AI tools and their application for developing soft skills of computer science students: the perspectives of IT specialists and university teachers

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AI tools and their application for developing soft skills of computer science students: the perspectives of IT specialists and university teachers

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Abstract. An attempt to understand whether artificial intelligence (AI) technology can help enhance the development of soft skills of the graduates of the faculties of information technologies and today's computer science (CS) students is the aim of the paper. The descriptive method and expert survey method were applied to this study. The study found that nowadays, there are AI tools for solving professional tasks in the IT industry that require the use of developed soft skills. Among the most widely used tools are AI Chats, AI-powered apps for improving the content of texts and text correction, platforms for efficient work with the involvement of AI technology. Two surveys were conducted as a part of the research: among IT specialists, and among university teachers who teach CS students. Resulting from the performed study it was determined that the more experienced the survey participants were, the more often they were satisfied with the results of using AI in their professional activities, agreed that AI is effective for work assignments that require a soft skill to resolve them effectively, were more likely to consider the use of AI in the professional training of IT majors appropriate.

1. Introduction

The technical (hard) skills of those who work in information technology (IT) are undoubtedly fundamental. However, as scientists stated, in the past decade, "soft" skills have been more frequently required than "hard" skills [1]. In the World Economic Forum's "Future of Jobs 2023" report, cognitive skills topped the list of those skills that were considered the most important skills to workers in 2023 (figure 1).

Creative and analytical skills rank first in the list of skills (figure 2), the importance of which is projected to increase for employees by 72% during the next five years.

Figure 1. Top skills of 2023 according to the World Economic Forum's "Future of Jobs 2023" report [2].

Figure 2. Top skills on the rise according to the World Economic Forum's "Future of Jobs 2023" report [2]

So, employers in the IT sphere also need not only technical knowledge from workers who work for them but also professional skills that would allow the firms to achieve more and better results. Today's work requires IT workers not only technical knowledge and skills in the IT field. They must also have the skills at the intersection of disciplines.

Currently, AI is at the forefront of technology, research, and education [3–12]. In this regard, the following question logically arose: Why not use AI technologies, particularly AI tools, to work on the development of soft skills (SS) of today's computer science (CS) students?

The current research **aims** to answer the above-stated question. For this, the research questions (RQ), as prompts, are determined to discover the essence of the current study's aim:

RQ1. What AI tools are available today and applicable to decide work tasks in the IT sphere that require strong soft skills to resolve them?

RQ2. What is the opinion of experienced specialists in information technology and university teachers regarding using AI tools to decide professional IT-related tasks, the implementation of which requires strong soft skills?

RQ3. Is using AI tools for soft skills development appropriate while training IT majors?

2. Literature review

Today, skills such as being a team player, self-motivation, verbal communication, problem-solving, and being proactive are often among the highest-ranking skills for employment. In the same way, the ability of employees to work well independently, in a proactive and self-motivating manner, and work effectively in a team is valued [13]. When interviewing CS graduates, the participants valued professional SS above technical hard skills [14]. It is believed that 84% of the workforce insists job candidates must demonstrate SS [15].

Moreover, based on their research [16] scientists noted that in such a rapidly changing technological era, experienced professionals value soft skills, particularly efficient communication skills, rather than hard skills. It should also be noted that they value soft skills with equal importance or even higher than hard skills. This study also showed that the soft skills gaps in the non-computing curriculum are much more significant than the gaps in computing disciplines. At the same time, the formation and development of soft skills enable the students not only to meet the requirements of the labor market but also to develop professional skills (hard skills) more successfully [17].

So that is why there is a pressing need to upgrade and renovate training programs for IT specialties to meet better the expectations of the leading figures of the IT industry regarding the training of a new generation of IT majors, resulting in the improvement of their soft skills. Scientists offered several methods, technologies, and approaches to forming and developing soft skills in IT majors. In particular, Milczarski et al. [18] involve multinational and interdisciplinary teams of students in teamwork for game development. In their view, this teamwork contributes to the communication and collaboration of IT students from diverse backgrounds. Paredes-Velasco et al. [19] proposed a pedagogical approach based on interdisciplinary practice and realistic problems to cultivate, enhance, or deepen the teamwork skills of CS students. In scientists' opinion, a project-based learning technology is a good way to develop the soft skills of CS bachelor students [17]. Abernethy and Treu [20], with a like-minded team of researchers, worked under the IT curriculum for undergraduate IT programs. Moreover, Abernethy and Treu [20] proposed one of the most interesting approaches appropriate for developing communicative skills in authentic surroundings: to use projects oriented to the customers, which are the training courses in which real customers take part. By applying this approach, students gradually build up their soft skills, as acquiring and applying this approach requires students' competence in interpersonal interaction and the use of communication skills. At the same time, applying this approach allows for developing or improving IT majors' communication skills in training, simultaneously with applying well-developed hard skills in the design, implementation, coding, and testing of IT products. No less interesting is the use of the design thinking methodology, which promotes the production of creative and innovative software solutions required for software

development by means of simulating scenarios of real projects that require innovative decisions [21].

These studies have received positive results. Engaging students to work in multinational and interdisciplinary teams for game development allows IT educators to give students an idea of how modern IT companies work and contributes to the development of effective practical project management skills. As a result of applying an interdisciplinary approach, students are gradually improving their ability to work and collaborate in a team. The method of using project-based learning technology also contributes to progressively increasing the level of soft skills formation for CS bachelors. Namely, it is about forming personal effectiveness, communication, managerial, strategic, and information management skills. Applying a project development approach involving real customers allows students to practice communication skills, bridging the gap between theory and practice. Implementation of the Design Thinking methodology promotes the development of communication skills. Also, it contributes to forming problem-solving skills, increasing creativity, supporting effective practical teamwork ability, and diversifying and critical thinking. Although these methods have proven effective, traditional curricula (training programs) pay much more attention to developing technical hard skills over soft skills, potentially leaving shortcomings in the professional training of IT majors. It remains, and constantly increasing, a noticeable gap between the soft skills that employers seek and require and those skills, mainly well-developed hard skills, that IT students usually obtain after graduation. This situation shows the ratio between academic training and IT industry needs [22].

It is important to remember that the world is moving forward, and new technologies (AI tools) can be applied so that IT professionals with low soft skills can demonstrate higher-level skills and be more productive in their work. AI is a trend in modern society and the point of interest for both students and teachers. Integrating AI into developing the soft skills of IT students is increasingly recognized as essential for students' future professional activity and successful fulfilment of working tasks. Recent scientific publications emphasize the potential of applying AI technology to improve the soft skills of IT majors [5–7]. Recent research confirms the positive cases of applying AI to develop soft skills. At the same time, the necessity to deeply study the ways of using and evaluating the effectiveness of AI in training is still relevant, and it exists [8]. Let us note that scientists [9] emphasize that to bridge the skills gap between industry demands and technical proficiency, academic institutions should incorporate creative teaching approaches that prioritize soft skills like problem-solving, teamwork, and communication.

Thus, the literature analysis has led us to believe that a strong soft skill set to work effectively in the IT industry is a requisite facet of the labor market requirements. Employers increasingly value teamwork, communication, problem-solving, etc. However, soft skills development at IT faculties is often given insufficient attention. To solve this issue, researchers propose various methods for developing soft skills in IT education, including project-based learning, interdisciplinary teamwork, and the integration of AI tools, while highlighting the need for academic institutions to adapt their curricula to better align with IT industry demands. So, the literature analysis confirms the relevance of the research questions posed.

3. Theoretical background

Soft skills and AI – are essential in the modern business reality in general and the IT industry in particular. Scientists claim that while AI excels at automating technical tasks and routine activity, the key to productive and profitable work – is a thriving, successful, and prosperous workforce and a unique human ability to foster soft skills for their intended purpose [23]. Are soft skills essential for IT professionals? It is possible to assert that soft skills are critical to long-term cooperation and teamwork. The terms that are used for characterizing soft skills vary in different sources.

Technical and professional skills are defined more or less clearly [14]. Some notions are given

below:

(i) Technical skills involve discipline-specific knowledge [24], particularly engineering or computing skills;

(ii) Professional skills include interpersonal and intrapersonal skills, which are, in principle, independent knowledge. They consider everything from lifelong learning to the understanding of ethics and professionalism [25] and are also known as generic competencies [26], transversal, key, professional, soft, and 21st-century skills [27].

Hard skills can be recognized as technical skills acquired due to an academic qualification. Conversely, soft skills are personal life skills and are more subjective [28]. However, there are variations of these definitions, as can be seen in figure 3.

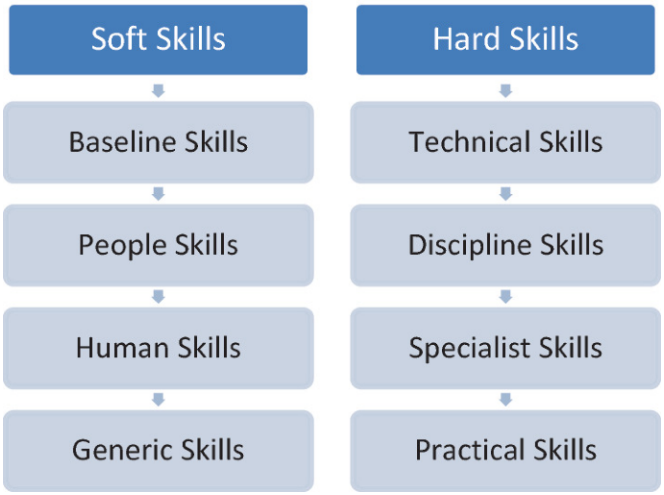

Figure 3. Baseline skills – scaffolding soft skills development within the curriculum [28].

The question of developing soft skills is common, but it remains relevant for today's educational process at the university level. Soft skills, generally characterized as non-technical skills that allow individuals to interact effectively and harmoniously with others, are essential to companies and can impact culture, perspectives, administration and supervision, mindsets, and behaviors. Soft skills fall into the categories [29]: advanced communication and negotiation skills, interpersonal skills and empathy, leadership and management skills, entrepreneurship and initiative-taking, adaptability and continuous learning skills, and teaching and training skills.

