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The Perception of Organizational Psychologists on the Importance of Soft Skills for Engineers

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Abstract

Soft skills are very important in the job market, as they are closely related to interpersonal interactions and well as other factors such as problem-solving. Despite their importance, in some technical fields like Engineering, they tend to be taken for granted. Organizational psychologists are the ones usually involved in hiring process within companies. Therefore, the presented work assessed the most important aspects necessary to build these skills based on organizational psychologists' perspectives. Important soft skills previously identified as important for Engineers through a Systematic Bibliographic Review were grouped into core groups. These were used as a basis to elaborate a questionnaire used to evaluate the organizational psychologists' perception of each soft skill in terms of Engineering performance. The results support the idea that soft skills are important for the professional performance of Engineer and are directly linked to the multidisciplinary feature of the field. The results also suggest the urgent need to increase the exchange between market and academia and reshape the Engineering curricula to reflect the demands of an increasingly challenging and competitive job market.

Keywords

Soft Skills, Organizational Psychology, Engineering Education, Fuzzy Logic

1. Introduction

Soft skills are key elements to human development, teaching and learning processes and management skills in the labor market. Therefore, organizational psychology professionals are constantly assessing and managing soft skills within human resources (Santos, Freitas, Macêdo, & Rodrigues, 2020).

In a competency management model, the assessment of organizational com-

petencies for the entire collaborators within a company are guiding factors in human resources practices, in which these skills become the most relevant assessment factors in hiring and personal development and the disconnection of people in an organization (Gondim, Borges-Andrade, & Bastos, 2017).

Understanding the perspective of these professionals working in organizational psychology, who have both practical and theoretical knowledge on human development, as well as on interpersonal relationships and professional performance related to soft skills, makes it possible to understand the labor market expectations and build dialogues with the academy, potentially leading to the development of these soft skills needed for Engineering professionals.

According to Gondim, Borges-Andrade & Bastos (2017), psychologists work in organizations searching for strategies to improve the work environment.

As these professionals are more familiar with the corporate scenario and professional practice within business management, this group of professionals is usually responsible assess and managing soft skills within this environment.

Both human resources management within an organization and psychology are complementary regarding organizational psychology, as these professionals evaluate the entire context of human development even before the hiring of new employees. Psychologists work in the assessment, development and in defining what is necessary for each of the activities performed by the professionals (Muldoon, 2020; Vasconcelos, 2017).

Thus, this study aimed to investigate the value attributed by organizational psychologists to different soft skills identified as important for Engineering courses graduates. The work proposed to deepen the discussion on the perception of organizational psychologists regarding the importance of soft skills for Engineering professionals, grouping skills with common characteristics.

2. Soft Skills for Engineers

The term "skill" refers to a set of competencies, as well as cognition and operational capabilities that an individual possesses to performance a specific activity. This is a macro term with englobes different capabilities, and it is directly linked to instrumental issues. Skills also refer to the characteristics demanded for a given activity or professions and are often used to state someone is qualified in a given task or job (OECD, 2016b; Pellegrini, 2017).

For El-zein & Hedemann (2016) the most important skills for Engineering professionals can be divided into three groups: hard skills, related to mathematics, research, problem solving and product development; soft skills, related to communication, leadership, ethics, motivation, among others; and global skills, focused on intercultural issues.

Within these competencies, the soft skills englobe a set of competencies related to human relationships, including skills to at work, in personal life and in other social interactions in general (Itani & Sprour, 2015), which includes foreign language, emotional intelligence, ethics, social responsibility, among others.

Campos, Resende & Fagundes (2020b) define, based on a systematic biblio-

graphic review, that the most relevant soft skills for Engineering professionals can be divided into six groups, which unfold in the following skills: Problem Solving, Open Mind, Verbal Communication, Written Communication, Active Listening, Reading, Foreign Language, Multiculturalism, Networking, Leadership, Ethics, Professionalism, Social Responsibility, Control of Emotions, Motivation, Lifelong Learning, Self-Direction, Creativity and Innovative Thinking. The thematic groups proposed by the authors, as well as the soft skills pertaining to each group are shown in Figure 1.

3. Methodology

Figure 2 exemplifies, in flowchart form, the methodology of this research:

To complete the objective proposed by the present work, a research method was first developed in the form of a structured questionnaire, based on the work done by Campos, Resende & Fagundes (2020b), evaluating 19 soft skills distributed under six core competence groups, as illustrated in Figure 1. Part of the soft skills was further broken down, when necessary, into indicators. The length questionnaire structure is shown in **Appendix 1**.

