International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Integrating Soft Skills with Technology Education for Computer Science Engineers: A Study on Employability and Industry Readiness

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Abstract

In the rapidly evolving technological world, Computer Science Engineers are expected to possess not only strong technical expertise but also well-developed soft skills such as communication, teamwork, adaptability, and emotional intelligence. Despite this, traditional engineering education continues to emphasize technical competency while often neglecting structured soft skills training. This research paper examines the role of soft skills in enhancing employability and workplace effectiveness of computer science engineering students with a specific focus on the integration of technology-enabled soft skills training. A survey-based study was conducted among the engineering students to analyze perceptions, preparedness levels, and the perceived impact of soft skills on career readiness. The findings indicate a significant gap between industry expectations and students' competence in soft skills, while also highlighting the potential of digital tools, AI-based platforms, and blended learning models in addressing this gap. The study concludes with recommendations for curriculum integration and future research directions.

Keywords: Soft Skills, Computer Science Engineering, Employability, Technology-Enabled Learning, Industry Readiness

Introduction

The field of computer science engineering (CSE) plays a critical role in shaping the digital infrastructure of modern society. With advancements in artificial intelligence, cloud computing, and automation, the demand for technically skilled engineers has grown exponentially. However, employers increasingly emphasize the importance of soft skills alongside technical knowledge. Soft skills such as communication, teamwork, leadership, problem-solving, and emotional intelligence enable engineers to collaborate effectively, adapt to dynamic environments, and mold technical solutions into real-world applications. Numerous industry reports suggest that lack of soft skills is a major reason for the unemployability of engineering graduates, particularly in developing economies. This issue is not rooted in lack of intelligence or technical training but rather in the absence of structured opportunities to develop human-centric skills during academic programs. This research seeks to explore how soft skills can be effectively integrated with technology education to improve the employability and professional readiness of computer science engineers.

Literature Review

Previous studies have highlighted the growing importance of soft skills in engineering and IT professions. Researchers have emphasized that communication skills and teamwork are essential for successful software development projects, especially in agile and distributed team environments. Studies on employability skills consistently rank soft skills such as adaptability, interpersonal communication, and problem-solving among the top requirements for engineering graduates. Existing literature also indicates that while technical skills can be taught through traditional classroom methods, soft skills require experiential learning approaches. Recent research has explored the use of technology-enabled solutions such as online learning platforms, virtual simulations, and AI-driven assessment tools for soft skills development. However, many studies focus on either technical education or soft skills training in isolation with limited research addressing their integrated implementation within the computer science curriculum.

Problem Statement and Research Objectives

Problem Statement

Despite strong technical curricula, many computer science engineering students lack adequate soft skills required by the industry, resulting in reduced employability and workplace effectiveness. There is a need to explore structured and technology-supported methods to integrate soft skills training within engineering education.

Research Objectives

- To analyze the importance of soft skills for computer science engineering students
- To assess students' self-perceived preparedness in soft skills
- To examine the role of technology-based tools in soft skills development
- To propose a framework for integrating soft skills with technology education

Research Methodology

Research Design

This study adopts a descriptive and survey-based research methodology.

Sample and Data Collection

A structured questionnaire was distributed online to undergraduate engineering students. A total of 22 valid responses were collected and analyzed.

Survey Instrument

Survey link:https://docs.google.com/forms/d/e/1FAIpQLSclpZl3b0BZB2sMTZyty5PqmWZbVqAgjagA9F3WdMRQXZwBvQ/viewform?usp=dialog

The survey was designed to examine the role of soft skills in the employability of Computer Science Engineering students. It collected basic academic details of students and assessed their awareness of soft skills and their perceived importance in the technology industry. The questionnaire included self-assessment items related to communication ability, confidence in teamwork, and comfort during presentations or interviews. It also explored whether students feel that their academic curriculum gives sufficient emphasis to soft skills alongside technical knowledge. In addition, the survey gathered

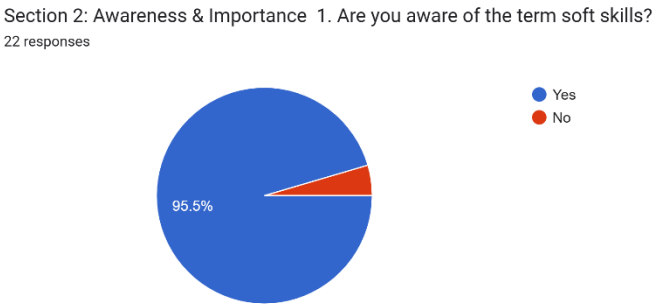
information about any formal soft skills training students may have received and their opinions on using technology or AI-based tools for soft-skill development. The survey concluded with an open-ended question inviting students to identify the soft skill they believe engineering students lack the most providing qualitative insight into key areas for improvement.

All data analyzed in this study is based on primary responses collected through a Google Form survey administered by the researcher.

Data Analysis and Results

Awareness and Importance of Soft Skills

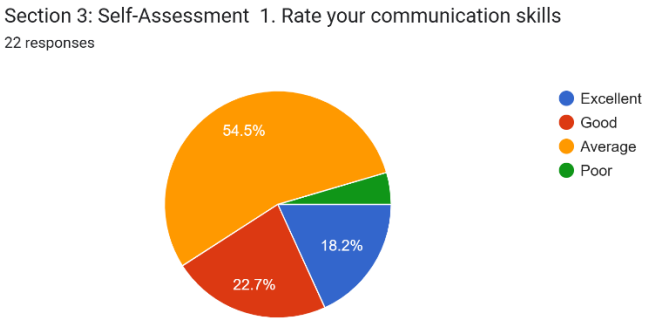
Analysis shows a very high level of awareness regarding soft skills among respondents. 95.45% of students reported being aware of the term *soft skills*, while only 4.55% were not. Furthermore, 100% of respondents agreed that soft skills are essential for employability in the technology industry, clearly reflecting strong consensus on their importance.