As defined in Cambridge Advanced Learner's Dictionary & Thesaurus, the notion of "soft skills" refers to an ability that does not depend on the knowledge needed for one particular job but on, for example, being able to work well in a team or communicate well with people [30]. As stated in the document "Criteria for Accrediting Computing Programs by Accreditation Board for Engineering and Technology (ABET)" [31], considering all existing student outcomes that enable graduates to attain a mastery of a Computing field, one can distinguish the following soft skills: (1) communicate effectively in a variety of professional contexts; (2) recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles; (3) function effectively as a member and leader of a team engaged in activities appropriate to the program's discipline.

Let's consider the data from the documents "Criteria for Accrediting Engineering Program by ABET" [32]. We obtain a more exhaustive list of results for students who are studying Engineering Programs. This list includes the following range of skills: (1) an ability to

communicate effectively with a range of audiences; (2) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts; (3) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives; (4) an ability to acquire and apply new knowledge.

So, as of today, there are no established views on the list of soft skills essential for CS students. However, many scientists, as well as document creators, such as authors of the document "The Criteria for Accrediting Engineering and Computing Programs", emphasize the importance of specific skills. In particular, scientists highlight the importance of soft skills, such as **communication skills**, for clear and effective interaction within teams and with stakeholders [9, 33, 34]; **teamwork and cooperation** that vital for effective practical work in team projects and the real world [9, 34, 35] and encourage the development of interpersonal skills and the ability to work harmoniously with others [36, 37]; **problem-solving skills** that necessary for identifying, analyzing and solving complex issues [9, 33, 34] and for increasing critical thinking and the ability to methodically approach problems [35]; **interpersonal skills** that include active listening, the ability to build relationships [38] and creating a positive work environment and effective collaboration [36]. In researchers' view, no less required are **time management and organizational skills** that are essential for managing workloads, meeting deadlines, and prioritizing tasks [37] and help maintain productivity and efficiency in a rapidly evolving environment [28]; **self-management skills** that are important for continuous personal and professional growth [38]; **leadership skills** that assist in decision making by taking responsibility [33, 36], encourages initiative and the ability to influence and motivate others; **creativity** that encourages thinking outside the box and developing new solutions and essential for adapting to new challenges and driving technological advancements [35].

Thus, based on the analysis of research relating to the development or enhancement of soft skills in the professional training of CS students (Introduction Chapter of the current research) and the above list of soft skills for Engineering and Computing Programs by ABET, we have identified a list of soft skills for our study.

4. Methodology

This study employed the descriptive method [39] and the expert survey method [40, 41]. Exploiting the descriptive method made it possible to analyze scientific papers and internet material to determine the appropriate AI tools for performing professional tasks requiring soft skills. The expert surveys were used to answer the RQ2 and RQ3. The target survey group consisted of IT specialists and university teachers (IT educators) who teach CS students. Applying a qualitative research method made it possible to process collected data, analyze this data, and answer research questions. The point of concern mirrored in the survey was the use of AI tools to complete professional tasks involving students' soft communication skills ability. It was also important to consider the feasibility of using AI tools in the professional training of future IT specialists. All survey participants were briefed on the study and consented to participate. The survey used the Google Forms tool with privacy settings.

4.1. Methods for analyzing the research to select existing AI tools for performing professional tasks related to soft skills

Aiming to analyse existing AI tools that help perform professional tasks that require applying well-developed soft skills, we searched for scientific publications in the platform Scispace. We asked two questions on this platform:

(Q1/Scispace) Are there any scientific articles that suggest the use of AI in the process of developing soft skills for students who major in CS?

(Q2/Scispace) How does using AI tools contribute to developing the soft skills of students majoring in CS?

We received a list of 100 scientific articles for every stated question – Q1/Scispace & Q2/Scispace – mentioned above. Scientific papers were evaluated for their correspondence to the inclusion and exclusion criteria table 1.

Table 1. Inclusion and exclusion criteria.

Inclusion	Exclusion
Peer-reviewed scientific publications involving higher IT education	Scientific works not related to higher IT education
Include topics of forming or developing SS in IT students with the help of AI tools	Not include topics of forming or developing SS in IT students with the help of AI tools
Published between 2022 – 2024	Published before 2022, published in a language other than English
Published in English	Closed access
Open access	Duplicates

After employing inclusion and exclusion criteria, eight studies were included in the analysis (figure 4). We also searched in the Scopus AI. Among the available functions of this tool (a Summary, an Expanded summary, a Concept map, Topic experts, "Go deeper", Emerging themes), we used Summary and Expanded summary to search for relevant scientific sources related to the topic and issues of artificial intelligence tools that contribute to the development of soft skills in CS students.

We received 16 scientific articles in response to the question we had posed in Scopus AI (Is using AI tools for soft skills development appropriate while training IT majors? (Q3/ Scopus AI)). Then, we checked the articles for compliance with the inclusion and exclusion criteria. Two studies were included in the analysis. Thus, 10 articles were included in the analysis (figure 4).

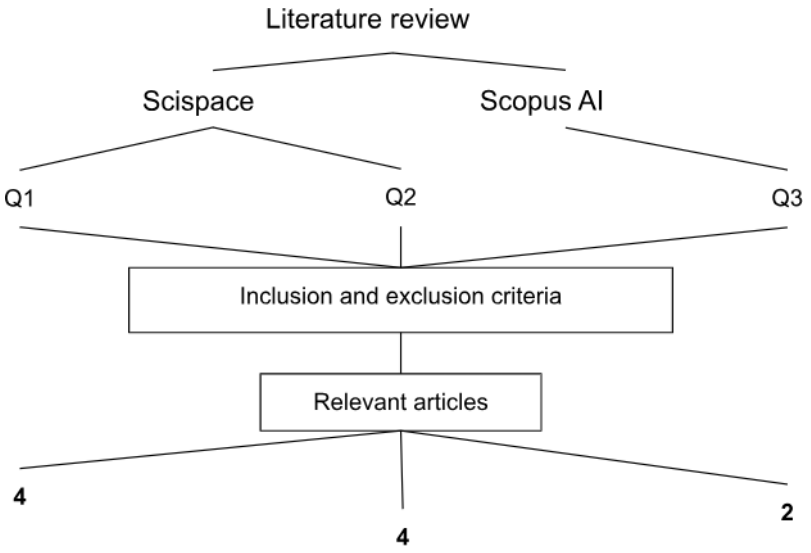

Figure 4. The results of searching for scientific publications in Scispace and Scopus AI.

We were trying to find the answer to the first question (RQ1: What AI tools are available today and applicable to decide professional tasks in the IT sphere that require applying well-developed soft skills) by analyzsing scientific publications. However, the search results needed to be comprehensively studied. For this reason, we searched for information on Internet resources, keeping in mind the soft skills listed and characterized in the "Theoretical background" section of this research. We exploited Google Search to find answers to the following questions:

(1) Which AI tools are used for communication and provide clear and effective communicative interaction between the team members and stakeholders?
(2) Which AI tools are used in teamwork and collaboration in IT companies and the IT sphere in general?
(3) Which AI tools are used for problem-solving in the IT industry?
(4) Which AI tools are used to foster interpersonal communication among specialists in information technology?
(5) Which AI tools are used for time management and organizational processes in IT companies?
(6) Which AI tools are used for the self-management of specialists in information technology?
(7) Which AI tools are used by the IT industry's leaders (e.g., the CEO or executive director) to perform tasks?
(8) Which AI tools are used to find creative solutions and new ideas for the IT industry?

The results of the Internet materials analysis are presented in the section 5.1.

4.2. Expert survey method

The survey among specialists in information technology and university teachers who teach CS students was conducted in November and December 2024. Collecting and processing the opinions was carried out online with the Google Forms application. Private data were not collected. Two surveys were proposed. The first survey was proposed for the IT specialists. The second survey was proposed for IT educators.

Survey one for IT specialists (Appendix A) consisted of seventeen questions. These questions were presented in five sections: (1) general information (gender identity, experience of working in the IT sphere, degree in education); (2) information about the company where the expert – a specialist in IT technology – works; (3) experience in using AI (questions related to the use of AI for working in the IT sphere, the use of AI in the training of CS students, the purpose of using AI in training of CS students); (4) experts' opinion on the use of AI tools in the professional training of CS students; (5) the purpose of the use of AI in the preparation of the CS students and own professional activities.

Survey two consisted of nineteen questions and was offered to university teachers who teach CS students (Appendix B). These survey questions were presented in six sections: (1) general information (gender identity, the experience of working with CS students); (2) information about the university where the teacher works; (3) experience of using AI in everyday professional practice; (4) opinion on the use of AI in professional training of CS students; (5) the purpose of the use of AI in the training process, and their work. The results of the surveys and their analysis are presented in the section 5.2.

5. Results

5.1. AI tools and AI technology that are applicable for developing, improving and applying soft skills

Considering the results of a search of the scientific publications in Scispace and Scopus AI we have analyzed 10 documents that hypothetically could shed light on the existing AI tools that

are applicable for developing, improving, and applying soft skills in the professional IT sphere. The results of the conducted analysis are presented in table 2.

Table 2. AI tools and technology for applying soft skills in the professional IT sphere.

Types of soft skills	AI technology / AI tools	Source
Communication skills Collaboration skills	Fuzzy rules and machine learning techniques	[42]
Communication, critical thinking, creativity, leadership, adaptability, and emotional intelligence	AI-based personalized learning platforms	[43]
Communication skills, critical thinking, team skills, empathy in communication, etc.	ChatGPT, Grammarly, Google Bard (Gemini), Notion, Midjourney	[8]
Communication, negotiation, problem-solving, finding a common language with colleagues and clients, public speaking, and intercultural	Microsoft Copilot, AI tools for public speaking (Yoodli, Verble, Gabble, Virtual Orator, Orai)	[5]
Communication skills (for reducing social anxiety)	Cross-platform application utilizing AI	[44]
Critical thinking, problem-solving abilities	GenAI-Based virtual assistants	[45]
Communication skills, collaboration skills, creativity skills, critical thinking skills, problem-solving skills	Intelligent tutoring systems, AI chatbots, automated assessment systems, dashboards	[46]
Critical thinking, problem-solving	ChatGPT	[47]
Collaboration, communication	Intelligent tutoring systems, adaptive learning platforms, AI-powered VR and AR, virtual assistants, automated grading systems, natural language processing, data and learning analytics and chatbots	[48]

Considering the results of a search of Internet sources related to the use of AI tools for developing, improving, and then applying soft skills in the IT sphere, we have compiled a list of AI tools applicable to completing professional tasks in the IT industry. The results of the conducted analysis are presented in table 3.

