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SOFT SKILLS DEVELOPMENT IN INFORMATION TECHNOLOGY EDUCATION: A SYSTEMATIC LITERATURE REVIEW

Abstract

The integration of soft skills into information technology (IT) education has become increasingly important to bridge the gap between academic preparation and industry expectations. This systematic literature review examines the current landscape of soft skills development in IT education, focusing on key competencies such as communication, self-motivation, teamwork, result-oriented attitude, problem-solving, and interpersonal skills. A total of 37 relevant articles were identified through comprehensive searches of the Scopus and ACM databases, with 22 articles from Scopus and 15 from ACM meeting the inclusion criteria. The selected articles were analyzed to determine the extent to which they addressed the development of soft skills and their impact on employability among IT specialists. The findings indicate a strong emphasis on communication skills, self-motivation, teamwork, and problem-solving skills followed closely. Result-oriented attitude and interpersonal skills were also considered important. Overall, the results suggest a growing recognition of the importance of soft skills in IT education. However, there is a need for further research to establish clear frameworks and methodologies for integrating these skills into curricula effectively. This study contributes to the ongoing discourse on soft skills development in IT education and provides insights for educators, policymakers, and industry stakeholders seeking to enhance the employability of IT graduates.

Keywords: soft skills, information technology, employability, higher education, industry needs, skills gap.

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РАЗВИТИЕ МЯГКИХ НАВЫКОВ В ИНФОРМАЦИОННО-ТЕХНОЛОГИЧЕСКОМ ОБРАЗОВАНИИ: СИСТЕМАТИЧЕСКИЙ ОБЗОР ЛИТЕРАТУРЫ

Аннотация

Интеграция мягких навыков в образование в области информационных технологий (ИТ) становится все более важной для преодоления разрыва между академической подготовкой и ожиданиями отрасли. В этом систематическом обзоре литературы рассматривается текущая ситуация в области развития мягких навыков в ИТ-образовании, уделяя особое внимание таким ключевым компетенциям, как коммуникация, самомотивация, работа в команде, ориентированность на результат, решение проблем и навыки межличностного общения. В результате всестороннего поиска в базах данных Scopus и ACM было выявлено в общей сложности 37 соответствующих статей, при этом 22 статьи из Scopus и 15 статей из ACM соответствовали критериям включения. Отобранные статьи были проанализированы, чтобы определить, в какой степени они посвящены развитию мягких навыков и их влиянию на возможности трудоустройства среди ИТ-специалистов. Результаты показывают, что большое внимание уделяется коммуникативным навыкам, самомотивации, командной работе и навыкам решения проблем. Ориентация на результат и навыки межличностного общения также считались важными. В целом, результаты свидетельствуют о растущем признании важности мягких навыков в ИТ-образовании. Однако существует необходимость в дальнейших исследованиях для создания четких рамок и методологий для эффективной интеграции этих навыков в учебные программы. Это исследование вносит вклад в продолжающуюся дискуссию о развитии мягких навыков в ИТ-образовании и дает ценную информацию преподавателям, политикам и заинтересованным сторонам отрасли, стремящимся повысить возможности трудоустройства выпускников ИТ-специалистов.

Ключевые слова: мягкие навыки, информационные технологии, возможности трудоустройства, высшее образование, потребности отрасли, дефицит навыков.

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АҚПАРАТТЫҚ ТЕХНОЛОГИЯЛЫҚ БІЛІМ БЕРУ ҮДЕРІСІНДЕ ИКЕМДІ ДАҒДЫЛАРДЫ ДАМЫТУ: ЖҮЙЕЛІ ӘДЕБИЕТТЕРГЕ ШОЛУ