The questionnaire was evaluated by organizational psychologists experienced with professional management of soft skills.

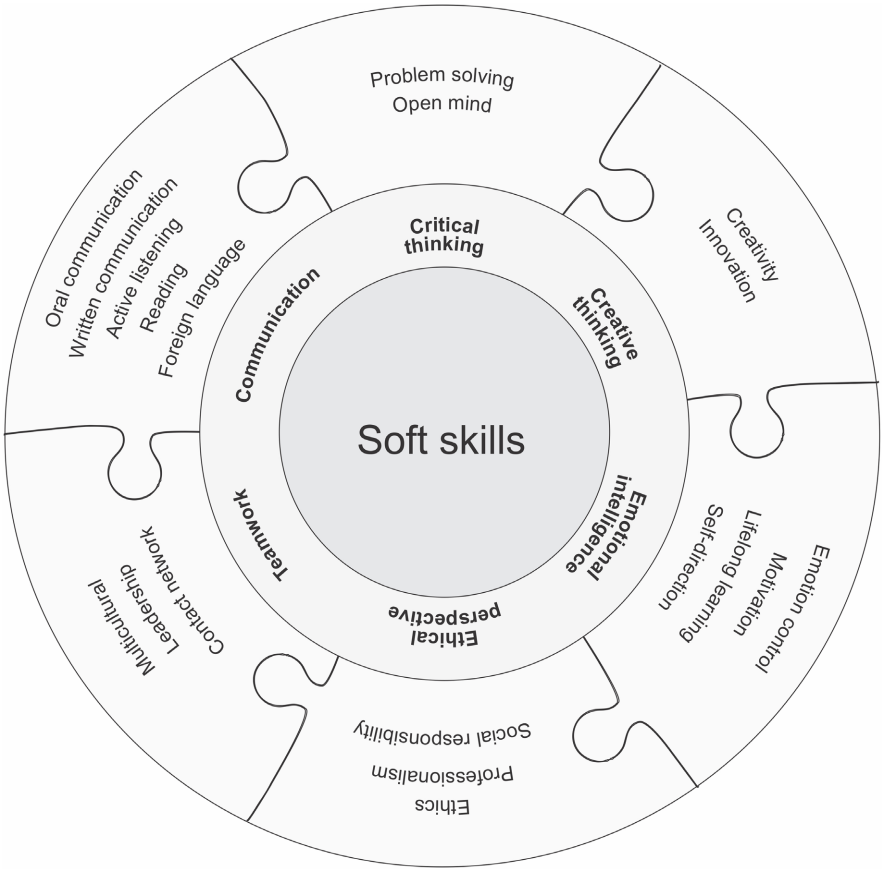

Figure 1. Compilation of the important soft skills for Engineers grouped by their core competences.

