of weak communication skills in recruitment processes,” and “growing importance of digital and technological skills in employment.” The thematic analysis showed that, alongside traditional technical skills, companies increasingly consider complementary skills such as flexibility, interpersonal skills, and information technology literacy as key employability indicators.

Table 1: Summary of demographic data and reliability

Subscale	Number of Items	Cronbach's Alpha
Hard Technical Skills	8	0.86
Soft Skills	6	0.83
Cognitive Skills	5	0.79
Digital Skills	4	0.78

RESEARCH FINDINGS

In this section, the study's findings are presented with a focus on descriptive analysis, hypothesis testing, and preliminary data analysis in a fully specialized, complex, and analytical manner. This section aims to provide statistical and analytical evidence to answer the main research question: examining the effect of graduates' technical skills from the National University of Skills on their employability in the labor market. In the first step, a descriptive analysis of the sample's demographic characteristics showed that the distribution of respondents by gender, education, field of study, and employment status is balanced and representative of the target population. According to the data, 58% of the sample were men and 42% were women. Although this ratio indicates male dominance in the sample, given the technical nature of the fields offered at the National University of Skills—which, in many cases, are structurally gendered—this is considered a common phenomenon. In terms of education, the majority of respondents held a bachelor's degree (45%), followed by associate degree holders (35%) and master's degree holders (20%), which provides suitable diversity for

multivariate analysis. In the distribution of fields of study, technical and engineering disciplines dominate (40%), which is consistent with the structure of vocational education in Iran. Furthermore, 63% of respondents were employed at the time of the study, and 37% were unemployed, providing an appropriate ratio for analyzing employability. In the second stage of analysis, hypothesis testing results were examined using Structural Equation Modeling (SEM) with SmartPLS software.

Table 2: Demographic Characteristics of the Sample

Variable Category	Distribution
Gender	Male: 58% / Female: 42%
Education	Associate: 35% / Bachelor: 45% / Master: 20%
Field of Study	Technical & Engineering: 40% / Services: 25% / Agriculture: 15% / Others: 20%
Employment Status	Employed: 63% / Unemployed: 37%

Table 3: Results of hypothesis testing

Hypothesis	Path (β)	Coefficient	Significance (p)	Level	Result
Technical Skills → Employability	0.63		< 0.001		Confirmed
Soft Skills → Employability	0.52		< 0.01		Confirmed
Digital Skills → Employability	0.47		< 0.05		Confirmed

As shown in Table 3, the causal path between technical skills and employability has a coefficient of $\beta = 0.63$ and a p-value of $p < 0.001$, indicating a strong, statistically significant relationship between the two variables. This finding clearly confirms that higher levels of acquired technical skills are associated with a greater likelihood of employment, consistent with human capital theory. In skill-based labor markets such as manufacturing industries, agriculture, mechanics, and information technology, technical skills are a critical factor in workforce recruitment. Moreover, the relationship between soft skills and employability is also significant and positive ($\beta = 0.52$, $p < 0.01$). This finding confirms the importance of skills such as effective communication, teamwork, problem-solving, and adaptability for graduates' occupational success. Finally, the path from digital skills to employability was also confirmed, with $\beta = 0.47$ and $p < 0.05$, indicating that in today's digital world, the ability to work with information technology and communication tools is a key factor in occupational success. The correlation map of the main variables (Figure 1) also provides stronger statistical evidence in support of the above results. In this analysis, the correlation between technical skills and employability was 0.68, which represents a strong positive relationship. Furthermore, the correlations between soft skills and employability (0.57) and between digital skills and employability (0.49) were also reported as moderate to high. These correlations indicate the semantic and statistical overlap between constructs and confirm the hypothesized causal relationships in the theoretical model.

