

# ASSESSING SOFT SKILLS IN INFORMATION SYSTEMS ENGINEERING STUDENTS: IMPORTANCE AND SELF-ASSESSMENT

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**Abstract:** *This research aimed to examine the soft skills required by Information Systems Engineering students for their future work. A total of 49 students participated in the study conducted in October 2022. The study focused on analyzing 18 different soft skills, with a two-step approach. In the first step, participants were asked to rate the importance of various soft skills needed for their future careers. The importance ratings provided valuable insights into the students' perceptions of the skills they considered essential. In the second step, participants were requested to assess their own skill levels for each soft skill analyzed. The results obtained from this research provide a comprehensive overview of the soft skills landscape within the Information Systems Engineering discipline. The findings can be used to tailor educational programs, mentorship initiatives, and career development strategies to foster a well-rounded skill set among Information Systems Engineering students.*

**Key words:** soft skills, information systems engineering, students

## 1. INTRODUCTION

In previous years, there has been a gap in understanding within the triangle formed by: students, i.e., future employees, higher education institutions, and companies. On one side, we have students who enter the job market with a lot of optimism and self-assurance, believing they possess everything needed to achieve great success in the careers they have been studying for. On the other side, we have higher education institutions claiming to educate employees ready for the new information age, while companies assert that their young employees lack the skills and abilities essential in the practical world awaiting them beyond classrooms and textbooks. This is particularly noticeable in industries that employ some of today's most sought-after professions: IT and the creative industry.

## 2. THEORETICAL BACKGROUND

A skill could be defined as "an individual's level of proficiency at performing a particular task" (Noe et al., 2015). Earlier, companies demanded that employees possess some basic skills such as writing, reading, and arithmetic. With the growing complexity of business processes and the formation of more intricate job roles, the needs for employee skills also changed. In modern human resources literature, a distinction can be found between the terms "soft skills" which refer to skills like communication, teamwork, and work ethics, and "hard skills" which pertain to the specific job being performed. Haselberger and colleagues (2012) collected definitions of skills, soft skills and competences and proposed a comprehensive definition of soft skills: "Soft skills represent a dynamic combination of cognitive and meta-cognitive skills, interpersonal, intellectual and practical skills. Soft skills help people to adapt and behave positively so that they can deal effectively with the challenges of their professional and everyday life.". These authors developed a list of 21 soft skills divided into three groups: (1) Personal – attitudinal component of the skill; (2) Social – interpersonal skills; and (3) Methodological – methodological aspects of work – management, achievement, innovation and change. Even in the reports from the European Commission (2012) and consulting firms such as Deloitte (2017) from the last decade, there is a consensus that continuous work on improving the soft skills of the workforce is needed in order to achieve economic progress, reduce the unemployment rate, and achieve a personal business success. This is particularly important for groups such as women, younger, and older workforce. This paper focuses on the importance of soft skills as perceived by the Information Systems Engineering (ISE) students, by answering the following research questions: (1) What are the most and the least important soft skills needed for future work, as perceived by ISE students? (2) How ISE students perceive their own soft skill levels? Which soft skills are ranked highest, and which one are ranked lowest? (3) Is there a

difference between perceived importance of soft skills for future work and self-assessed level of soft skills?

### 3. METHODS

Previous studies analyzed existing literature to identify soft skills that have been previously researched. As previously noted, Haselberger and colleagues (2012) identified 21 soft skill, while Taylor (2016) identified 25 soft skills that were examined in earlier studies. From previous research, 14 soft skills were adopted, and an additional 5 skills were included to align the study with the curriculum needs of the subject: Motivation, Organizational skills, Feedback, Stress management, and Presentation skills. To make the survey more engaging for students belonging to Generation Z, we decided to conduct the research in the form of a quiz using the Kahoot platform. The survey consisted of two parts. In the first part of the quiz, students were asked to rate soft skills on a scale from 1 to 10 based on their importance for their future careers. Then, in the second part of the quiz, using the same order, students were asked to rate their level of proficiency in each specific soft skill on a scale from 1 to 10. In this way, we obtained a repeated measurement from the same sample of participants. The research was conducted in October 2022. The study involved second-year students of Information Systems Engineering who were taking the course on Fundamentals of Organizational Behavior at the Faculty of Technical Sciences in Novi Sad. There were 83 students enrolled in the course, out of which 75 students were present during the first lecture when the survey was conducted. Among the total number of participants, 11 students did not participate in the quiz, while 15 did not complete it. The final number of respondents in the study was 49 (59% completion rate).