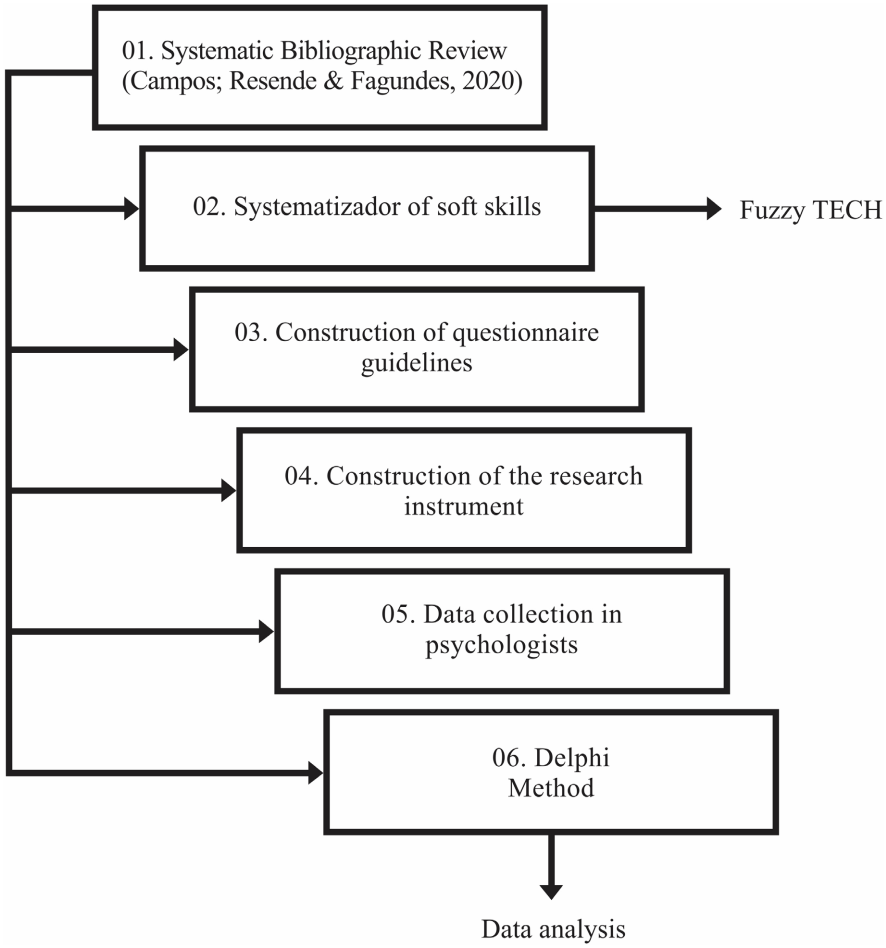

Figure 2. Flowchart of the methodology of this study.

Forty professionals were interviewed, between February and April 2019, selected by a non-probabilistic sample, formed by 8 male professionals and 32 female professionals. Manzato & Santos (2012), suggest this type of sampling to facilitate the methodological process without compromising sample quality in qualitative and quantitative research.

For each item in the questionnaire, respondents were requested to respond, based on a Likert scale with values ranging from 0 to 10, their perception on the importance of a given soft skill, group of soft skill or indicator for Engineering professionals.

According to Vieira & Dalmoro (2008), the Likert scale may not be the most adequate methodological resource, especially when the answers are very dispersed, requiring complementary strategies to aggregate of values in the measurement scale. To increase the reliability of the answers, the Delphi method was as a complementary methodology. As explained by Fagundes (2015), the association of the Delphi method with the Likert scale is intended to converge the data and reduce the dispersion of the responses obtained.

The Likert scale, proposed by Fagundes (2015), is performed through a weighted average, as demonstrated with an example **Table 1**, for the insertion of

Table 1. Calculation of Index Ordinatio for the keywords group of "Human Skills & Egress".

Question	Attributed weighs and responses frequency											AR
	0	1	2	3	4	5	6	7	8	9	10	
How much "Ability to present ideas clearly during a conversation" impacts "Oral Communication" How much "Problem Solving" impacts "Critical Thinking"						2	4	3	1			6.3

Source: Adapted from: Fagundes (2015).

values in the fuzzyTECH software.

Equation (1) demonstrates the calculation based on the results of **Table 1**.

$$\text{Weighted average} = (2\times 5)+(4\times 6)+(3\times 7)+(1\times 8) = 63$$

$$AR = 63/(2+4+1+3) = 6.3 \quad (1)$$

The Delphi method groups responses based on collective consensus, selecting values that are more representative than isolated opinions. However, trends of the leading opinions may prevail over others and interfere in the results of the group (Giovinazzo, 2001).

To ensure adequate results with the Delphi method, a group of experts, who are familiar with the research topic, represented here by organizational psychologists, were consulted. After the elaboration of the questionnaires, they were sent to the individual respondents, who returned their evaluations to the researcher. The researcher evaluated the content received and returned it to the respondents, to reduce the dispersion of the values (Wright & Giovinazzo, 2000).

For scientific legitimacy, three requirements were respected: the anonymous identity of the respondents, the statistical representation of the distribution of the obtained values and the return of the group's answers, for the new evaluation in the round(s) (Listone & Turoff, 2002; Wright & Giovinazzo, 2000; Martino, 1993).

In the second and last rounds, the same questionnaire was used, and the same professionals now in possessed the Weighted Average of the result of the first stage. At this stage, the experts decided either to maintain or modify the responses of the first round, increasing the reliability of the responses as well as decreasing the dispersion of the values.

These values were divided into guidelines, indexes and indicators. The construction of the fuzzyTECH tree was structured based on 4 hierarchical levels. The fourth level represents the final result, which is generated from the aggregation of the indexes. The indicators defined at the second level and are soft skills identified based on a RBS bibliometrics, broken down into guidelines inspired by the P21 report (Casner-Lotto & Barrington, 2006), which represent the first level.