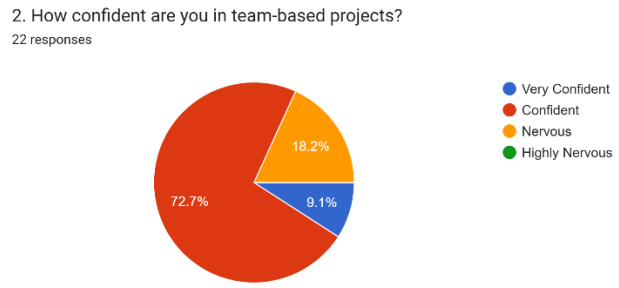


Self-Assessed Soft Skills Preparedness

When asked to rate their communication skills, only **18.18%** of students considered themselves excellent, while **22.73%** rated themselves as good. A majority **54.55%** rated their communication skills as average, and **4.55%** reported poor communication skills. This indicates moderate confidence levels and highlights scope for improvement.

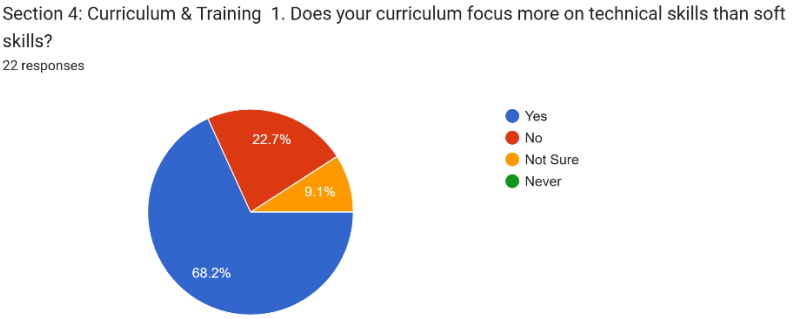
In terms of confidence during teamwork and collaborative activities, most respondents indicated partial confidence rather than high confidence, suggesting limited exposure to structured collaborative learning environments.





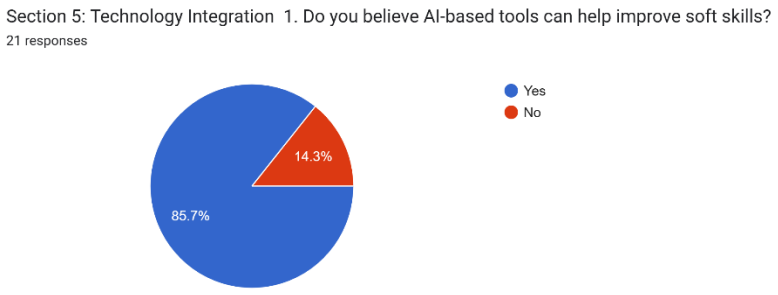
Exposure to Formal Soft Skills Training

Responses reveal that the academic curriculum is largely technical in nature. A significant proportion of students indicated that their coursework focuses more on technical subjects than soft skills. Only a small segment reported having undergone formal soft skills training as part of their academic journey.



Role of Technology in Skill Development

Most respondents expressed a positive attitude toward technology-enabled soft skills development. **More than 75%** of students agreed that AI-based tools and digital platforms could help improve communication, interview performance, and teamwork skills. Preferred tools included online communication platforms, AI-based interview simulators, and virtual teamwork projects. Qualitative responses further emphasized communication as the most lacking soft skill among engineering students reinforcing the quantitative findings.



Discussion

The findings derived from the primary survey data strongly support existing literature on the importance of soft skills in engineering education. Although awareness regarding soft skills is high, students' self-assessment reveals moderate confidence levels, particularly in communication and professional interaction.

The lack of formal training opportunities within the curriculum appears to be a key contributing factor to this skills gap. Students' strong inclination toward technology-enabled learning solutions indicates readiness for innovative pedagogical approaches. Tools such as AI-driven interview simulations, virtual collaboration environments, and online communication platforms can provide scalable and effective solutions for soft skills development.

Embedding soft skills training within technical coursework—through presentations, group-based software projects, and continuous assessment—can lead to more holistic learning outcomes and improved industry readiness.

Proposed Integration Framework

The study proposes a blended framework consisting of: - Curriculum-embedded soft skills modules such as technology-based training platforms, project-based and collaborative learning with continuous assessment using digital tools and industry mentorship with organized feedback

Limitations of the Study

- The sample size of 22 respondents limits the generalizability of findings; however, the study serves as a valid exploratory analysis.
- Responses are based on self-assessment, which may introduce subjectivity.
- The study focuses primarily on student perspectives and does not include direct employer feedback.

Future Scope

Future research may include longitudinal studies, industry-based surveys, or experimental implementation of technology-driven soft skills programs. The impact of AI-based personalized training systems on employability outcomes can also be explored.

Conclusion

Based on the analysis of primary survey data, this study concludes that while computer science engineering students clearly recognize the importance of soft skills, there exists a noticeable gap in their preparedness and training. Communication skills, in particular, emerged as the most deficient area.

The positive response toward technology-enabled learning methods highlights an opportunity for institutions to integrate AI-based tools and digital platforms into the curriculum. Such integration can enhance employability, confidence, and professional effectiveness among future engineers.

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