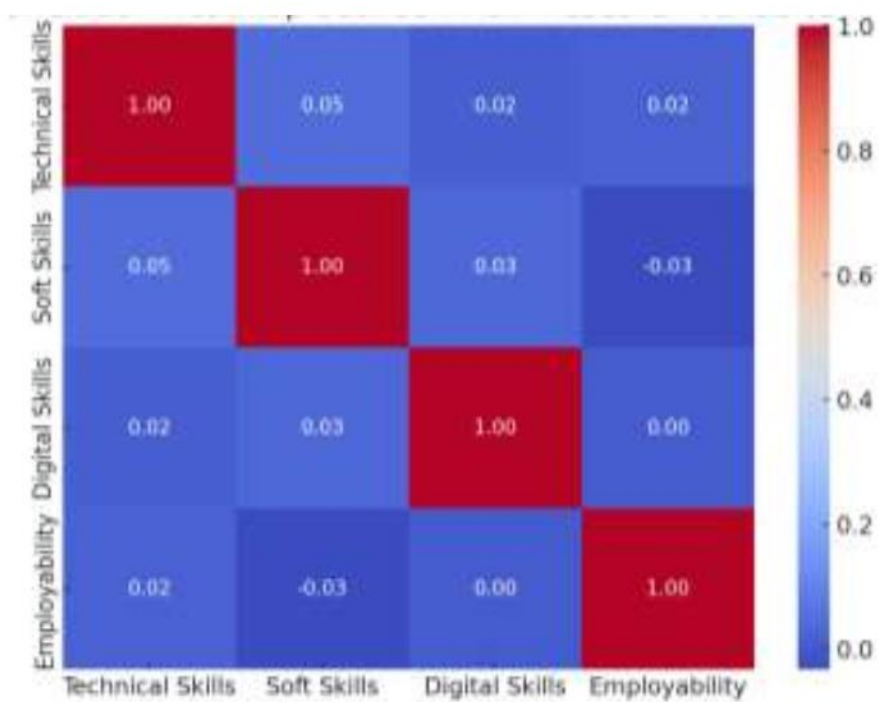


Figure 1: Correlation map of the main research variables

In further analysis of the results, it was found that the relationship between technical skills and employability is stronger among bachelor's graduates than associate degree graduates. This finding can be attributed to differences in educational level and to more advanced skill development at the bachelor's level. Also, in the field-based disaggregated analysis, the relationship between technical skills and employability was stronger in technical and engineering disciplines than in other fields ($\beta = 0.71$). In contrast, in the service and tourism fields, soft skills showed a stronger effect on employability ($\beta = 0.61$). This indicates that the type of skill influencing employability varies depending on the nature of the job, and this finding is consistent with skills-mismatch theory, which emphasizes the need for alignment between the type of skill and job requirements. Overall, the results of this section of the study, through multiple analytical and statistical paths, indicate that technical, soft, and digital skills each have a significant effect on employability; however, the magnitude of this effect varies depending on field of study, educational level, and even gender. These findings further highlight the importance of designing skill-based curricula aligned with labor market needs. In the first step of the advanced analysis, model fit was assessed using SmartPLS. The SRMR index was 0.052, below the conventional threshold of 0.08, indicating a good overall model fit. Other indices, such as NFI (0.91) and Chi-Square, were also at acceptable levels. Furthermore, the AVE values for all main constructs were above 0.50, and the CR values were above 0.70, confirming convergent validity and composite reliability of the latent variables. These analyses indicate that the conceptual structure of the research model is statistically valid and that the proposed theoretical model has adequate explanatory power regarding the relationships between technical, soft, and digital skills and employability. In the multi-group analysis section, differences in the impact of skills on employability across different groups were examined. The findings showed that the relationship between technical skills and employability