This hierarchy represents a simplified cut of the Model mounted on the fuz-

zyTECH tree and the Model proposed by Campos, Resende & Fagundes (2020a), calibrated with these guidelines, indexes and indicators was used to provide the results presented in the next session.

4. Results & Discussion

For the analysis of the results, the soft skills were divided into the core competence groups as defined by Campos, Resende & Fagundes (2020b). The work also presents the final average of the values attributed by organizational psychology professionals to each of the questions, regarding the influence of one soft skill on another, as well as on the importance of the group of skills itself for engineering professionals.

4.1. Critical Thinking

Table 2 presents the results of the interviewees' opinion about the soft skills involved in the core competence Critical Thinking.

Critical thinking englobes the ability to evaluate and analyze a problem or situation and solve them using multidisciplinary knowledge, accepting suggestions and diametrically opposed ideas, as well as flexibility within a heterogeneous team.

Thinking critically means analyzing a given situation under many aspects, within less time and lower costs, understanding the impacts on a globally interconnected economy (Meireles & Bonifácio, 2015; Barrera, 2017).

Multidisciplinary problem solving is indispensable to the soft skill Critical Thinking, as the problems in the Engineering workplace have a very complex structure, because they englobe conflicts of interest, different solution methods,

Table 2. Average of the values assigned by Psychologists for the Core Competence Critical Thinking, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Critical Thinking" impacts the soft skills of an Engineer	8.89
Soft Skill	How much "Problem Solving" impacts "Critical Thinking"	7.71
Index	How much "Use knowledge, data and facts" impacts "Problem Solving"	8.89
Index	How much "Find Solutions using multidisciplinary knowledge" using impacts "Problem Solving"	8.51
Soft Skill	How much "Open Mind" impacts "Critical Thinking"	8.37
Index	How much "Ability to solve problems in a pacific manner" impacts "Open Mind"	7.29
Index	How much "Openness to suggestions, new ideas and contrary opinions" impacts "Open Mind"	9.46

Source: Own authorship.

standards, restrictions, and unforeseen events. Therefore, they require collaborative action to be solved.

According to the study by Yu, Wu & Fan (2020), Engineering students, specifically those involved in product development, who could evaluate and critically explain the content learned, had a greater ability to apply scientific knowledge in Engineering and in the process of creation.

The fact that critical thinking is an important competence for the 21st century market in an increasingly globalized world, makes the demand for this competence even higher in Engineering organizations. In line with these, the respondents assigned a high score for the core competence "Critical Thinking", with an average of 8.89, indicating its relevance of in soft skills.

When analyzing the components of this competence, the lowest values were found for the indicator "Knowing how to solve problems peacefully", with a similar result to the soft skill "Problem Solving". Both refer to the ability to solve problems, which, when evaluated isolated, are not seen by organizational psychology professionals as the greatest contributions to building soft skills. On the other hand, characteristics that demand proactivity and interdisciplinarity were assigned the highest scores, such as "Use knowledge, facts and data from the workplace" and "Be open to suggestions, different ideas and contrary opinions".

4.2. Communication

Both the OECD reports (OECD, 2015, 2016a, 2016b) and the P21 report (Casner-Lotto & Barrington, 2006) bring the skill "Communication" as an indispensable feature for a healthy relationship between people, and people who have this skill are more likely to have good evaluations in the eyes of 21st century employers.

When lacking interpersonal skills, Engineers become more prone to misunderstandings. In a study conducted by Trevelyan (2010) with Engineers, almost all participating professionals reported that the main flaws in the work environment resulted from mistakes in human interactions, rather than technical errors. Human and social relations have a great influence in the technical results in Engineer's performance.

The highest values assessed by psychologists within the Communication core competence were indexes related to dialogue ("being able to participate in a clear dialogue" and "active listening") and writing ("Being able to participate in a clear dialogue influences 'Oral Communication'"). On the other hand, foreign language received the lowest scores in the assessments, as can be seen in **Table 3**.

Verbal Communication is a soft skill that plays an important role in Engineering, as it is directly related to dialogues and understanding, especially when exposing or defending an idea. It also contributes to the hiring and training process of new employees, in communicating project scopes and presenting proposals to clients as well as in communication within the team itself, and any other activities related to expression and presentation skills.