Аңдатпа

Ақпараттық технологиялар (IT) саласына икемді дағдыларды интеграциялау академиялық дайындық пен салалық күтулер арасындағы алшақтықты жою үшін маңыздырақ бола бастады. Бұл жүйелі әдебиеттік шолу коммуникация, өзін-өзі ынталандыру, топтық жұмыс, нәтижеге бағдарлану, проблемаларды шешу және тұлға аралық дағдылар сияқты негізгі құзыреттерге назар аудара отырып, IT-білім берудегі икемді дағдыларды дамытудың қазіргі көрінісін зерттейді. Scopus және ACM дереккорларын кешенді іздеу нәтижесінде барлығы 37 сәйкес мақала анықталды, Scopus-тан 22 мақала және ACM-ден 15 мақала қосу критерийлеріне сәйкес келді. Таңдалған мақалалар IT мамандарының икемді дағдыларын дамыту және олардың жұмысқа қабілеттілікке әсер ету дәрежесін анықтау үшін талданды. Нәтижелер қарым-қатынас дағдыларына, өзін-өзі ынталандыруға, топта жұмыс істеуге және проблемаларды шешу дағдыларына қатты назар аударылғанын көрсетеді. Нәтижеге бағытталған көзқарас пен тұлғааралық дағдылар да маңызды деп саналды. Жалпы алғанда, нәтижелер IT-білім берудегі икемді дағдылардың маңыздылығын мойындаудың артып келе жатқанын көрсетеді. Дегенмен, осы дағдыларды оқу бағдарламаларына тиімді енгізудің нақты негіздері мен әдістемелерін құру үшін қосымша зерттеулер қажет. Бұл зерттеу IT білім берудегі икемді дағдыларды дамыту бойынша жалғасып жатқан дискурсқа үлес қосады және IT түлектерінің жұмысқа қабілеттілігін арттыруға ұмтылатын мұғалімдерге, саясаткерлерге және салалық мүдделі тараптарға түсінік береді.

Түйін сөздер: икемді дағдылар, ақпараттық технологиялар, жұмысқа қабілеттілік, жоғары білім, салалық қажеттіліктер, дағдылардағы айырмашылық.

Main provisions

The main provisions of the study illuminate the crucial intersection between higher education in information technology (IT) and the evolving demands of the industry. It underscores the necessity for academic institutions to adapt their curricula to bridge the gap between what companies require and what students are taught. This adaptation is imperative due to significant shifts in the technology-related job market, driven by rapid technological advancements. The research highlights a fundamental misalignment between the skills imparted by higher education institutions and those sought after by IT companies. It reveals a prevailing deficiency in soft skills among novice ICT professionals, emphasizing the need for a holistic approach to education that goes beyond technical knowledge. The study underscores the importance of personal development goals, including the cultivation of social and emotional skills, alongside technical proficiency.

Additionally, the findings emphasize the critical role of collaboration between academic institutions and industry stakeholders. By fostering partnerships and engaging in dialogue, universities can gain valuable insights into industry needs and tailor their programs accordingly. This collaborative approach is essential for addressing the skills gap and ensuring the employability of IT graduates in a rapidly changing job market. Furthermore, the study sheds light on the emerging importance of non-cognitive competencies, often referred to as soft skills, in the IT sector. These skills, such as communication, creativity, and critical thinking, are increasingly valued by employers alongside technical expertise. As such, there is a growing imperative for higher education institutions to integrate the development of these skills into their curricula to better prepare students for the demands of the modern workforce. In conclusion, the study underscores the transformative role of higher education in shaping the future of the IT workforce. By prioritizing the development of both technical and soft skills, academic institutions can empower students to thrive in a dynamic and competitive industry landscape while contributing to societal and economic growth.

Introduction

The growing emphasis on soft skills in the field of Information Technology (IT) highlights a pivotal shift in higher education and professional sectors toward more holistic competency frameworks. As the demand for soft skills has escalated, so too has the scrutiny on higher education institutions (HEIs) by employers who believe graduates are not sufficiently prepared with these crucial capabilities. In [1] researchers articulate this dynamic by exploring the differing perceptions between students and employers regarding the importance and acquisition of soft skills, indicating a significant gap in expectations and reality.

Innovative educational strategies such as cooperative learning have been developed to address these needs. The implementation of group projects in IT courses at Georgia Southern University demonstrates an active learning approach aimed at enhancing both deep learning and soft skills, such as teamwork and communication, which are crucial for success in the IT sector [2]. However, while these methods promote soft skills training, their effectiveness in real-world scenarios remains difficult to assess, particularly in terms of equitable contribution and actual skill application outside the classroom.

Despite the acknowledged importance of soft skills, there is a dearth of empirical models linking these skills directly to IT project success. In [3] authors underscores this gap, revealing a lack of comprehensive models that delineate the causal relationship between soft skills and project outcomes in IT, even though such skills are crucial for managing the complexities of modern IT.

This study aims to address the gap in the literature by investigating the integration of soft skills into IT curricula. Specifically, the research focuses on identifying which soft skills are deemed essential for IT specialists and examining the educational strategies and pedagogical theories that support the development of these skills in IT education settings.