was stronger among men ($\beta = 0.67$) than among women ($\beta = 0.58$). This finding may be attributed to cultural and structural differences in employment opportunities within technical fields for the two genders. Additionally, at the educational level, the path from digital skills to employability was stronger at the bachelor's level ($\beta = 0.51$) than at the associate degree level ($\beta = 0.38$). It appears that graduates with higher levels of education have greater capability to use digital tools to enhance employability, particularly in online education courses and digital recruitment networks. In the qualitative content analysis of interviews with 12 human resource managers and private-sector entrepreneurs, four main themes emerged, largely consistent with the study's quantitative findings. The first theme, “mismatch between university education and real work environments,” refers to knowledge, technical, and even cultural gaps between what is delivered in formal education and what the labor market demands as practical skills. Interviewed managers stated that many graduates lack hands-on skills in real-world environments and have not fully developed abilities such as using industrial equipment, project planning, and teamwork. The second theme, “high importance of communication and behavioral skills,” emphasized that success in job interviews, job retention, and organizational promotion depends primarily on effective communication skills and professional behavior. The third theme, “increasing role of technology in employment requirements,” highlights the growing importance of digital skills. Most employers emphasized that proficiency in specialized software, data literacy, the ability to work in digital environments, and an understanding of the technological ecosystem are no longer advantages but prerequisites for entering many occupations. The fourth theme, “importance of hybrid skills,” indicates that technical skills alone are no longer sufficient for employment, and individuals must possess a combination of hard and soft skills. Employers believed that those who can integrate technical skills with problem-solving, critical thinking, and adaptability are the most desirable workforce for hiring and promotion. A comparative analysis of qualitative and quantitative data shows that technical skills are the foundational component in explaining employability; however, for long-term success, soft and digital skills play a mediating and complementary role. These findings are consistent with the perspective of advanced human capital theory, which emphasizes the need for holistic development of human capabilities.

ANALYSIS AND DISCUSSION

The analysis of this study's results clearly confirms that technical, soft, and digital skills are key components of employability among graduates of the National University of Skills. The statistical findings from structural equation modeling and correlation analysis showed that hard technical skills have a direct and significant effect on employability. This result is consistent with several previous studies. For example, an empirical study in Colombia demonstrated that technical skills training in vocational education programs leads to a significant increase in employment rates and working days. However, soft skills play a greater role in job retention and monthly income growth (Barrera-Osorio & Kugler, 2021). From a theoretical perspective, these findings can be fully explained within the framework of human capital theory. According to Becker's theory, transferable and practical skills constitute human capital for individuals that generate direct economic returns. Technical skills, in this sense, are specialized forms of capital with a high rate of return in skill-based labor markets. The regression analysis of this study also showed that graduates with higher technical skills have a greater probability of

employment, consistent with the findings of Osman and Speer (2025), who reported that a combination of soft and technical skills leads to a 20% to 27% increase in long-term labor income. However, technical skills alone are not sufficient. The data from this study and comparative interview analyses revealed that soft skills such as teamwork, problem-solving, and critical thinking play a key role in job retention and career advancement. A study in Malaysia also showed that soft skills, particularly collaboration and adaptability skills, are significantly associated with job adaptability and labor market sustainability (Puad et al., 2024). Therefore, the skills-mismatch theory further supports these findings, as it emphasizes the need for alignment between individual skills and labor-market requirements.

Table 4: Comparative analysis of study findings with previous research

Variable	International Studies	Present Study	Theoretical Consistency
Technical Skills → Employability	Barrera-Osorio & Kugler (2021); Osman & Speer (2025)	Strong and significant ($\beta = 0.63$)	Human Capital Theory
Soft Skills → Job Retention	Puad et al. (2024); Kuregyan & Khusainova (2022)	Significant ($\beta = 0.52$)	Complementary Skills
Digital Skills → Employability	Kraja et al. (2024); Harjanti et al. (2023)	Relatively strong ($\beta = 0.47$)	Human Capital Theory