Table 3. Average of the values assigned by Psychologists for the Core Competence Communication, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Communication" impacts the soft skills of an Engineer	8.57
Soft Skill	How much a "Verbal Communication" impacts "Communication"	8.66
Index	How much "Ability to talk in public" impacts "Verbal Communication"	8.17
Index	How much "Ability to present ideas clearly during a conversation" impacts "Verbal Communication"	9.17
Soft skill	How much a "Written Communication" impacts "Communication"	8.54
Index	How much "Ability to write complex reports and documents with clarity" impacts "Written Communication"	9.23
Index	How much "Having an understandable handwriting and good domain of grammar and rules of the native language" impacts "Written Communication"	8.86
Soft Skill	How much "Active Listening" impacts "Communication"	9.09
Index	How much "Think in an articulate manner, with clear and efficient ideas" impacts "Active Listening"	8.91
Index	How much "Ability to listen to the interlocutor and wait to speak" impacts "Active Listening"	8.46
Soft skill	How much "Reading" impacts "Communication"	8.63
Soft skill	How much "Foreign Language" impacts "Communication"	7.43

Source: Own authorship.

It is worth mentioning that for Engineers, according to Kaye's (1999), written communication is not something that "distracts" professionals from the real Engineering work, but rather the key to creating better partnerships. Communication is the basis of trust, and everyone benefits from good communication.

The skill Active Listening is described by Kumar & Hsiao (2007) as the ability to listen carefully and learn from others. This soft skill was also mentioned by OECD (2015) as very important for the exchange of views between people. Andersen & Hansen (2002) call "Empathic Listening" the ability to listen carefully and communicate without ambiguity, facilitating the resolution of problems in Engineering.

Reading-related indices received high scores by psychologists. Herkert & Vincent (1991) and Andrews, Mcbride & Sloan (1993) pointed out the difficulty of reading and interpreting among engineering students and proposed the inclusion of writing throughout the Engineering curriculum, preparing students for the development of communication skills both individually and in groups. Figure 3 shows the distribution of wages in countries surveyed by the OECD

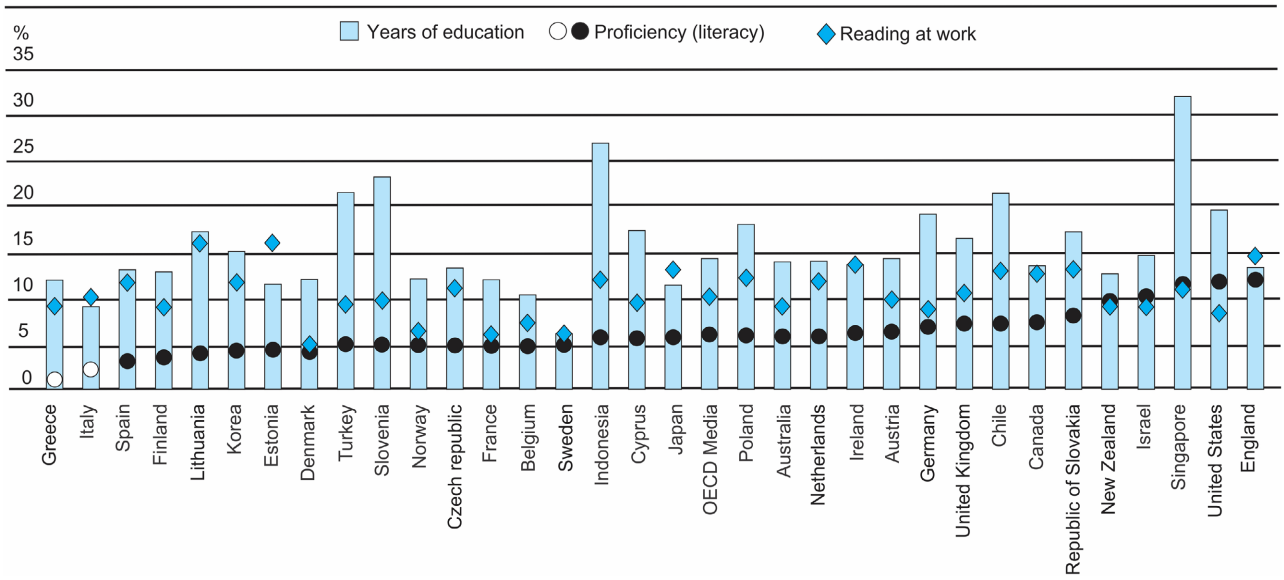

Figure 3. Impact on education, literacy and use of reading at work according to salaries (Source: OECD (2016b)).