So, based on the search for scientific publications in Scispace and Scopus AI, we found out which AI tools, according to scientists, can be used by IT students to perform future professional tasks related to their use of soft skills. This list has been expanded by analyzing Internet sources. To harmonize theory and practice, we surveyed specialists in IT and university teachers who teach CS students, and the results and analysis are given in the following subsection.

5.2. Survey analysis and figuring the correlation between the experience and the extent of use of AI by specialists in IT and university teachers who teach CS students

The survey was aimed at 1) gathering and analyzing the points of view of specialists in IT and university teachers who teach CS students on the use of AI tools for carrying out tasks,

Table 3. AI tools for performing professional tasks in the IT-sphere for which SS are essential.

Soft skills	AI tools
communication skills	*Microsoft Teams, Slack, and Zoom* with AI are used to summarise conversations, prepare transcripts, etc. [49]; *Jasper.ai* – to create high-quality written content using AI; *ChatGPT* – to conduct natural language processing and communication; *Grammarly* – to improve the quality of writing following grammar and style suggestions [50].
teamwork and collaboration	*TARA* is used to optimize the efficiency and performance of teams based on identifying spheres that have to be improved and providing personalized resources to help them achieve their goals; *Notion* – to automate repetitive tasks and provide advanced productivity tools, and *Taskade* – to optimize project management processes and productivity, automate repetitive tasks and provide tools for collaboration [51].
problem-solving skills	*Fordi AI* is used to answer work-related questions; it also helps one find solutions for everyday tasks and offers ideas. Correspondently, *ShotSolve* – to decide the issue immediately by taking screenshots. *Texti* – to supports problem-solving and collecting information by seeing a real-time preview.
interpersonal skills	*Mindreader* enhances communication by analyzing linguistics and physiognomy, providing personalized insights and recommendations for effective communication.
time management and organizational skills	*Microsoft 365 Copilot* is used to provide each employee with a Copilot as a personal assistant [52]. *PPM Express* – to perform project portfolio management, project planning, execution, and monitoring; *Asana* – to do work management, combining task management functions, project planning, and team collaboration; *Monday.com* – to conduct team communication and provide a visual platform for the teams to collaborate on projects and tasks [53].
self-management skills	*Clara* is helpful in scheduling the meetings, communicating with the participants, and adding details to the calendar; *ClickUp* – in workplace productivity, time tracking, and prioritizing tasks based on urgency and importance. *Reclaim* – in calendar management and time tracking [54].
leadership skills	*Trello* with Butler is good for automatization of tasks. Otter.ai – for capturing meetings in real-time. *Monday.com* – for projects management. *Zapier* – for connecting many apps. *X.AI* – for scheduling calls and meetings. *HubSpot* – for marketing and sales on autopilot. *Evernote* – for organisation notes and tasks. *Crystal* – for improving personality communication. *Microsoft Power BI* – for making data clear. Hootsuite – for managing social media and other things [55].
creativity	*Midjourney, DALL-E*, and *Adobe Firefly* are used to generate images and change typography and colours based on user prompts; *Synthesia* – to develop video projects; *Looka Logo Maker* – to create logos and brands [56]; *Miro AI* – to automatically create mental maps and summarize and turn ideas into effective roadmaps. *Startup.ai* – to generate ideas for start-ups; *Dime A Dozen* and *Feedback by AI* – to test ideas and receive feedback [57].

the performance of which requires having well-developed soft skills of students who major in IT, and 2) clarifying the feasibility of using AI tools in the professional training of future IT specialists to perform the tasks related to the applying soft skills. Two surveys were prepared (see Appendix A and Appendix B).

5.2.1. Results of survey analysis: perspectives of IT specialists. The 30 IT specialists participated in the survey. Most surveyed are men (73.3%), and women are a minor part of the respondents (26.7%). 40% of respondents have been working in the IT sphere for 10-20 years, and 30% of the respondents have working experience from 5 to 10 years. Note that 13.3% of surveyed IT specialists are luminaries of IT, as their working experience is more than 20 years. The same number of respondents have been working in IT for 3-5 years. And 3.3% have been working in IT for not over 3 years (figure 5). So, most surveyed participants are experienced professionals with extensive backgrounds.

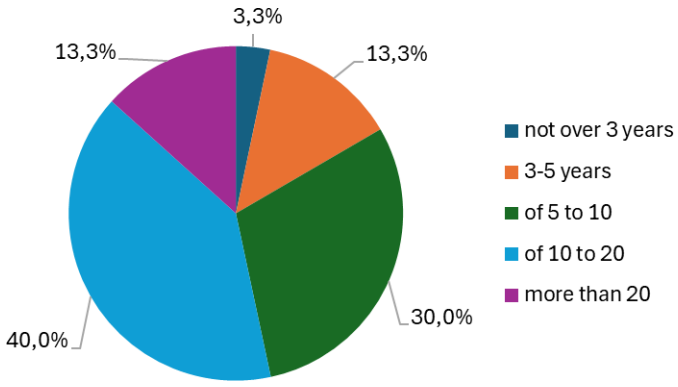

Figure 5. Work experience in the field of IT.

Most of the surveyed IT specialists have a master's degree in education (53.3%). Some respondents have a bachelor's degree in education (26.7%). Respondents have an academic degree in higher studies in IT, i.e., PhD, Post Doc, or Doctor of Science, or passed certified training courses, 3.3% each. So, most respondents obtained an academic degree in IT.

IT specialists who took part in the survey obtained different positions in the IT industry. Among them: web developers (20%), soft developers (16.7%), IT project managers (10%), system administrators (10%), engineers (6.7%), CEO of AI company (3.3%), etc. The respondents are from Ukraine (44.8%), Norway (17.2%), the USA (10.3%), Poland (6.9%), etc. The surveyed participants work for different famous companies and organisations, such as GSC Game World, Initial Force AS, Kaco Systems, Q-Free, Ciklum, BetterMe, SecurePractice, Sporttradar, Ninja Holdings, InfoTech, Intellope, Execon One, State Emergency Service, etc.

To the question, "Which AI tools / or AI-powered apps do you use to help with work tasks that do not involve programming skills (e.g., communication, organization, administration, etc.)", most of the IT specialists responded – AI chats (Microsoft Copilot, Gemini, ChatGPT, Assistant Poe) (86.7%). 26.7% of the surveyed participants use AI-powered apps to work on improving the text and for text correction (Grammarly, Quillbot); 16.7% – to efficiently work with the involvement of AI technology (Microsoft 365 Copilot); 10% – to work with projects (Taskade, Notion); 6.7% of respondents work with AI art generators (Night Cafe Creator, Microsoft Image Creator). Respondents were asked to state the AI tools that were not mentioned in the questionnaire. In response, the respondents stated that they use at work the following AI-powered tools such as Otter AI to make notes (3.3%), AI-powered software products, i.e., Eleven Labs (3.3%), and others. Some respondents do not need AI tools for performing tasks (13.3%)

and consequently do not involve programming skills. The unexpected outcome of the survey analysis was that, according to the respondents' responses, no one among surveyed specialists in IT has not used a voice assistant (Microsoft Cortana) for performing tasks at work, AI tools for productive work (ClickUp, Reclaim, Clara), and AI tools to make decisions (Fordi AI). Note that these tools were given as answer options in the questionnaire. It may signal that these products are not in demand among IT specialists. So, the appropriateness of their use in training CS specialists at universities is called into question.

In this context, it is essential to note that in total, 93.3% (40% – 50/50; 30% – partly yes; 23.3% – definitely yes) of the respondents are pleased one way or another with the results of the use of AI tools (AI-powered apps) in their professional work (figure 6).

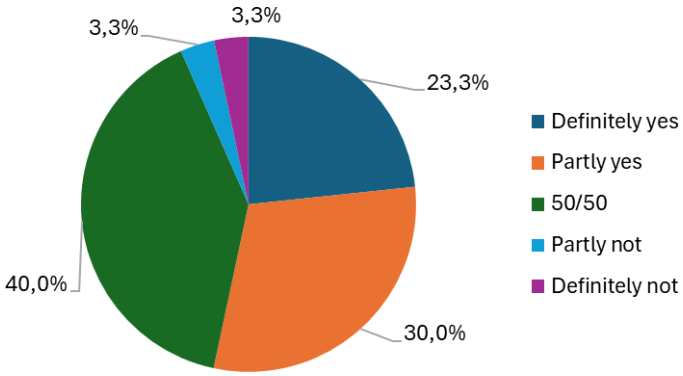

Figure 6. Representation of the satisfaction rating from IT specialists: this rating is related to the use of AI tools and applications based on AI at work.

The dilemma of whether to use AI-powered resources in the training process or not is still being discussed among the inhabitants. We asked the opinion of IT specialists on this matter. And it turned out that most of the surveyed IT professionals (precisely 89.7%; that is 53.3% – partly yes; 20% – 50/50; 16.7% – definitely yes) believe that AI is appropriate to use in the professional training of future IT specialists. IT specialists recognize that AI chats are valuable for training CS students. In particular, the survey participants stated that using specific/particular sets of AI tools to perform professional tasks is appropriate; hence, these sets of AI tools can be recommended for training CS students. The list of these AI tools and their percentage is in figure 7.

Moreover, IT professionals specified additional AI tools to help perform tasks requiring well-developed soft skills. Among their recommendations are the MLOPs plugin for Houdini (in the creation of content for video games) and ChatGPT and its wide options.

We asked IT specialists about the purpose of using AI tools in training CS students. Most of the respondents opted for two objectives: (1) AI tools allow students to optimize the learning process and reduce routine work to be able to focus on more creative tasks (63.3%), and (2) AI tools give ideas to IT students for their studying (53.3%). AI tools help make teaching and learning accessible and compelling to everyone (40%); also, AI can contribute to the development of the student's creativity and innovative thinking of students (40%), and using AI allows students to prepare for the future challenges of the IT industry and make them more competitive in the labor market (40%). Moreover, AI tools support the intention of IT students to learn humanitarian subjects to improve or develop their soft skills (33.3%), and AI tools make students aware of the latest technologies and trends (33.3%).