### 4. RESULTS

The results of descriptive statistics are presented in Table 1. When it comes to the importance of various soft skills needed for future careers, students rated Team work and Communication skills as the most important, and Creativity and Leadership as the least important soft skills. When students were asked to assess their own levels of soft skills, Problem solving and Flexibility/Adaptability were rated with the highest scores, while Presentation skills and Stress management were ranked lowest.

Table 1: Descriptive statistics

	Measure*	Min	Max	Mean	Std. deviation
Communication skills	1	1	10	8.14	2.00
	2	1	10	6.08	2.98
Team work	1	1	10	8.76	1.71
	2	0	10	6.45	3.37
Leadership	1	1	10	6.00	3.08
	2	0	10	5.35	3.29
Flexibility / Adaptability	1	1	10	7.41	3.42
	2	0	10	6.73	3.41
Problem solving	1	0	10	7.80	3.65
	2	0	10	6.98	3.19
Creativity	1	0	10	5.90	3.36
	2	0	10	5.67	3.61
Interpersonal skills	1	1	10	6.55	3.41
	2	0	10	6.08	3.26
Time management	1	0	10	6.88	3.77
	2	0	10	5.02	3.43
Work ethics	1	1	10	6.96	3.63
	2	0	10	6.33	3.38
Motivation	1	1	10	6.77	3.38
	2	0	10	5.80	3.33
Organizational skills	1	0	10	6.82	3.56
	2	0	10	5.96	3.38
Negotiation	1	1	10	7.16	3.47
	2	0	10	6.00	2.95
Feedback	1	1	10	7.45	3.37

	2	0	10	6.35	3.14
Conflict resolution	1	1	10	7.20	3.70
	2	0	10	6.20	3.01
Stress management	1	1	10	7.47	3.80
	2	0	10	4.47	3.20
Decision making	1	0	10	7.02	3.67
	2	1	10	5.00	3.23
Self-confidence	1	1	10	7.02	3.47
	2	0	10	5.14	3.34
Presentation skills	1	0	10	6.90	3.79
	2	0	10	4.16	3.09

\* 1- assessed need for work; 2 – assessed skill level.

Since the sample was relatively small (< 100 participants) and the data were not normally distributed, the nonparametric test equivalent to the dependent t-test was used. The Wilcoxon signed-rank test was employed to compare two sets of scores collected from the same students. Details are presented in Table 2.

Table 2: Descriptive statistics The results of Wilcoxon signed-rank test

	Z-value	p	r	Comment
Communication skills	-3.826	0.000	0.38	medium effect
Team work	-4.382	0.000	0.44	medium effect
Leadership	-1.693	0.090		
Flexibility / Adaptability	-2.674	0.007	0.27	small effect
Problem solving	-2.981	0.003	0.30	medium effect
Creativity	-0.987	0.324		
Interpersonal skills	-1.800	0.072		
Time management	-3.319	0.001	0.34	medium effect
Work ethics	-2.127	0.033	0.21	small effect
Motivation	-2.223	0.026	0.22	small effect
Organizational skills	-2.657	0.008	0.27	small effect
Negotiation	-2.458	0.014	0.25	small effect
Feedback	-2.566	0.010	0.26	small effect
Conflict resolution	-3.032	0.002	0.31	medium effect
Stress management	-4.162	0.000	0.42	medium effect
Decision making	-3.735	0.000	0.38	medium effect
Self-confidence	-3.157	0.002	0.32	medium effect
Presentation skills	-4.434	0.000	0.45	medium effect

As the results suggest, only three out of the 18 skills did not show a statistically significant difference between the importance level of skills needed for future work and the value of student's self-assessment of soft skills. Those soft skills are Leadership, Creativity and Interpersonal skills. To provide a better insight into observed differences, effect sizes (r) were calculated by dividing the value of Z by the square root of N. Most of the observed differences between needed soft skills and self-assessed levels of soft skills can be considered to have a medium effects. When we observe Z values, the largest deviations are noticed for the following skills: Presentation skills, Team work, Stress management, Communication skills and Decision making.