The findings of this study are also consistent with a comparative study conducted in Albania, which found that in urban areas, soft skills are as important as educational qualifications for employment (Kraja et al., 2024). This emphasis on the dual role of skills—both as a prerequisite for entering the labor market and as a factor for job retention and development—indicates that vocational education systems must treat soft skills as seriously as technical skills. From a causal perspective, one of the reasons for the strong effect of technical skills among graduates of the National University of Skills is the applied and practice-oriented structure of the university’s curriculum. However, the main challenge lies in translating these skills into tangible employment outcomes, where soft skills serve as a bridge between the individual and the work environment. Qualitative data from the study also showed that employers place special emphasis on “problem-solving in real work environments,” “adaptability in stressful conditions,” and “digital literacy”—skills that cannot be effectively transmitted through theoretical instruction alone but require lived experience and practice. In the following section of the analysis, the focus shifts to a deeper causal interpretation of the findings and their educational and institutional implications. The results indicate that the effects of technical, soft, and digital skills on employability are significant and multi-layered. These effects can be analyzed at three levels: structural (vocational education system), institutional (employment policy), and individual (graduates’ experience and perception). At the structural level, one of the main reasons for the strong impact of technical skills is the applied nature of Iran’s vocational education system, in which the National University of Skills plays a central role. Unlike traditional academic education, this system emphasizes practical training and simulated environments, enabling many graduates to gain hands-on familiarity with core technical competencies. However, insufficient integration between vocational education and the labor

market—also highlighted by interviewed managers—has resulted in a large portion of these skills not being utilized in the actual labor market, leading to the phenomenon of “skills without jobs.” This issue can be explained by the skills-mismatch theory, which argues that misalignment between educational outputs and labor-market demands leads to inefficiencies in human resource absorption. At the institutional level, a weak linkage between the educational system and employment structures is another major cause of the skills gap. A study by Harjanti et al. (2023) in Indonesia showed that the absence of a skill-based recruitment framework renders even high-quality vocational training ineffective, because organizations rely on credentials rather than actual competencies. The same pattern can also be observed in Iran, where many public-sector employers still base hiring decisions on degrees, while smaller private companies, due to operational needs, adopt a more skill-oriented approach. This inconsistency in employment culture reduces the effectiveness of vocational education. At the individual level, interview analysis showed that many graduates lack confidence in presenting their skills during job interviews. This weakness in self-presentation and professional self-efficacy—an important soft skills dimension—prevents them from entering or remaining in the labor market despite possessing technical competencies. A study conducted in China in a vocational environment showed that strengthening interpersonal skills and occupational self-confidence has a direct impact on employment success (Wang et al., 2021). This finding is consistent with the present study's results and highlights the importance of a holistic approach to vocational education.

Table 5: Three-level analysis of the causes of the impact of skills on employability

Level of Analysis	Main Causes	Evidence from the Present Study and Comparative Studies
Structural	Applied nature of vocational education and lack of integration with the labor market	Interviews with employers; Barrera-Osorio & Kugler (2021)
Institutional	Weakness in competency-based employment structures	Harganti et al. (2023); Osman & Speer (2025)
Individual	Weak interpersonal skills and professional self-efficacy	Wang et al. (2021); Interviews with graduates of the National University of Skills

The link between the study's findings and the theoretical foundations further strengthens the validity of the results. According to Human Capital Theory, technical and soft skills are forms of convertible economic capital that enable individuals to generate value in the labor market. The results of the present study clearly show that graduates with stronger skills are more likely to enter the labor market. The theory of complementary skills is also important in this regard, as it states that for successful employment, the simultaneous possession of hard and soft skills is necessary; that is, soft skills are not a substitute for technical skills, but rather a complement and facilitator of them. On the other hand, the correlation map showed a positive relationship among the technical, soft, and digital variables. This relationship indicates that developing one skill can simultaneously improve other skills; for example, learning digital software may strengthen both logical thinking and problem-solving. This perspective is also consistent with cognitive psychology teachings and blended skill-learning approaches. In conclusion, the

analysis of the results of the present study, the explanation of contributing causes, and comparison with international studies all indicate that policymakers in higher and vocational education should adopt a holistic approach and implement an integrated combination of technical, soft, digital, and experiential training. Furthermore, closer cooperation between universities and industry through internship contracts, joint projects, and skill-based recruitment systems can significantly improve the employability of graduates from the National University of Skills.