The IT specialists themselves use AI preferably for four reasons: (1) to automate repetitive and routine tasks (66.7%), (2) to search for information (56.7%); (3) to look for and find ideas (56.7%), (4) to solve professional tasks (53.3%), Note, that surveyed participants could choose

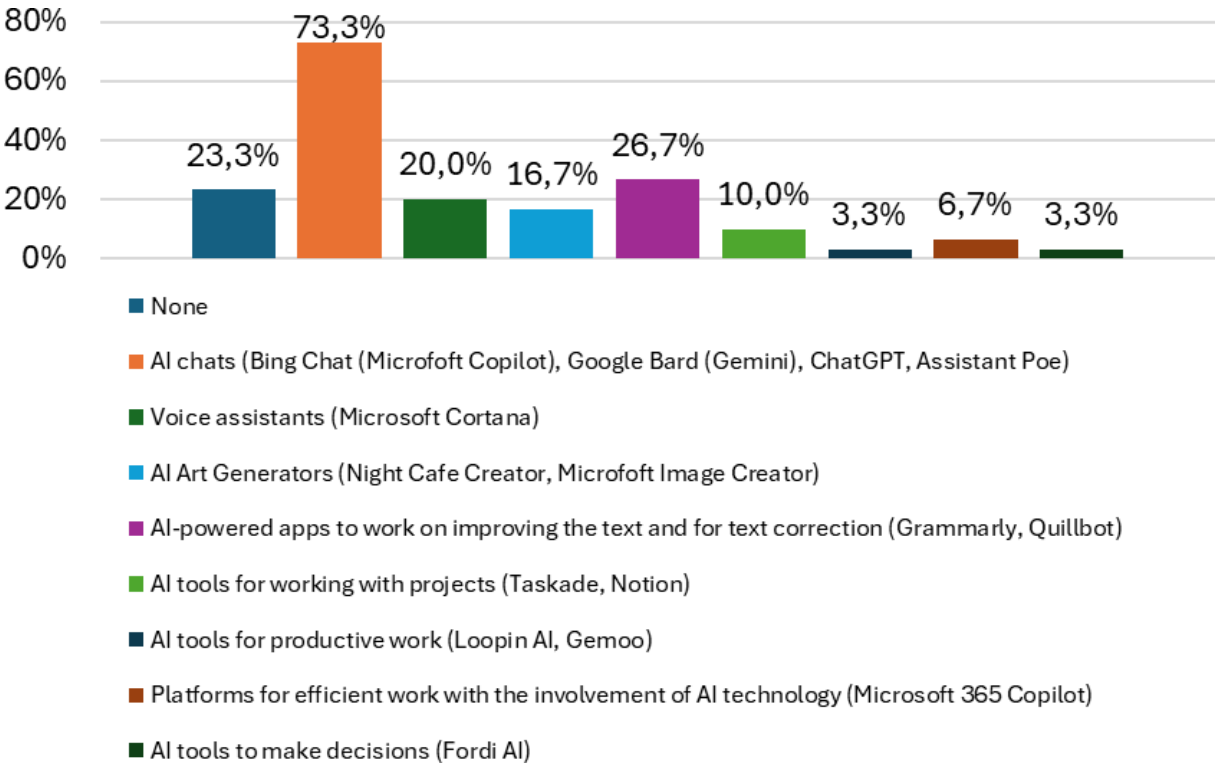

Figure 7. AI tools to perform professional tasks that require well-developed soft skills (IT specialists' views).

more than one option. Most IT specialists use AI in software development to enhance its functionality (43.3%). Moreover, based on the survey results, AI-driven solutions are helpful in developing automation and process optimization (27.6%). AI is also a great helper for data analysis and modelling (10.3%). Professionals equally (50.0% – 50/50) use AI for completing professional (the work with the code) and general (communication, organization, planning, administration) tasks. Some respondents (26.7%) use AI only for professional purposes, and the same number of respondents (23.3%) use AI only as a helper in planning or administrating the IT industry sphere. What matters is that 93.3% of the respondents said "Yes" to the appropriateness of using AI in the process of professional training of future IT specialists. For two participants in the questionnaire, it was hard to define whether AI is essential in training IT majors (figure 8).

One of the respondents stated that using AI in the training of CS students is not expedient. He explained his opinion in the following way: "*First of all, it's hard to name it AI at the current stage, but I see where it's coming from, and secondly, in my experience, teachers who use AI usually overlook some details and errors that it makes when it generates the content*".

Thus, most of the IT specialists who participated in the survey use AI tools themselves while performing work that requires well-developed soft skills, and they recommend the use of AI tools in training CS students.

5.2.2. Results of survey analysis: perspectives of IT educators. In the survey 25 specialists in IT participated. Most of them have solid teaching experience: 32% of respondents have been teaching for 10-20 years, and exactly the same quantity of respondents has been teaching for more than 20 years. The new generation of teachers participated in the survey. Among them,

20% have been teaching for 5-10 years, and 16% have not over 3 years of experience (figure 9).

Most of the surveyed IT teachers are men (56%), but women are also a great part of the respondents (44%). Most of the surveyed IT teachers have a PhD degree in education. Post Doc or Doctor of Science degree 32% of teachers have. And 8% – Master's degree (figure 10).

IT educators who responded to the survey questions are mostly from Ukraine (68%). Also, IT educators from different countries shared their views on the topic under investigation. They live or work in Norway (16%), India (4%), Ethiopia and India (4%), China (4%) and Poland (4%), etc. Surveyed IT educators work for the following universities: Norwegian University of Science and Technology (NTNU), Lutsk National Technical University, University of Lodz, National University of Life and Environment of Ukraine, Lviv Polytechnic National University, Bannett University, Zhytomyr Polytechnic State University, Kharkiv National University of Radio Electronics, Taras Shevchenko National University of Kyiv, Wachemo University, National Institute of Technology Hamirpur, University of Stavanger, Islamic Azad University, Igor Sikorsky Kyiv Polytechnic Institute, etc.

To the question, "Which AI tools and/or AI-powered apps (of those listed below) do you use to help with work tasks?" IT teachers mostly (92%) answered that AI chats (Bing Chat (Microsoft Copilot), Google Bard (Gemini), ChatGPT, Assistant Poe). AI-powered apps (Grammarly, Quillbot) are also in great demand. 52% of respondents use them to improve the content of the text and for text correction. Microsoft 365 Copilot has value for IT teachers. 40% of respondents chose it. AI Art generators (Night Café Creator, Microsoft Image Creator) help 32% of respondents. 16% – use AI tools for working with projects (Taskade, Notion). Among the surveyed participants, 4% do not use Fordi AI – an AI tool commonly used to make decisions in the IT sphere and offered in the survey as a response option. Notably, some respondents added the names of AI tools that they use. Consequently, the AI search engine for research, Consensus, and Avidnote (AI for Research Writing, Reading, and Analysis) was added.

For the question "Are you pleased with the results of the use of these AI tools / AI-powered apps," most of the surveyed IT teachers, particularly 44%, answered "Partly yes." An equal quantity of respondents (28% / 28%) preferred the answers "50/50" or "definitely yes" (figure 11).

The question "Do you think AI tools can be used to perform professional tasks related to developing and showcasing IT students' soft skills in communication?" almost equal quantity of respondents answered "Definitely yes" – 36%, and "partly yes" – 32%. There were IT teachers who fifty-fifty agreed (20%) and those who answered "partly not" (12%).

As IT teachers think, AI tools can be used to perform professional tasks that require applying soft skills. IT teachers' opinions on this matter are divided in such a way: 76% of respondents suggest using AI chats for this, 56% of respondents offer to apply AI-powered apps (for improving

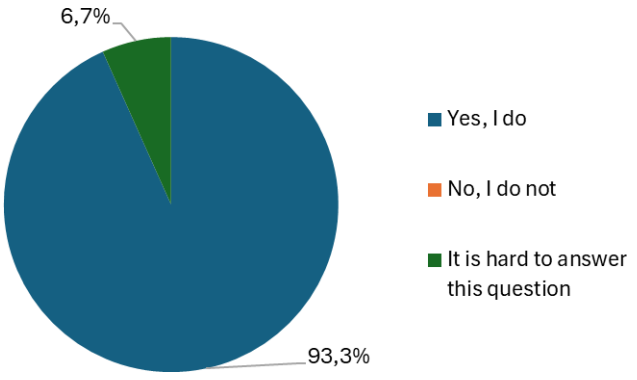

Figure 8. The use of AI in the process of training of CS students: IT specialists' views.

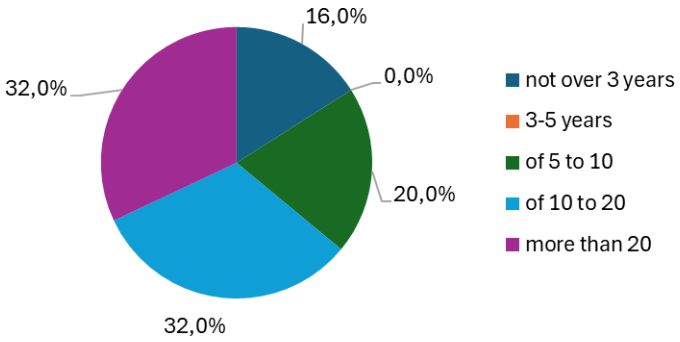

Figure 9. Teaching experience with CS students.

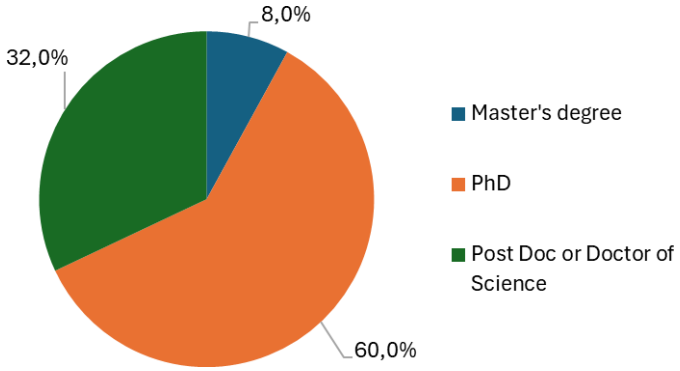

Figure 10. Academic title and/or academic degree of university teachers who teach CS students.