## 5. DISCUSSION

The research has uncovered several soft skills that students consider important in the industry, while simultaneously evaluating them as insufficiently developed. Previous research have also found that Team work and Communication skills are important skills to possess and students expressed the need for their improvement (Patacsil & Tablatin, 2017). Other study (Ahmed et al., 2015) pointed out that soft skills are in demand in the software industry, with an emphasis on communication skills, while for other skills, it is necessary to understand their connection to software engineering. Some earlier research (Itani & Srour, 2016) has shown that future engineers do not consider soft skills to be important, even though employers emphasize their significance. However, this research has demonstrated that a change is happening, and students are becoming more aware of the importance of non-technical skills. Finally, it is important to highlight some of the limitations. In this study, soft skills were observed only from the perspective of

students. In future research, it would be interesting to compare the results of students with those of lecturers and industry experts. This way, more detailed insights into the differences between these three parties could be obtained. Moreover, to overcome the methodological challenges of the cross-sectional research, future studies should be preferably grounded as experimental, and after implementing interventions such as soft skills training, real differences in their improvement could be observed.

## 6. CONCLUSIONS

The aim of this paper was to examine the soft skills required by Information Systems Engineering students for their future work. Findings revealed the differences between the importance level of skills needed for future work and the level of student's self-assessment of soft skills. These findings suggest that educational institutions, professors, students and companies have to cooperate in order to succeed. Educational institutions and curriculum designers need to align their programs to meet the industry's demands and prepare students for the professional world effectively. In addition to working on so-called hard skills professors should implement methods to develop specific soft skills through practical work, improvisation, and simulations of real-life situations in the classroom. Finally, constant collaboration with companies is necessary to enable the creation of an appropriate curriculum based on their practical insights, and feedback on evaluations after the employment of young individuals will provide insights into the effectiveness of the conducted education.

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## REFERENCES

- Ahmed, F., Capretz, L. F., Bouktif, S., & Campbell, P. (2015) Soft skills and software development: A reflection from the software industry. arXiv preprint arXiv:1507.06873.
- Deloitte Access Economics (2017) Soft Skills for Business Success. Retrieved from <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-deakin-soft-skills-business-success-170517.pdf>
- European Commission (2012) An agenda for new skills and new jobs in Europe: Pathways towards full employment. Retrieved from [http://ec.europa.eu/research/social-sciences/pdf/new-skills-and-jobs-in-europe\\_en.pdf](http://ec.europa.eu/research/social-sciences/pdf/new-skills-and-jobs-in-europe_en.pdf)
- Haselberger, D., Oberheumer, P., Perez, E., Cinque, M. & Capasso, D. (2012) Mediating Soft Skills at Higher Education Institutions. Handbook of ModEs Project. Life Long Learning Programme.
- Itani, M., & Srour, I. (2016) Engineering students' perceptions of soft skills, industry expectations, and career aspirations. *Journal of professional issues in engineering education and practice*, 142(1), 04015005. [https://doi.org/10.1061/\(ASCE\)EI.1943-5541.0000247](https://doi.org/10.1061/(ASCE)EI.1943-5541.0000247)
- Noe, R. A., Hollenbeck, J. R., Gerhart, B. & Wright, P. M. (2015) *Human Resource Management – Gaining a competitive advantage* (9<sup>th</sup> ed.). New York: McGraw-Hill Education.
- Patacsil, F. F., & Tablatin, C. L. S. (2017) Exploring the importance of soft and hard skills as perceived by IT internship students and industry: A gap analysis. *Journal of Technology and Science education*, 7(3), 347-368. <https://doi.org/10.3926/jotse.271>
- Taylor, E. (2016) Investigating the perception of stakeholders on soft skills development of students: Evidence from South Africa. *Interdisciplinary Journal of e-Skills and Life Long Learning*, 12, 1-18. Retrieved from <http://www.ijello.org/Volume12/IJELLv12p001-018Taylor2494.pdf>