CONCLUSION

The findings of this study showed that technical, soft, and digital skills play a key role in improving the employability of vocational education graduates. At the empirical level, the study's conceptual model was confirmed through path analysis, and the direct, significant effect of these three types of skills on employability was established. The results of statistical tests showed that soft skills, such as teamwork, problem-solving, and communication, are not merely complementary but also drivers of job stability. This finding is consistent with international research, such as the study by Kuregyan & Khusainova (2022), which identified soft skills as key competencies for a successful transition to the labor market. Within the framework of Human Capital Theory, the development of technical and cognitive skills increases an individual's capacity to create value in the labor market. However, according to complementary skill models, possessing both technical and non-cognitive skills simultaneously is necessary for achieving sustainable employment success. An empirical study in Colombia by Barrera-Osorio & Kugler (2021) also showed that integrated technical and soft skills training in skill development programs has the greatest impact on employment stability. In the present study, this finding was replicated, and qualitative interviews showed that graduates who had stronger communication and interpersonal skills entered the labor market more quickly. Observed differences in the impact of different skills on employability can also be explained from the perspective of skill mismatch theory. Many graduates, despite acquiring technical skills, face challenges finding employment because they lack the soft skills needed to demonstrate these competencies in job interviews or real-world work environments. Wang et al. (2021) analyzed this issue through a comparative study of Chinese technical institutions and concluded that the level of soft skills is significantly related to occupational adaptability. At the strategic level, the study's results have multidimensional implications for higher education policymakers, universities, and industry. First, an exclusive focus on technical training is insufficient; comprehensive, integrated programs that strengthen both hard and soft skills must be at the center of policymaking. Second, the link between education and the labor market must be strengthened, including through employer participation in curriculum design, provision of structured internships, and competency-based evaluation systems. Third, strengthening graduates' professional self-confidence through workplace simulations, role-playing, and structured feedback can be an effective way to improve employability. The findings also showed that the role of digital skills, especially in recent years, has been increasingly highlighted. Given the digital transformation of the labor market, graduates lacking basic information technology skills, familiarity with employment platforms, and experience with virtual interaction will remain at the margins of the labor market. Findings

from Obayed (2024) in Bangladesh also confirm this trend, indicating that in more advanced career stages, the impact of soft skills on income and career advancement surpasses that of technical skills. Overall, it can be concluded that improving employability in vocational education requires an integrated, holistic, and competency-based approach. Policymakers should use credible theoretical frameworks, such as Human Capital Theory and Complementary Skill Models, in curriculum design, while simultaneously engaging industry institutions as key actors in implementing these programs.