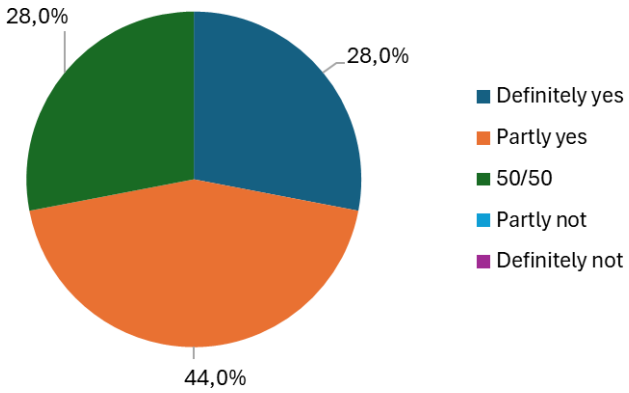

Figure 11. Representation of IT educators' satisfaction with the results of using AI tools (AI-based applications) in their professional work.

the content of texts and text correction); 32% – platforms for efficient work with the involvement of AI technology (e.g., Microsoft 365 Copilot) (figure 12). One participant stated that he also uses a language model called Claude.

For the question, "Could you add the categories of AI tools? Or could you mention the specific AI tools to perform professional tasks related to demonstration of soft skills?" the IT teachers proposed the following suggestions: (1) services for creating presentations, audio and video content; (2) Deepl online translator (deepl.com); (3) Gemini, Liama; (4) Overleaf, Plagiarism checkers, Github; (5) Azure AI language.

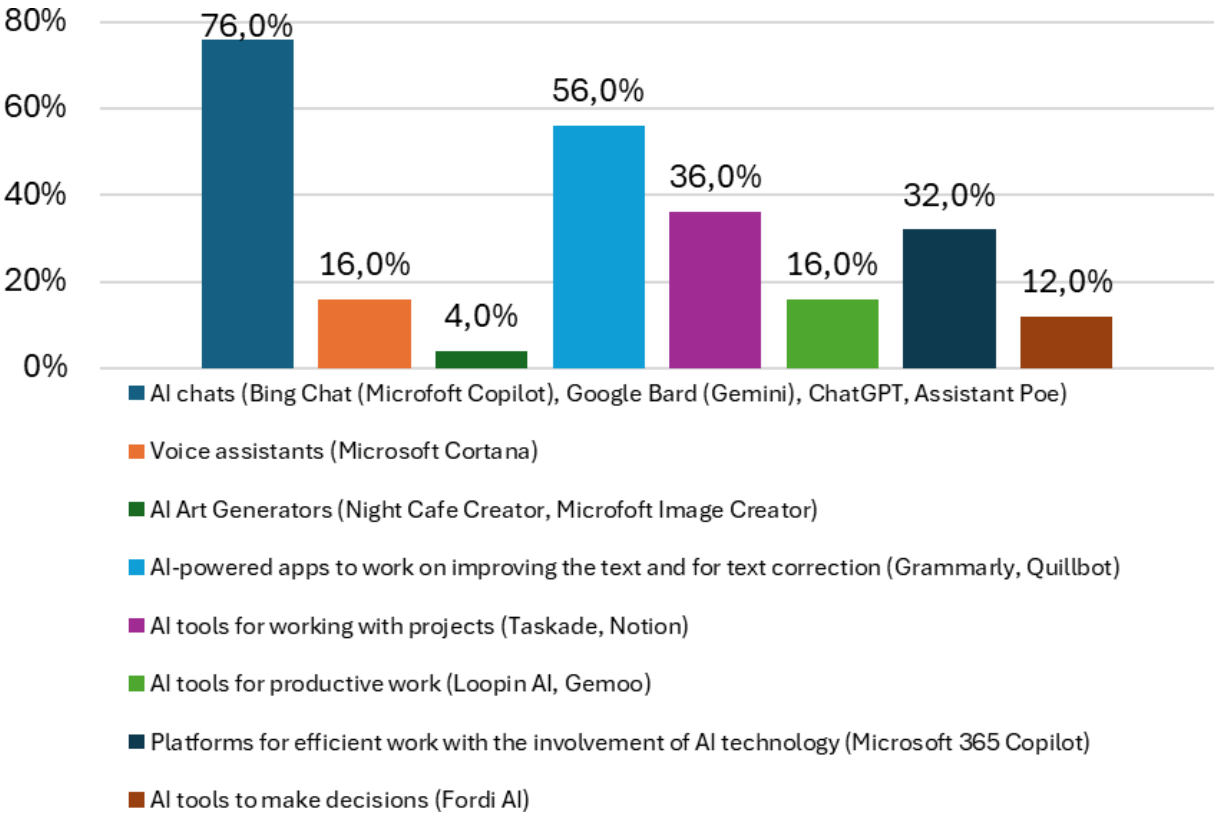

Figure 12. AI tools for performing work tasks that require well-developed soft skills (IT educators' views).

The main reasons for using AI in the process of training IT students were identified by respondents as follows: AI tools give the ideas for IT students for their studying (72%), AI tools make students aware of the latest technologies and trends (60%), AI tools allow students to optimize the learning process, reduce routine work to be able to focus on more creative tasks (60%), using AI allows students to prepare for the future challenges of the IT industry and make them more competitive in the labor market (56%), AI can contribute to the development of the students creativity and innovative thinking of students (44%), AI tools allow students to gain practical experience in solving real-world problems (40%), AI tools support the intention of the IT students to learn humanitarian subjects to improve or develop the soft skills (40%). Some respondents believe that AI tools are necessary to train IT students. In their view, AI tools help make teaching and learning accessible to everyone and practical (36%), AI tools foster the ability to work in a team, teach the students to work together in a team, utilizing various instruments and AI tools; allow to accelerate the development of effective communication (36%).

Most of the respondents – IT teachers – use AI to automate repetitive and routine tasks (76%) and to look for and find ideas (60%), to process and analyze large amounts of data (48%), and to search for information (44%), to solve professional tasks (44%). Some respondents, not many, use AI to receive personalized recommendations (40%), for entertainment purposes (32%), and to plan (perform) work tasks (28%).

Most of those surveyed support the inclusion of AI concepts in curricula designed to provide a comprehensive IT education (68%). Moreover, 56% of respondents think familiarizing IT students with AI during the lessons is essential. 44% of IT teachers use AI in IT education (propose tasks that require AI, e.g., scripts of negotiations). 40% of IT teachers support

integrating AI into preparation to develop soft skills and enhance the practical skills of IT students.

Most of the respondents IT educators (48% "agree" and 40% "definitely agree") consider that it is appropriate to use AI in the process of professional training of future IT specialists. Only 12% are not sure about this decision and none of the respondents consider it inappropriate to use AI in the process of professional training of future IT specialists (figure 13).

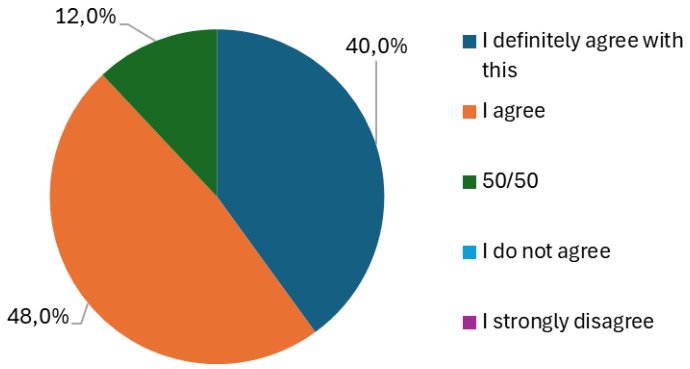

Figure 13. The use of AI in the process of professional training of future IT majors: IT educators' views.

Interesting? Beneficial? Useful? What do IT teachers think? Most respondents believe AI is interesting for students (48% "definitely agree" with this, the same number of the respondents, 48% – agree, and 4% chose "50/50"). AI benefits students, as 84% of the respondents think (60% of them – "definitely agree," and 24% – "agree"). Also, 84% of the surveyed IT educators think that AI is useful for IT students (64% of them – definitely agree, 20% – agree).

5.2.3. Finding the correlation coefficients. In the process of the analysis of the opinions of IT specialists, we decided to determine the correlation between their experience of work in the IT sphere and the following two characteristics: 1) the satisfaction rating (figure 6) related to exploiting the AI tools and applications based on AI at work; 2) the conviction that the tools of AI can be used to perform professional tasks that require well-developed soft skills. To define the correlation coefficient, we use the Pearson correlation coefficient (PCC). The formula is (1):

$$r = \frac{\Sigma(X_i - X) \times (Y_i - Y)}{\sqrt{\Sigma(X_i - X)^2 \times \Sigma(Y_i - Y)^2}} \tag{1}$$

The terms in that formula are: r – the Pearson correlation coefficient; X_i and Y_i – the individual values of one (the other) variable (working experience for defining the value of the parameter of verification); X and Y – the mean values of the two variables.

We obtained the following correlation coefficients (PCC No.1):

(i) for the satisfaction rating related to exploiting the AI tools and applications based on AI at work, the correlation coefficient is $r = 0.8$;

(ii) for the conviction that the tools of AI can be used to perform professional tasks that require well-developed soft skills, the correlation coefficient is $r = 0.87$.

Considering the correlation coefficients PCC No.1, it can be concluded that there is a strong positive correlation ($r > 0$), in particular:

(i) between the working experience in the IT sphere and the satisfaction level related to the use of AI tools and apps based on AI (the list of AI tools is offered in the survey as response options); so, → *it has been defined* that the more experience in IT the respondents have, the more their satisfaction with AI exploiting;

(ii) between the working experience in the IT sphere and the conviction that AI tools can be used to perform professional tasks that require well-developed soft skills; so, → *it has been defined* that the more experience in IT the respondents have, the more they agree that AI tools/apps are valuable in the process of training CS students.

The next step is to define whether there is a correlation – PCC No.2 – between the work experience of IT educators and the following three characteristics: 1) the satisfaction level related to the use of AI tools and apps based on AI, 2) the conviction that the tools of AI can be used to perform professional tasks that require well-developed soft skills, 3) the feasibility of using AI in the process of training CS specialists.