The primary purpose of this systematic literature review is to synthesize existing research on the role of soft skills in IT education and professional practice. By consolidating findings from studies published in major academic databases, the review seeks to highlight effective strategies for embedding soft skills within IT curricula and to discuss the implications of these strategies for enhancing employability and job performance among IT professionals.

The study was guided by several hypotheses:

H1: Soft skills are positively associated with job performance and employability among IT specialists.

H2: Educational interventions that incorporate soft skills development into IT curricula improve student outcomes and preparedness for the workforce.

These hypotheses aim to explore the transformative potential of integrating soft skills into IT education and to provide a foundation for recommendations on curriculum enhancements. Through this review, we seek to provide educational leaders and policymakers with evidence-based guidance on fostering a workforce well-equipped to meet the challenges of the modern IT landscape.

Research methodology

This systematic literature review aims to identify the essential soft skills relevant to IT specialists by reviewing existing literature and citing relevant studies and theories related to soft skills development in education and the IT sector. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method was employed to ensure a structured and transparent approach to this review.

Based on a comprehensive review of available databases, Scopus and ACM were chosen for this study. Scopus was selected over the Web of Science (WoS) due to its broader coverage in Natural Sciences and Engineering, as established by Philippe Mongeon and Adèle Paul-Hus in their comparative analysis of journal coverage [4]. This study also noted a 63% overlap between Scopus and WoS, justifying the choice to use only one of these databases to avoid redundancy. Meanwhile, the overlap between ACM and Scopus was deemed low, making ACM a valuable additional source

for accessing literature specific to computing and IT. This selection strategy ensures coverage of high-indexed and good journals, important for a comprehensive review of the topic.

The search was conducted using the string: *"soft skills" AND ("IT specialists" OR "information technology" OR education) AND ("development" OR "employability" OR "integration").* This search aimed to capture a broad spectrum of articles discussing the development, relevance, and educational theories of soft skills specifically tailored for IT professionals.

The search criteria used for retrieving relevant articles from the Scopus and ACM databases are summarized in Table 1. This table outlines the database names, search keywords, date ranges, and language filters employed in the search process.

Table 1. Summary of Search Criteria for Scopus and ACM Databases

Scopus	*ACM*
- Field of Study: Computer Science, Social Sciences, and Engineering. *- Document Type: Review papers and research articles.* *- Time Frame: From 2010 to April 2024, based on the relevance and contemporary significance of the literature.* *- Language: Articles published in English.*	*- Document Type: Research articles.* *- Time Frame: Articles published from 2010 onwards, following the same rationale as for Scopus to ensure the relevance of the data.*

The initial screening was based on titles and abstracts using pre-defined questions aligned with the study's hypotheses. This was followed by a full-text review to ensure the articles adequately addressed the research questions and hypotheses.

Screening Questions

Hypothesis 1: Soft skills are positively associated with job performance and employability among IT specialists.

- Question 1: Does the article investigate the impact of soft skills on job performance or employability in the IT sector?

- Question 2: Are specific soft skills linked to positive outcomes in professional IT settings within the article?

Hypothesis 2: Educational interventions that incorporate soft skills development into IT curricula improve student outcomes and preparedness for the workforce.

- Question 1: Does the article evaluate or discuss educational programs or interventions aimed at developing soft skills within IT education?

- Question 2: What are the reported effects of these interventions on student outcomes or workforce preparedness?

General Screening Questions

- Question 1: Is the article a research study, literature review, or theoretical analysis that directly relates to soft skills in the IT sector?

- Question 2: Does the study provide empirical data or theoretical insights that can inform the development, integration, or impact of soft skills in IT professions?

Data extraction focused on identifying information relevant to the hypotheses, including types of soft skills discussed, the context of their application, methodologies used for teaching these skills, and the outcomes related to IT professional practice. A standardized form was used to extract data, which included study design, population, interventions, outcomes, and conclusions.

The quality of each selected article was assessed using established criteria to ensure reliability and validity of the findings. This included evaluating the clarity of data presentation, the appropriateness of the methodologies used, and the strength of the evidence provided.

The findings from the selected articles were synthesized qualitatively. Themes were identified based on the frequency and significance of findings related to the hypotheses. The synthesis aimed to provide a comprehensive understanding of the role of soft skills in IT education and their impact on employability and job performance.

This methodology ensures a thorough and systematic review of the literature, providing a robust foundation for understanding the current landscape of soft skills in the IT sector and their critical role in shaping the future of IT education and professional practice.