(OECD, 2015, 2016a, 2016b) and suggests a strong correlation between reading skills and higher wages.

Finally, among the Communication core competence group, foreign language received the lowest score. According to the OECD (2015), communication in its entirety is achieved when there is accurate writing, correct interpretation, and articulate speaking, including proficiency in a foreign language. The P21 report (Casner-Lotto & Barrington, 2006) also highlights the importance of foreign languages in one's employability, stating that those who can communicate in another language within the business environment are far ahead from those who only know their native language.

The foreign language rating may have received a low rating for being linked to a subcategory inside the soft skill communication. However, it is worth emphasizing its importance due to the interdisciplinary and international feature of Engineering, as there is an increasingly exchange of products and solutions across the entire world.

4.3. Teamwork

Long, Rajabzadeh & MacKenzie (2017) point out, along with Campos, Resende & Fagundes (2020b), the importance of teaching and developing teamwork in Engineering professionals since their education. For the authors, developing the characteristics necessary to achieve this soft skill, which were also outlined by the OECD report, has a direct impact on the performance Engineers and their teams.

Within the skills that form this core competence, organizational psychologists do not perceive networking as the most important characteristic. One of the hypotheses on why networking received a low score is that the term "network" might relate to the idea of networking outside the organization, while, for the

respondents, "Teamwork" is much more complex than creating a network. This is supported by the fact that "'Being able to work, negotiating and managing conflicts with diverse teams and "Stimulate to develop the strengths of others to achieve common goals", were the two of the most highly rated items, as can be seen in Table 4.

4.4. Ethical Perspective

The values of the indexes within the Core Competence Ethical were assigned the highest scores by psychologists when compared to other core competences, and did not present a significant variation within them, as shown in Table 5.

For Cioc, Cioc & Springman (2020) and Kohlbeck et al. (2021), ethics should be considered, in engineering, from the training and qualification of engineering professionals, including topics related to professional responsibilities, ethical responsibilities, respect for diversity and quality and continuous improvement, both evaluated in this research, including permanent issues in the labor market

Table 4. Average of the values assigned by Psychologists for the Core Competence Teamwork, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Teamwork" impacts the soft skills of an Engineer	8.49
Soft Skill	How much "Leadership" impacts "Teamwork"	8.33
Index	How much "Ability to negotiate and manage conflicts with diverse teams" impacts "Leadership"	9.14
Index	How much "Encourage others to develop their strengths to achieve a common goal" impacts "Leadership"	9.23
Index	How much "Ability to use interpersonal skills to train and develop others" impacts "Leadership"	9.06
Soft Skill	How much "Multiculturalism" impacts "Teamwork"	8.20
Soft skill	How much "Networking" impacts "Teamwork"	7.51

Source: Own authorship.

Table 5. Average of the values assigned by Psychologists for the Core Competence Ethical Perspective, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Ethical Perspective" impacts the soft skills of an Engineer	8.94
Soft Skill	How much "Professionalism" impacts "Ethical Perspective"	9.14
Soft skill	How much "Social Responsibility" impacts "Ethical Perspective"	8.54
Soft skill	How much "Personal Ethics" impacts "Ethical Perspective"	9.06

Source: Own authorship.

and in other professional relationships.

Ethics is also a desired virtue in individuals and in human relations, reflecting the need to work in an integral way, in professional and social bonds, which hypothetically explains the importance considered to it by the responding psychologists, since it permeates all our social relationships.

Although all the items that make up this axis were very well evaluated, it is clear that an ethical behavior ("Personal Ethics") combined with behavior that respects social and relationship rules ("Professionalism") are key factors in the construction of this competence.

4.5. Emotional Intelligence

The roots of Emotional Intelligence (EI) lie in an extensive study about emotions, considering the personality perspective (Revelle & Scherer, 2009). According to Petrides, Mikolajczak & Mavrolevi (2016), EI essentially relates to people's perceptions about their own emotions and how they impact in the society.

Emotional Intelligence differs from the so-called cognitive intelligence, commonly referred to as IQ. While the later relates mostly to innate skills of humans, the former encompasses a set of capabilities related to the ability to identify and manage one own emotions and feelings as well as understanding others' emotions. It is identified as a subdivision of social intelligence, which also involves managing emotions and guiding thinking and actions (Rocha, 2016). For Fair, Deshpande, Joseph & Shu (2005), Emotional Intelligence levels can be improved and developed over time.