We obtained the following correlation coefficients:

(i) for the satisfaction rating related to exploiting the AI tools and applications based on AI at work, the correlation coefficient is $r = 0.84$;

(ii) for the conviction that the tools of AI can be used to perform professional tasks that require well-developed soft skills, the correlation coefficient is $r = 0.74$;

(iii) for the feasibility of using AI tools in the process of training CS students, the correlation coefficient is $r = 0.87$.

Considering the correlation coefficients PCC No.2, it can be concluded that there is a strong positive correlation ($r > 0$), in particular:

(i) between the teaching experience of IT educators and the satisfaction level related to the use of AI tools and apps based on AI (the list of AI tools is offered in the survey as response options); so, → *it has been defined* that the more teaching experience the respondents have, the more their satisfaction with AI exploiting;

(ii) between the teaching experience of IT educators and the conviction that AI tools can be used to perform professional tasks that require well-developed soft skills; so, → *it has been defined* that the more experience the teachers have, the more they agree that AI tools/apps are valuable for performing IT related tasks that require well-developed soft skills;

(iii) between the teaching experience of IT educators and their opinion about the feasibility of using AI tools in the process of training CS students; so, → *it has been defined* that the more teaching experience the teachers have, the more they agree that the use of AI tools/apps in the training process is considered appropriate.

6. Conclusions

A controversial issue is integrating AI tools in higher education, particularly IT education, and the simultaneous development of AI majors' soft skills during the study process. The current study encompasses the use of AI to improve soft skills such as (1) communication skills, (2) teamwork and collaboration, (3) problem-solving skills, (4) interpersonal skills, (5) time management and organizational skills, (6) self-management skills, (7) leadership skills, and (8) creativity. The use of AI resources in IT majors' training process allows IT teachers to prepare their students for increasingly harsh market demands that widely implement AI resources in the IT industry (as evidenced by a survey of IT specialists).

The results of the current research allow us to answer the RQs:

(Result 1). Today, there are AI tools that are applicable to deciding professional tasks in the IT industry, and they require applying well-developed soft skills. The results obtained from the analysis of scientific publications in Scispace and Scopus AI (table 2) and the analysis of the open-access publications on the Internet allow us to outline a range of AI tools that are available today and applicable to professional tasks in the IT sphere that require applying well-developed soft skills. Among these AI tools are AI Chats (mainly ChatGPT), voice assistants, AI art generators (mainly Midjourney), intelligent tutoring systems, personalized AI guidance and text generation (mainly Grammarly), and tools for teamwork and collaboration (primarily Notion). Moreover, other AI tools applicable to the IT industry exist in the market today, particularly for conducting interpersonal communication, dealing with workplace challenges, time management and self-management, and completing tasks that require applying leadership and creativity skills. Simultaneously, IT specialists and university teachers consider these AI tools essential for work and study, based on the survey results.

(Result 2). The survey confirmed the theoretical conclusions that most of the IT specialists and IT educators use AI Chats (86.7% and 92%, respectively), as well as AI tools for improving the text and for text correction (Grammarly, Quillbot) (26.7% and 52%) A much smaller percentage of IT specialists (16.7%) are using platforms for efficient work with the involvement of AI technology (Microsoft 365 Copilot), but 40% are IT educators using it. 10% of IT specialists use AI tools at work, and 16% of university teachers who work with CS students use AI tools during training. AI art generator tools are preferred by IT educators (32%) compared with IT specialists (6.7%). So, IT teachers are more enthusiastic about using AI tools and/or AI-powered apps to help with work tasks. Based on the work experience of IT specialists and IT teachers, AI tools are helpful at work and in study. First and foremost, it is about AI chats (73.3% and 76.0%) and AI-powered apps and their use to work on improving text and text correction (26.7% and 56.0%). Respondents also noted the feasibility of applying AI tools for project completion (10.0% and 36.0%). Platforms for efficient work with the involvement of AI technology (6.7% and 32.0%) are also essential resources today. A much smaller percentage of respondents – IT specialists and university teachers who work with CS students – suggest using AI tools such as voice assistants (20.0% and 16.0%), AI art generators (16.7% and 4.0%), AI tools for productive work (3.3% and 16.0%), AI tools to make decisions (3.3% and 12.0%).

(Result 3). Based on the survey results, we can imply that the vast majority of IT specialists who participated in the survey support the idea that AI tools can be used to train CS students to perform professional tasks by applying well-developed soft skills (53.3% of IT specialists answered "Partly yes", 20% – 50/50, and 16.7% – "Definitely yes"; 36% IT educators answered "Definitely yes", 32% "Partly yes," and 20% – 50/50). AI tools can be used for soft skills development during the training process of IT majors. Among the "FOR" arguments claimed by IT educators are students' interest (48% – definitely agree, 48% – agree, and 4% – 50/50). In the process of calculating correlation coefficients, we discovered the following patterns: (1) the more experienced IT specialists and IT educators are, the more they are satisfied with the use of AI technology at work; (2) the more experienced IT specialists and IT educators are, the more they agree that AI tools/apps are valuable for performing IT related tasks that require well-developed soft skills; (3) the more IT educators experience the teachers have, the more they have become convinced that the use of AI tools/apps in the training process is appropriate.

Given the sufficient number of AI tools available today online, considering the requirements of the modern labor market that states multiple tasks for the IT specialist, the successful performance of which requires good knowledge of new AI technology along with well-developed soft skills, also taking into consideration the fact that the experience of AI-power implementation in the process of training CS students exists; we conclude that the use of AI tools in the process of training CS students is relevant. Consequently, this implementation contributes to developing soft skills among CS students, which is in demand in the modern labor market. In this regard, further research aims to clarify the efficiency of the use of AI tools for developing soft skills among CS students.

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Appendix A. Survey "The points of view of IT specialists on Artificial Intelligence (AI), AI tools, AI-powered apps and their applicability for the development of the soft skills of IT students"

Block 1: Characteristics of the participants

1. What is your gender identity?
    - Male
    - Female
    - Non-binary
    - Prefer not to say
2. What has been your experience of working in the IT field?
    - not over 3 years
    - 3-5 years
    - of 5 to 10
    - of 10 to 20
    - more than 20
    - other
3. Are you a qualified expert in the IT field? What degree do you have?
    - Bachelor's degree
    - Master's degree
    - PhD
    - Post Doc or Doctor of Science
    - other

Block 2: The obtained position in the IT company, the country, and the company

1. The obtained position in the company ...
   - Engineer
   - Software developer/ Software Development Manager
   - Systems Administrator
   - Database administrator
   - Cybersecurity analyst
   - IT Project manager
   - Web developer
   - Quality assurance engineer
   - Cloud architect
   - IT Manager/Director
   - Chief Information Officer (CIO)
   - Chief Technology Officer (CTO)
   - other
2. The country you are working in ...
   - Ukraine
   - Poland
   - Germany
   - USA
   - China
   - Slovakia
   - Spain
   - Norway
   - other
3. The name of the IT company you work for ...

Block 3: The use of AI in your own professional activities in the IT sphere

1. What AI tools / or AI-powered apps do you use to help with work tasks that do not involve programming skills (e.g., communication, organization, administration, etc.)?
   - I don't use AI tools for it
   - AI chats (Bing Chat (Microfoft Copilot), Google Bard (Gemini), ChatGPT, Assistant Poe)
   - Voice assistants (Microsoft Cortana)
   - AI Art Generators (Night Cafe Creator, Microsoft Image Creator)
   - AI-powered apps to work on improving the text and for text correction (Grammarly, Quillbot)
   - AI tools for working with projects (Taskade, Notion)
   - AI tools for productive work (ClickUp, Reclaim, Clara)
   - Platforms for efficient work with the involvement of AI technology (Microsoft 365 Copilot)
   - AI tools to make decisions (Fordi AI)
   - other
2. Are you pleased with the results of the use of these AI tools / AI-powered apps?
   - Definitely yes
   - Partly yes

- 50/50
- Partly not
- Definitely not

Block 4: The use of AI professional training of future IT specialists

1. Do you agree that AI tools can be used in training IT majors to perform professional tasks that require well-developed soft skill?
   - Definitely yes
   - Partly yes
   - 50/50
   - Partly not
   - Definitely not
2. Which AI tools do you think should be used to perform professional tasks that require well-developed soft skill?
   - None
   - AI chats (Bing Chat (Microfoft Copilot), Google Bard (Gemini), ChatGPT, Assistant Poe)
   - Voice assistants (Microsoft Cortana)
   - AI Art Generators (Night Cafe Creator, Microfoft Image Creator)
   - AI-powered apps to work on improving the text and for text correction (Grammarly, Quillbot)
   - AI tools for working with projects (Taskade, Notion)
   - AI tools for productive work (Loopin AI, Gemoo)
   - Platforms for efficient work with the involvement of AI technology (Microsoft 365 Copilot)
   - AI tools to make decisions (Fordi AI)
   - other
3. Could you add the categories of AI tools? Or could you mention the specific AI tools to perform professional tasks related to the demonstration of soft skills? If yes, indicate/type them below:
   ...

Block 5: The purpose of the use of AI in the preparation of the IT students and in your own professional activities

1. What are the reasons for using AI in the preparation of the IT students?
   - AI tools support the intention of IT students to learn humanitarian subjects to improve or develop the soft skills
   - AI tools give ideas for IT students for their studying
   - AI tools make students aware of the latest technologies and trends
   - AI tools give students the opportunity to gain practical experience in solving real-world problems
   - AI tools help make teaching and learning accessible to everyone and effective
   - AI tools foster the ability to work in a team, allow to accelerate the development of effective communication
   - AI can contribute to the development of the student's creativity and innovative thinking of students
   - Using AI allows students to prepare for the future challenges of the IT industry and make them more competitive in the labour market

- AI tools allow students to optimize the learning process, reduce routine work to be able to focus on more creative tasks
- other

2. Why do you use AI?
   - to process and analyze large amounts of data
   - to solve professional tasks
   - to receive personalized recommendations
   - to automate the repetitive and routine tasks
   - for entertainment purpose
   - to search for information
   - to look for/find ideas
   - to plan (perform) work tasks
   - other
3. How do you use AI in your own professional activities?
   - I use AI in software development to enhance its functionality
   - I use AI for data analysis and modelling
   - I use AI-driven solutions for developing automation and process optimization
   - I use AI tools for leveraging cybersecurity and the automated detection of threats
   - other
4. What tasks do you preferably complete using AI technology: professional or general?
   - Professional tasks
   - Both: 50/50
   - General tasks
5. Do you consider that it is appropriate to use AI in the process of professional training of future IT specialists?
   - Yes, I do
   - No, I do not
   - It is hard to answer the question
6. If you answered "No, I do not" or "It is hard to answer this question" to the previous question, then please explain your point of view.