Results of the study

The systematic search conducted in the Scopus and ACM databases yielded a substantial number of articles relevant to the integration of soft skills in IT education. The search in Scopus resulted in 921 matches, with publications dating back as far as 1985. However, for the purpose of maintaining a focus on contemporary practices and theories, only articles published from 2010 onwards were considered, narrowing down the selection to 886 articles. Of these, 814 were published in English and were included in the further screening process.

In ACM, the first relevant article appeared in 2007, with a total of 971 matches found by the search. Consistent with the Scopus approach, only articles published after 2010 were included, resulting in 904 matches that were considered for detailed review. After rigorous screening based on title and abstract relevance, 64 papers from Scopus and 57 from ACM were identified as suitable for further review. Following a comprehensive full-text review, this number was further narrowed down to 22 papers from Scopus and 15 from ACM, which precisely addressed the integration of soft skills into IT curricula and their impact on employability. Table 2 displays the distribution of papers that adequately answered the screening questions, highlighting a robust focus on the development of soft skills and their impact on job performance and employability among IT specialists.

*Table 2. Response to Screening Questions by Included Papers*

Paper Title	*Discusses Soft Skills Development? (Y/N)*	*Focuses on IT Specialists? (Y/N) (P-partially)*	*Addresses Impact on Job Performance? (Y/N)*
Soft skills to enhance graduate employability: comparing students and employers' perceptions	*Y*	*P*	*Y*
Enhancing individual employability: the perspective of engineering graduates	*Y*	*Y*	*Y*
Bringing the Human Factor to Software Engineering	*Y*	*Y*	*Y*
Enhancing employability in engineering and management students through soft skills	*Y*	*Y*	*Y*
Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning	*Y*	*P*	*Y*
Operationalisation of soft skill attributes and determining the existing gap in novice ICT professionals	*Y*	*Y*	*Y*
Evaluating the demand for soft skills in software development	*Y*	*Y*	*Y*
Peer assessment of soft skills and hard skills	*Y*	*Y*	*Y*
Development of the employability skills assessment	*Y*	*Y*	*Y*
Cooperative learning and soft skills training in an IT course	*Y*	*Y*	*Y*

Emotions and interpersonal skills for IT professionals: An exploratory study	*Y*	*Y*	*Y*
Critical IT project management competencies: Aligning instructional outcomes with industry expectations	*Y*	*Y*	*Y*
Assessing alignment between information technology educational opportunities, professional requirements, and industry demands	*P*	*Y*	*Y*
Emotional maturity and employer satisfaction: A study on recruitment of information technology graduates	*P*	*Y*	*Y*
Assessing both the Know and Show in IT Service-Learning	*Y*	*Y*	*Y*
Balancing skills in the digital transformation era: The future of jobs and the role of higher education	*Y*	*P*	*Y*
Technical and non-technical education and the employability of engineering graduates: an Indian case study	*Y*	*Y*	*Y*
Using virtual interactions to enhance the teaching of communication skills to information technology students	*Y*	*Y*	*Y*
Information technology asymmetry and gaps between higher education institutions and industry	*Y*	*Y*	*Y*
A Project-Based Learning Approach for Enhancing Learning Skills and Motivation in Software Engineering	*Y*	*Y*	*Y*
Soft Skills: What do Computing Program Syllabi Reveal About Non-Technical Expectations of Undergraduate Students?	*Y*	*Y*	*Y*
Hackathons as a Pedagogical Strategy to Engage Students to Learn and to Adopt Software Engineering Practices	*Y*	*Y*	*Y*
Bridging the Digital Skills Gap∗ Are computing degree apprenticeships the answer?	*Y*	*Y*	*Y*
Faculty Views on the Goals of an Undergraduate CS Education and the Academia-Industry Gap	*Y*	*Y*	*Y*
Assessing Students' IT Professional Values in a Global Project Setting	*Y*	*Y*	*Y*
Assessing the Impact of the Distributed Software Development Course on the Careers of Young Software Engineers	*Y*	*Y*	*Y*
Knowledge, Skills, and Abilities for Specialized Curricula in Cyber Defense: Results from Interviews with Cyber Professionals	*Y*	*Y*	*Y*
Going soft on soft skills: A qualitative study of student supervisor perspectives of the impacts of COVID-19 on soft skill development in students	*Y*	*P*	*Y*
How COVID-19 impacted soft skills development: The views of software engineering students	*Y*	*Y*	*Y*

The review of the selected papers emphasized the critical soft skills necessary for IT professionals, identified as:
- Communication: Essential for collaboration and clarity in IT projects.
- Self-Motivation (Initativeness): Key in driving self-directed projects and continuous learning.
- Teamwork: Crucial for successful project execution in team-based environments.
- Result-Oriented: Important for aligning efforts with business outcomes.
- Problem Solving: Necessary for addressing and resolving technical issues.
- Interpersonal Skills: Required for effective client and team interactions.