The soft skill Control of emotions is one of the main components of the Emotional Intelligence competence, followed by the soft skills "Having passion for the goals" and "Self-esteem, optimism and confidence", as can be seen in **Table 6**.

Thus, for organizational psychology professionals, Emotional Intelligence is primarily built on the tripod emotion—self-esteem—passion. This reinforces the importance of emotional education on the ability of one to recognize, understand and manage their own feelings as well as build the bond between their emotions and professional activities (passion for goals).

None of these components are simple to develop, but they need to be addressed, because a better handling of feelings is related to less impulsive decisions, leading to a better performance of the Engineer's work (Campos, Resende & Fagundes, 2020a).

When analyzing Motivation, for many years, factors such as financial reward and punishment were believed to be natural motivator factors within a business. However, according to several scientific studies cited by Pink (2009), these are only effective in a surprisingly narrow range of circumstances. Nowadays, these factors are associated with limited creativity, and it is believed that high performance is not directly associated with rewards and punishments. Instead, most current studies associate performance with an intrinsic desire for meaning.

Table 6. Average of the values assigned by Psychologists for the Core Competence Emotional Intelligence, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Emotional Intelligence" impacts the soft skills of an Engineer	8.80
Soft Skill	How much "Motivation" impacts "Emotional Intelligence"	8.14
Index	How much "Being persistent" impacts "Motivation"	9.20
Index	How much "Having passion for the goals" impacts "Motivation"	8.34
Index	How much "Possess self-esteem, optimism and confidence" impacts "Motivation"	9.20
Soft Skill	How much "Control of Emotions" impacts "Emotional Intelligence"	9.23
Index	How much "Ability to learn with the own mistakes" impacts "Control of emotions"	7.97
Index	How much "Possessing self-control" impacts "Control of emotions"	9.09
Soft Skill	How much "Lifelong Learning" impacts "Emotional Intelligence"	8.51
Soft Skill	How much "Self-Direction" impacts "Emotional Intelligence"	8.17

Source: Own authorship.

Motivation is an ability that depends on multiple variables, such as upholding the individual's essential rights, as well as maintaining their basic needs (Schunk & DiBenedetto, 2020). Therefore, motivation can also be understood as an indirect consequence of the professional's broad well-being, which includes psychic, physical, emotional, social, and spiritual variables.

Soft skills related to EI are required not only in workspaces, but in many other aspects of life, and are related to other increasingly necessary characteristics such as flexibility, sensitivity, perspective (Katarzyna, 2018); awareness and the ability to be focused on the present (Schneider et al., 2010). This helps explain the highest scores assigned to these skills by organizational psychologists when compared to other skills.

4.6. Creative Thinking

Creative Thinking is usually associated with the creation of a new product or concept. Consequently, the so-called creative cognition is set of cognitive processes that support the generation of new and useful ideas (Beaty, Benedek, Silcia, & Schacter, 2016).

Creativity is the product of a fruitful way of thinking, which culminates with the ability to create something new or providing new ideas that can be applied to problem solving as well as the ability to stablish relationships between pre-existing ideas or concepts (Hasanah & Surya, 2017).

Although Engineering constantly involves the process of creation and search for solutions, the Creative Thinking core competence was the lowest evaluated by organizational psychologists among the six competences identified in the

present study. These professionals seem not to view Creative Thinking as the most important skill for Engineers, although they strongly agree that it plays an important role in creativity and innovation, as can be seen in Table 7.

4.7. Perception of the Importance of Each Soft Skill in Engineering

Although soft skills are interdisciplinary and derive from various areas of knowledge (e.g., verbal communication from linguistics, native ethics from philosophy and leadership from applied social sciences), in the present work, the analyzed skills were grouped into six sets called Core Competences: Critical Thinking, Creative thinking, Emotional Intelligence, Ethical Perspective, Teamwork and Communication.

The analysis of the scores assigned to each of these six Core Competences by organizational psychologists on Engineering shows that Ethical Perspective, Critical Thinking and Emotional Intelligence received the highest scores as can be seen in Table 8.

A further analysis of the Core Competences with highest scores to evaluate which soft skills were assigned highest scores inside each of them is shown on Table 9.

Table 7. Average of the values assigned by Psychologists for the Core Competence Creative Thinking, after application of the Delphi Method.