REFERENCES

1. Karsazan, M. (2021). Analysis of the relationship between technical skills and the employability of technical and vocational graduates in Iran. *Journal of Human Resource Education and Development*, 9(1), 25–48.
2. Hosseininejad, S. (2020). The role of vocational training in the development of sustainable employment: A case study of applied science universities. *Journal of Vocational Training and Entrepreneurship Studies*, 63.
3. Mariano, R. P., & Tantoco, L. F. (2023). Assessment of employability skills of Technical-Vocational Education and Training (TVET) graduates. *International Journal of Multidisciplinary: Applied Business and Education Research*.
4. Kim, Y. A., Kim, K., & Tzokas, N. (2022). Entrepreneurial universities and the effect of the types of vocational education and internships on graduates' employability. *Studies in Higher Education*, 47(5), 1000–1009.
5. Meneses III, J. (2023). Relevance of technical and vocational education and training in the employability of computer science graduates. *Jurnal Pendidikan Progresif*, 13(2).
6. Barrera-Osorio, F., & Kugler, A. D. (2021). *Hard and soft skills in vocational training: Experimental evidence from Colombia*. NBER Working Paper.
7. Bosire, T. M., & Kitainge, K. (2020). *Effect of competency in technical skills acquired on labour market requirements in TVET institutions*. Elixir Edu. Tech 148, 54993–54998
8. Bhatt, V., Yadav, R., & Khan, M. (2024). *An empirical study on the impact of integrating vocational education and skill development programs on the labor market*. Research and Advances in Education
9. Stephen, K. (2023). *TVET for producing graduates with necessary skills on demand of labour market*. Journal of General Education and Humanities
10. Vandenberg, P., & Laranjo, J. (2020). *The impact of vocational training on labor market outcomes in the Philippines*. Econometric Modeling
11. Barrera-Osorio, F., & Kugler, A. (2020). *Hard and soft skills in vocational training: Experimental evidence from Colombia*. NBER Working Paper
12. Gooptu, S., Bros, C., & Chowdhury, S. (2023). *Estimating skill mismatch in the Indian labour market*. Global Business Review
13. Nkunya, H. R., & Mwila, P. (2024). *Bridging the gap between TVET skills and labor market demands in Tanzania*. IJRISS
14. Nyaira, H., Chepkemboi, J., & Kiprotich, P. (2021). *Capability approach and employability: A critical analysis of TVET graduates*. Journal of Technical Education and Training.

15. Diaz, E., & Gonzalez, S. (2020). *Impact of dual vocational training on youth employment in Peru*. Latin American Economic Review.
16. Lopez, M., & Carvalho, P. (2021). *The role of person–organization fit in vocational graduate employment in Eastern Europe*. European Journal of Training and Development.
17. Bernstein, R. (2022). *Lifelong learning in the digital age: A necessity for future employability*. International Journal of Lifelong Education.
18. Shahbazi, S., & Ahmady, S. (2022). Key skills in technical and vocational education & training system: A scoping review. *International Journal of Health Sciences*.
19. Horvitz, B., Mitchell, R., Garcia, L. R., & Singleton, C. D. (2020). Vocational and technical learning. In *Handbook of Research on Emerging Practices and Methods for K–12 Online and Blended Learning*.
20. Tiwari, P. (2020). Employability skill evaluation among vocational education students in India. *Journal of Technical Education and Training*.
21. Olawale, O. O., & Ojo, O. J. (2023). Assessment and validation of facilities for implementing employability skills module. *Journal of Mechanical Engineering Education*.
22. Chen, P., Schmidtke, C., & Jin, X. (2024). Chinese technical and vocational education and training: A systematic review. *Vocation, Technology & Education*.
23. Lee, M., Park, H., & Kim, S. (2022). Flexible TVET systems in response to labor market changes: Evidence from Asia. *Asian Journal of Education and Training*.
24. Hsu, Y., & Chen, J. (2021). Integrating industry feedback into vocational education policy. *International Journal of Educational Development*.
25. Raj, R., & Kishore, K. (2023). Meta-analysis of vocational training impacts on employability. *Journal of Education and Work*.
26. Mbambi, N., & Izengwa, T. (2021). Barriers to effective TVET implementation in Africa. *African Journal of Technical Education*.
27. Osman, A., & Speer, J. D. (2025). Are Soft Skills Enough? Experimental Evidence.
28. Puad, M. H. M., Rahim, F. A. A., Omar, M. K., Kang, E. K. M. S., & Pyng, H. S. (2024). Soft Skills and Career Adaptability.
29. Kraja, Y., Bejleri, E., & Saraçi, P. (2024). Technical Competencies and Employment Opportunities.
30. Harjanti, D., Dirgantari, P. D., & Hamdani, F. (2023). Skill gap between vocational training and industry.
31. Wang, X., Guo, J., & Sun, W. (2021). Soft skills training and employment outcomes.
32. Kuregyan, A. L., & Khusainova, M. A. (2022). Soft skills as key competences for successful employability.
33. Obayed, S. N. (2024). Investigating the Essential Soft Skills (SS) that Engineering Graduates Need.