These competencies were visualized in a bar chart (Figure 1), which provided a breakdown of the emphasis each skill received across the reviewed literature.

Emphasis on Each Soft Skill Across Reviewed Literature
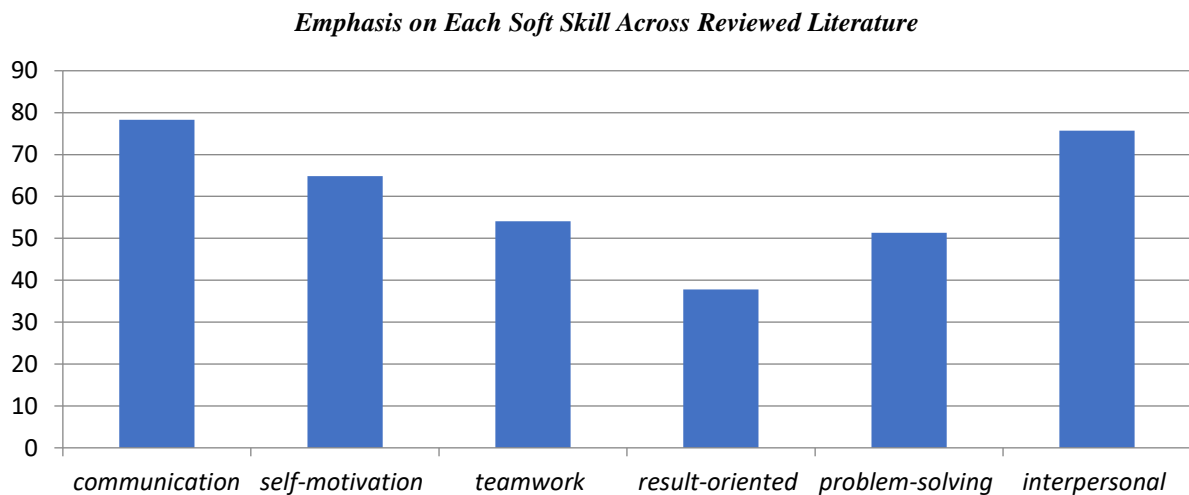
Figure 1. Emphasis on Each Soft Skill Across Reviewed Literature

The studied articles encompassed a wide range of topics related to the development and assessment of soft skills in Information Technology (IT) students. The following sections provide a summary of the key findings from these articles. In [1] authors highlighted a significant disparity between the soft skills that students believe are important for employability and those that employers prioritize. Employers often value communication, teamwork, and problem-solving skills more than technical expertise, which students may not fully appreciate. The perceptions of engineering graduates regarding the importance of soft skills in their careers were studied in [5]. The study found that while technical skills are essential, soft skills such as communication and adaptability are equally important for career success. The authors also indicated that employers generally think self-initativeness and creativity is key soft skills in employability. Authors in [6] emphasized the importance of soft skills, such as communication and teamwork, in software engineering projects. The paper argued that while technical skills are necessary, they are not sufficient for project success, and soft skills play a crucial role in enhancing team dynamics and collaboration. The industry's demand for soft skills among software developers was addressed in [7]. The study found that employers increasingly value soft skills such as communication, creativity, and problem-solving, alongside technical skills, in software development roles. "Peer assessment of soft skills and hard skills" discussed the use of peer assessment to evaluate both soft and hard skills in IT students. The paper highlighted the benefits of peer assessment, such as promoting self-reflection and providing students with constructive feedback to improve their skills [8]. "Cooperative learning and soft skills training in an IT course" examined the effectiveness of cooperative learning strategies in developing soft skills in IT students. The study found that cooperative learning promotes collaboration, communication, and problem-solving skills, which are essential for success in the IT industry [2].

This finding aligns with the broader literature that underscores the value of active, collaborative learning approaches in enhancing students' ability to work effectively in team-based environments, a key requirement in IT professional practice [9]. The project-based learning (PBL) experience in a Spanish university's software engineering program showcased the effectiveness of student-centered approaches in bridging theory and practice. The PBL approach, implemented through small, diverse teams, allowed students to tackle real-world software development challenges, emphasizing skills like teamwork, leadership, and initiative. A key feature was role rotation and documentation transfer, enabling students to engage in various tasks and challenges throughout the project. The assessment included both teacher ratings and peer assessments, reflecting a holistic evaluation of student performance. The results demonstrated that PBL significantly enhanced students' skills, preparing them more effectively for future roles as software engineers.