Appendix B. Survey "The points of view of IT educators on Artificial Intelligence (AI), AI tools, AI-powered apps and their applicability for the development of the soft skills of IT students"

Block 1: Characteristics of the participants

1. How long have you been working as an IT teacher?
   - not over 3 years
   - 3-5 years
   - of 5 to 10
   - of 10 to 20
   - more than 20
2. What is your gender identity?
   - Male
   - Female

- Non-binary
- Prefer not to say

3. What degree do you have?
   - Master's degree
   - PhD
   - Post Doc or Doctor of Science
   - other

Block 2: The country and the university

1. The country you are working in ...
   - Ukraine
   - Poland
   - Germany
   - USA
   - China
   - Slovakia
   - Spain
   - Norway
   - other
2. The university you work for ...

Block 3: The use of AI in your own professional activities in the IT sphere and in the IT students' training

1. Which AI tools / or AI-powered apps do you use to help with work tasks?
   - I don't use AI tools for it
   - AI chats (Bing Chat (Microfoft Copilot), Google Bard (Gemini), ChatGPT, Assistant Poe)
   - Voice assistants (Microsoft Cortana)
   - AI Art Generators (Night Cafe Creator, Microsoft Image Creator)
   - AI-powered apps to work on improving the text and for text correction (Grammarly, Quillbot)
   - AI tools for working with projects (Taskade, Notion)
   - AI tools for productive work (ClickUp, Reclaim, Clara)
   - Platforms for efficient work with the involvement of AI technology (Microsoft 365 Copilot)
   - AI tools to make decisions (Fordi AI)
   - other
2. Are you pleased with the results of the use of these AI tools / AI-powered apps?
   - Definitely yes
   - Partly yes
   - 50/50
   - Partly not
   - Definitely not

Block 4: The use of AI professional training of future IT specialists

1. Do you agree that AI tools can be used in training IT majors to perform professional tasks that require well-developed soft skill (particularly, communication skills)?

- Definitely yes
- Partly yes
- 50/50
- Partly not
- Definitely not

2. Which AI tools do you think should be used to perform professional tasks that require well-developed soft skill?

- None
- AI chats (Bing Chat (Microfoft Copilot), Google Bard (Gemini), ChatGPT, Assistant Poe)
- Voice assistants (Microsoft Cortana)
- AI Art Generators (Night Cafe Creator, Microfoft Image Creator)
- AI-powered apps to work on improving the text and for text correction (Grammarly, Quillbot)
- AI tools for working with projects (Taskade, Notion)
- AI tools for productive work (Loopin AI, Gemoo)
- Platforms for efficient work with the involvement of AI technology (Microsoft 365 Copilot)
- AI tools to make decisions (Fordi AI)
- other

3. Could you add the categories of AI tools? Or could you mention the specific AI tools to perform professional tasks related to the demonstration of soft skills? If yes, indicate/type them below:
...

Block 5: The purpose of the use of AI in the preparation of the IT students and in your own professional activities

1. What are the reasons for using AI in the preparation of the IT students?

- AI tools support the intention of IT students to learn humanitarian subjects to improve or develop the soft skills
- AI tools give ideas for IT students for their studying
- AI tools make students aware of the latest technologies and trends
- AI tools give students the opportunity to gain practical experience in solving real-world problems
- AI tools help make teaching and learning accessible to everyone and effective
- AI tools foster the ability to work in a team, allow to accelerate the development of effective communication
- AI can contribute to the development of the student's creativity and innovative thinking of students
- Using AI allows students to prepare for the future challenges of the IT industry and make them more competitive in the labour market
- AI tools allow students to optimize the learning process, reduce routine work to be able to focus on more creative tasks
- other

2. Why do you use AI?

- to process and analyze large amounts of data
- to solve professional tasks

- to receive personalized recommendations
- to automate the repetitive and routine tasks
- for entertainment purpose
- to search for information
- to look for/find ideas
- to plan (perform) work tasks
- other

3. How do you use AI in your own professional activities?
    - I support incorporating AI concepts into curriculum design for comprehensive IT education
    - I support integrating AI into preparation to develop soft skills and enhance practical skills of IT students
    - I use AI in IT education (I propose tasks that require the use of AI; e.g., scripts of negotiations)
    - I think that familiarisation of IT students with AI during the lessons is essential
    - other
4. Do you consider that it is appropriate to use AI in the process of professional training of future IT specialists?
    - I definitely agree with this
    - I agree
    - 50/50
    - I do not agree
    - I strongly disagree
5. If you answered "No, I do not" or "It is hard to answer this question" to the previous question, then please explain your point of view.

References

[1] Wenjing L and Jin L 2021 Soft skills, hard skills: What matters most? evidence from job postings *Applied Energy* **300** 117307 DOI https://doi.org/10.1016/j.apenergy.2021.117307
[2] Masterson V 2023 Future of jobs 2023: These are the most in-demand skills now - and beyond URL https://www.weforum.org/stories/2023/05/future-of-jobs-2023-skills
[3] Haranin O M and Moiseienko N V 2018 Adaptive artificial intelligence in RPG-game on the Unity game engine *Proceedings of the 1st Student Workshop on Computer Science & Software Engineering, Kryvyi Rih, Ukraine, November 30, 2018* (*CEUR Workshop Proceedings* vol 2292) ed Kiv A E, Semerikov S O, Soloviev V N and Striuk A M (CEUR-WS.org) pp 143–150 URL https://ceur-ws.org/Vol-2292/paper16.pdf
[4] Bielinskyi A, Soloviev V, Solovieva V and Velykoivanenko H 2022 Fuzzy time series forecasting using semantic artificial intelligence tools *Neuro-Fuzzy Modeling Techniques in Economics* **2022**(11) 157–198 DOI https://doi.org/10.33111/nfmte.2022.157
[5] Shumeiko N V and Osadcha K P 2024 Application of artificial intelligence in higher education institutions for developing soft skills of future specialists in the sphere of information technology *Journal of Physics: Conference Series* **2871**(1) 012027 DOI https://doi.org/10.1088/1742-6596/2871/1/012027
[6] AlAfnan M A, Dishari S and MohdZuki S F 2024 Developing Soft Skills in the Artificial Intelligence Era: Communication, Business Writing, and Composition Skills *Journal of Artificial Intelligence and Technology* **4**(4) 305–317 DOI https://doi.org/10.37965/jait.2024.0496
[7] Symonenko S V, Zaitseva N V, Osadchyi V V, Osadcha K P, Kruglyk V S and Sysoieva S O 2024 Application of chatbots for enhancing communication skills of IT specialists *Journal of Physics: Conference Series* **2871**(1) 012026 DOI https://doi.org/10.1088/1742-6596/2871/1/012026
[8] Borkovska I, Kolosova H, Kozubska I and Antonenko I 2024 Integration of AI into the Distance Learning Environment: Enhancing Soft Skills *Arab World English Journal (AWEJ)* (Special Issue on ChatGPT) 56–72 DOI https://doi.org/10.24093/awej/ChatGPT.3
[9] Mohammed F S and Ozdamli F 2024 A Systematic Literature Review of Soft Skills in Information Technology Education *Behavioral Sciences* **14**(10) 894 DOI https://doi.org/10.3390/bs14100894

[10] Striuk A M and Hordiienko V V 2024 Research and development of a subtitle management system using artificial intelligence *Proceedings of the 7th Workshop for Young Scientists in Computer Science & Software Engineering (CS&SE@SW 2024), Virtual Event, Kryvyi Rih, Ukraine, December 27, 2024* (*CEUR Workshop Proceedings* vol 3917) ed Semerikov S O and Striuk A M (CEUR-WS.org) pp 415–427 URL https://ceur-ws.org/Vol-3917/paper61.pdf

[11] Tarasova O Y and Doroshko V S 2024 Methodological foundations of teaching the basics of artificial intelligence to lyceum students *Proceedings of the 7th International Workshop on Augmented Reality in Education (AREdu 2024), Kryvyi Rih, Ukraine, May 14, 2024* (*CEUR Workshop Proceedings* vol 3918) ed Semerikov S O, Striuk A M, Marienko M V and Pinchuk O P (CEUR-WS.org) pp 240–249 URL https://ceur-ws.org/Vol-3918/paper184.pdf

[12] Korotun O V, Vakaliuk T A and Makhno A M 2025 Tools for Teaching the R Programming Language to Bachelors of Computer Science in the Period of Distance Learning *E-Learning and Enhancing Soft Skills: Contemporary Models of Education in the Era of Artificial Intelligence* ed Smyrnova-Trybulska E, Chen N S, Kommers P and Morze N (Cham: Springer Nature Switzerland) pp 309–330 ISBN 978-3-031-82243-8 DOI https://doi.org/10.1007/978-3-031-82243-8_18

[13] McGunagle D and Zizka L 2020 Employability skills for 21st-century STEM students: the employers' perspective *Higher Education, Skills and Work-Based Learning* **10**(3) 591–606 DOI https://doi.org/10.1108/HESWBL-10-2019-0148

[14] Cortázar C, Goñi I, Ortiz A and Nussbaum M 2024 Are Professional Skills Learnable? Beliefs and Expectations Among Computing Graduates *ACM Trans. Comput. Educ.* **24**(2) DOI https://doi.org/10.1145/3641551

[15] Robinson B 2024 84% Of Workforce Insists Job Candidates Must Demonstrate Soft Skills, New Study Finds URL https://www.forbes.com/sites/bryanrobinson/2024/04/04/soft-skills-in-the-workplace/

[16] Akdur D 2021 Skills Gaps in the Industry: Opinions of Embedded Software Practitioners *ACM Trans. Embed. Comput. Syst.* **20**(5) 43 DOI https://doi.org/10.1145/3463340