Similarly, authors in [10] examined the non-technical skills expected of undergraduate computing students by analyzing 278 non-technical syllabi from 110 universities in 30 European countries. It found that while skills like teamwork and communication were commonly emphasized, others such as creativity and empathy were less frequently highlighted, suggesting a need for greater emphasis on a broader range of non-technical skills in computing programs.

Another work that studied educational interventions incorporating soft skills investigated the use of hackathons as a pedagogical strategy in undergraduate computing programs to motivate students to practice software development and enhance social skills through group work. It examined students' motivations for attending, perceptions of, and practices during hackathons. Findings indicated that students enjoyed the informal learning environment of hackathons for improving technical skills and networking, offering insights for educators seeking non-traditional teaching methods [11].

The study "Operationalisation of Soft Skill Attributes and Determining the Existing Gap in Novice ICT Professionals" examines the importance and gap in soft skills among new entrants in the information technology sector. It identifies 53 soft skill attributes and categorizes them into six significant factors: personal skill, leadership skill, interpersonal skill, team skill, enterprising skill, and organizational skill. The research highlights the importance of these skills in the ICT sector and the need for academic institutions to review their methods to enhance students' employability. The findings provide valuable insights for educators, employers, and policymakers to bridge the gap between industry expectations and students' preparedness in soft skills, ultimately contributing to the future success of novice ICT professionals [12].

The article "Balancing Skills in the Digital Transformation Era: The Future of Jobs and the Role of Higher Education" explores the evolving job market in the context of digital transformation and the role of higher education in preparing students for future careers. The study likely delves into the changing skillsets required by employers, emphasizing the need for a balance between technical and non-technical skills. It might discuss how higher education institutions can adapt their curricula to meet these demands, potentially highlighting the importance of soft skills, adaptability, and continuous learning. The article likely provides insights into how educators can better prepare students for the future job market, ensuring they have the skills needed to thrive in a rapidly evolving digital landscape [13].

In [14] and [15] investigated the impact of the COVID-19 pandemic on the development of soft skills among IT students. The studies found that the shift to online learning and remote work during the pandemic posed challenges for soft skills development, particularly in areas such as communication and teamwork.

This systematic literature review revealed a critical need for educational institutions to adapt their curricula to better meet the demands of the IT industry, particularly in the development of soft skills such as initiativeness and result-oriented problem-solving. The findings underscore the importance of innovative educational strategies that provide real-world experience and a closer alignment with industry expectations, ultimately enhancing the employability of IT graduates.

Discussion

The findings reveal a good alignment of current IT education with the soft skills demanded by the industry, particularly in communication and teamwork. However, the less frequent emphasis on result-oriented and self-motivation skills suggests potential areas for curriculum enhancement to meet evolving industry standards.

The review highlighted innovative educational strategies like project-based learning and cooperative learning as effective in embedding soft skills in IT curricula. These methods not only address technical skill development but also enhance essential interpersonal and problem-solving skills, preparing students for real-world challenges.

Challenges in updating curricula to keep pace with rapid technological advancements and industry demands were evident. However, the increasing incorporation of soft skills into IT education presents significant opportunities for enhancing graduate employability and meeting the nuanced needs of the IT sector.

Conclusion

The systematic literature review confirmed that while significant progress has been made in integrating soft skills into IT education, gaps still exist, particularly in developing initiative and result-oriented competencies. The strong emphasis on communication and teamwork across the studies underscores their importance in both educational settings and the workplace.

Future research should explore effective strategies for integrating less emphasized soft skills, such as result-orientation and initiative, into IT curricula. Additionally, longitudinal studies could be beneficial in assessing the long-term impacts of current educational strategies on IT graduate employability.

This review suggests that IT education programs should continue to evolve, incorporating a balanced mix of soft and technical skills to better prepare students for the complexities of the modern workplace. Close collaboration with industry professionals can help ensure that curricula remain relevant and responsive to the dynamic IT landscape.

These sections synthesize the hypothetical findings, discuss their implications, and conclude with recommendations for future research and educational practice, providing a comprehensive overview of the current state of soft skills integration in IT education.

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