[17] Glazunova O G, Korolchuk V I, Voloshyna T V and Vakaliuk T A 2022 Development of soft skills in computer science bachelors in the project learning process *Information Technologies and Learning Tools* **92**(6) 111–123 DOI https://doi.org/10.33407/itlt.v92i6.5076

[18] Milczarski P, Podlaski K, Hłobaż A, Dowdall S, Stawska Z and O'Reilly D 2021 Soft Skills Development in Computer Science Students via Multinational and Multidisciplinary GameDev Project *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education* SIGCSE '21 (New York, NY, USA: Association for Computing Machinery) p 583–589 DOI https://doi.org/10.1145/3408877.3432522

[19] Paredes-Velasco M, Arnal-Palacián M, Urquiza-Fuentes J and Martín-Lope M 2023 Improving Soft Skills Through an Interdisciplinary Approach in a Realistic Context Between Education and CS Students in an HCI Course *IEEE Transactions on Education* **66**(6) 579–590 DOI https://doi.org/10.1109/TE.2023.3269691

[20] Abernethy K and Treu K 2009 Teaching computing soft skills: an experiential approach *J. Comput. Sci. Coll.* **25**(2) 178–186 URL https://dl.acm.org/doi/10.5555/1629036.1629065

[21] Marques A B, Ferreira B, Lopes A and Silva W 2020 Stimulating the development of soft skills in Software Engineering Education through Design Thinking *Proceedings of the XXXIV Brazilian Symposium on Software Engineering* SBES'20 (New York, NY, USA: Association for Computing Machinery) p 690–699 DOI https://doi.org/10.1145/3422392.3422488

[22] Karimi H and Pina A 2021 Strategically Addressing the Soft Skills Gap Among STEM Undergraduates *Journal of Research in STEM Education* **7**(1) 21–46 DOI https://doi.org/10.51355/jstem.2021.99

[23] Nadeem M 2024 The Golden Key: Unlocking Sustainable Artificial Intelligence Through the Power of Soft Skills! *Journal of Management and Sustainability* **14**(2) 71–82 DOI https://doi.org/10.5539/jms.v14n2p71

[24] Garousi V, Giray G, Tuzun E, Catal C and Felderer M 2020 Closing the Gap Between Software Engineering Education and Industrial Needs *IEEE Software* **37**(2) 68–77 DOI https://doi.org/10.1109/MS.2018.2880823

[25] Shuman L J, Besterfield-Sacre M and McGourty J 2005 The ABET "Professional Skills" — Can They Be Taught? Can They Be Assessed? *Journal of Engineering Education* **94**(1) 41–55 DOI https://doi.org/10.1002/j.2168-9830.2005.tb00828.x

[26] Male S A 2010 Generic Engineering Competencies: A Review and Modelling Approach *Education Research Perspectives* **37**(1) 25–51 DOI https://doi.org/10.70953/ERPv37.10002

[27] Cruz M L, Saunders-Smits G N and Groen P 2020 Evaluation of competency methods in engineering education: a systematic review *European Journal of Engineering Education* **45**(5) 729–757 DOI https://doi.org/10.1080/03043797.2019.1671810

[28] Beckingham S 2018 Baseline Skills—Scaffolding Soft Skills Development Within the Curriculum *Higher*

Education Computer Science: A Manual of Practical Approaches ed Carter J, O'Grady M and Rosen C (Cham: Springer International Publishing) pp 221–242 DOI https://doi.org/10.1007/978-3-319-98590-9_15

[29] Avrane-Chopard J, Potter J and Muhlmann D 2019 How to develop soft skills URL https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/the-organization-blog/how-to-develop-soft-skills

[30] 2025 soft skill URL https://dictionary.cambridge.org/us/dictionary/english/soft-skill

[31] ABET 2021 Criteria for Accrediting Computing Programs, 2025 – 2026 URL https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-computing-programs-2025-2026

[32] ABET 2021 Criteria for Accrediting Engineering Programs, 2025 – 2026 URL https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2025-2026/

[33] Luciano R G, Herrera N G and Marcos M I P 2020 Assessment Of The Personal Skills Of BSIT Students: A Basis For Training Plan Development *International Journal of Scientific & Technology Reserch* **9**(3) 6549–6555 URL https://www.ijstr.org/final-print/mar2020/Assessment-Of-The-Personal-Skills-Of-Bsit-Students-A-Basis-For-Training-Plan-Development.pdf

[34] Kieu Nguyen M T, Nguyen L T and Le Q P 2024 The Role of Soft Skills in Developing Students' Stem Competence *2024 9th International STEM Education Conference (iSTEM-Ed)* pp 1–5 DOI https://doi.org/10.1109/iSTEM-Ed62750.2024.10663171

[35] Van Horne C and Rakedzon T 2022 Extended Abstract: Collaboration, Communication, Curiosity and Critical Thinking: the 4 Cs of Developing Teamwork in Chinese STEM Students *2022 IEEE International Professional Communication Conference (ProComm)* (IEEE Press) p 81–83 DOI https://doi.org/10.1109/ProComm53155.2022.00018

[36] Singh Dubey R, Paul J and Tewari V 2022 The soft skills gap: a bottleneck in the talent supply in emerging economies *The International Journal of Human Resource Management* **33**(13) 2630–2661 DOI https://doi.org/10.1080/09585192.2020.1871399

[37] Woodward B S, Sendall P and Ceccucci W 2010 Integrating Soft Skill Competencies Through Project-based Learning Across the Information Systems Curriculum *Information Systems Education Journal* **8**(8) URL http://isedj.org/8/8/

[38] Ricchiardi P and Emanuel F 2018 Soft Skill Assessment in Higher Education *Journal of Educational, Cultural and Psychological Studies* (18) 21–53 DOI https://doi.org/10.7358/ecps-2018-018-ricc

[39] Cresswell J W and Cresswell J D 2018 *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* 5th ed (SAGE Publications, Inc.) URL https://tinyurl.com/59zzs77y

[40] Maestas C 2018 Expert Surveys as a Measurement Tool: Challenges and New Frontiers *The Oxford Handbook of Polling and Survey Methods* (Oxford University Press) DOI https://doi.org/10.1093/oxfordhb/9780190213299.013.13

[41] von Soest C 2023 Why Do We Speak to Experts? Reviving the Strength of the Expert Interview Method *Perspectives on Politics* **21**(1) 277–287 DOI https://doi.org/10.1017/S1537592722001116

[42] Tomić B B, Kijevčanin A D, Ševarac Z V and Jovanović J M 2023 An AI-based Approach for Grading Students' Collaboration *IEEE Trans. Learn. Technol.* **16**(3) 292–305 DOI https://doi.org/10.1109/TLT.2022.3225432

[43] Hutson J and Ceballos J 2023 Rethinking education in the age of AI: The importance of developing durable skills in the Industry 4.0 *Journal of Information Economics* **1**(9) 26–35 DOI https://doi.org/10.58567/jie01020002

[44] Bura A, Joshi S, Deshpande S, Chaudhari R and Deshpande K 2023 ML Based Comprehensive Application to Enhance Soft Skills *2023 11th International Conference on Emerging Trends in Engineering & Technology - Signal and Information Processing (ICETET - SIP)* pp 1–6 DOI https://doi.org/10.1109/ICETET-SIP58143.2023.10151569

[45] Pantazatos D, Grammatikou M and Maglaris V 2024 Enhancing Soft Skills in Network Management Education: A Study on the Impact of GenAI-Based Virtual Assistants *2024 IEEE Global Engineering Education Conference (EDUCON)* pp 1–5 DOI https://doi.org/10.1109/EDUCON60312.2024.10578597

[46] Celik I, Gedrimiene E, Siklander S and Muukkonen H 2024 The affordances of artificial intelligence-based tools for supporting 21st-century skills: A systematic review of empirical research in higher education *Australasian Journal of Educational Technology* **40**(3) 19–38 DOI https://doi.org/10.14742/ajet.9069

[47] Waseem M, Das T, Ahmad A, Liang P, Fahmideh M and Mikkonen T 2024 ChatGPT as a Software Development Bot: A Project-Based Study *Proceedings of the 19th International Conference on Evaluation of Novel Approaches to Software Engineering - ENASE* INSTICC (SciTePress) pp 406–413 DOI https:

//doi.org/10.5220/0012631600003687
[48] Sarkheyli A 2023 Exploring the Potential of Artificial Intelligence in Addressing Pedagogical Challenges and Improving Group Work Quality in Higher Education *2023 International Conference on Electrical, Communication and Computer Engineering (ICECCE)* pp 1–7 DOI https://doi.org/10.1109/ICECCE61019.2023.10442360
[49] Dennison K 2024 Tools To Enhance Communication & Efficiency Across Global Teams URL https://www.forbes.com/sites/karadennison/2024/06/14/tools-to-enhance-communication--efficiency-across-global-teams
[50] Manikandan P 2024 10 Best AI Communication Tools in 2024 — ClickUp URL https://clickup.com/blog/ai-communication-tools
[51] Kruger E 2023 The Best AI Tools for Teams URL https://www.linkedin.com/pulse/best-ai-tools-teams-erik-kruger
[52] Spataro J 2024 Introducing Microsoft Copilot actions, new agents, and tools to empower IT URL https://www.microsoft.com/en-us/microsoft-365/blog/2024/11/19/introducing-copilot-actions-new-agents-and-tools-to-empower-it-teams
[53] PPM Express 2023 The Ultimate List of 20 Best AI Work Management Tools URL https://ppm.express/blog/ai-work-management-tool/
[54] Marr B 2024 22 Generative AI Workplace Tools And How To Use Them URL https://www.forbes.com/sites/bernardmarr/2024/07/16/the-best-generative-ai-workplace-productivity-tools/
[55] The Corporate Chaos 2024 Top 15 AI Tools for Leaders to Boost Productivity in 2024 URL https://thecorporatechaos.com/ai-tools-for-leaders-to-boost-productivity
[56] Peck D 2025 AI in Design: 15 Best Tools + The Future of the Industry (2025) URL https://www.devlinpeck.com/content/ai-in-design
[57] TIP Staff 2025 Top 20 Generative AI Tools For Innovation - Triangle IP URL https://triangleip.com/top-20-generative-ai-tools-for-innovation