Parameter	Question	Avg.
Core competence	How much "Creative Thinking" impacts the soft skills of an Engineer.	7.98
Soft Skill	How much "Creativity" impacts "Creative Thinking"	9.29
Soft Skill	How much "Innovation" impacts "Creative Thinking"	9.17

Source: Own authorship.

Table 8. Average of the values assigned by Psychologists on the importance of each Core Competence for Engineering, after application of the Delphi Method.

Core Competence	Variable	Avg.
Ethical Perspective	Professionalism	9.14
	Personal Ethics	9.06
	Social Responsibility	8.54
Critical Thinking	Openness to suggestions, new ideas and contrary opinions	9.46
	Use knowledge, data and facts	8.89
	Find Solutions using multidisciplinary knowledge	8.51
Emotional Intelligence	Control of Emotions	9.23
	Having passion for the goals	9.20
	Self-Control	9.09

Source: Own authorship.

Table 9. Structure of the questionnaire applied to the organizational psychologists.

Indicator	Avg.
How much "Critical Thinking" impacts the soft skills of an Engineer	8.89
How much "Communication" impacts the soft skills of an Engineer	8.57
How much "Teamwork" impacts the soft skills of an Engineer	8.49
How much "Ethical Perspective" impacts the soft skills of an Engineer	8.94
How much "Emotional Intelligence" impacts the soft skills of an Engineer	8.80
How much "Creative Thinking" impacts the soft skills of an Engineer	7.98

Source: Own authorship.

The results presented on Table 9 suggest that the most important aspects of soft skills are related to the ability to understand and manage one's emotions, developing and applying ethical thinking as well as the ability to think outside the box and to take into consideration other's ideas and perspectives into consideration.

5. Conclusion

Soft skills are related to human behavior and interpersonal relationships. Therefore, organizational psychologists are the most indicated professionals to assess the most important aspects necessary to build these skills.

In organizational psychology, more specifically in competence management, psychologists are responsible for evaluating and defining which skills are valuable for a given organization. This is the starting point to seek for external and internal candidates, so that the behavioral characteristics are the guidelines for the human resources management model (Vasconcelos, 2017).

The analysis of the results shows little variation on the scores assigned to the different soft skill, which supports the importance of development of cognitive, social, and interpersonal skills in general for Engineering professionals.

For the respondents, soft skills are important for the professional and relational performance of the Engineer. Since they work in an intrinsically multidisciplinary environment, including exchange between different areas of knowledge and cross functional teams, the soft skills are important for many of their activities, such as creation and product development as well as problem-solving.

It is, therefore, necessary to reshape Engineering curricula and Engineering education to include the development of soft skills. As many of these skills are developed in a cross functional manner and through experience, it is not enough to expect that a professional will develop them alone, but rather they need to be built through pedagogical projects, creating situations in which such skills can also be provoked in students along with technical-scientific skills.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendices

Appendix 1. Structure of the questionnaire applied to the organizational psychologists.

Article	Question
Core competence	How much "Critical Thinking" impacts the soft skills of an Engineer
Soft Skill	How much "Problem Solving" impacts "Critical Thinking"
Index	How much "Use knowledge, data and facts" impacts "Problem Solving"
Index	How much "Find Solutions using multidisciplinary knowledge" using impacts "Problem Solving"
Soft skill	How much "Open Mind" impacts "Critical Thinking"
Index	How much "Ability to solve problems in a pacific manner" impacts "Open Mind"
Index	How much "Openness to suggestions, new ideas and contrary opinions" impacts "Open Mind"
Core competence	How much "Communication" impacts the soft skills of an Engineer
Soft Skill	How much a "Verbal Communication" impacts "Communication"
Index	How much "Ability to talk in public" impacts "Verbal Communication"
Index	How much "Ability to present ideas clearly during a conversation" impacts "Verbal Communication"
Soft skill	How much a "Written Communication" impacts "Communication"
Index	How much "Ability to write complex reports and documents with clarity" impacts "Written Communication"
Index	How much "Having an understandable handwriting and good domain of grammar and rules of the native language" impacts "Written Communication"
Soft Skill	How much "Active Listening" impacts "Communication"
Index	How much "Think in an articulate manner, with clear and efficient ideas" impacts "Active Listening"
Index	How much "Ability to listen to the interlocutor and wait to speak" impacts "Active Listening"
Soft skill	How much "Reading" impacts "Communication"
Soft skill	How much "Foreign Language" impacts "Communication"
Core competence	How much "Teamwork" impacts the soft skills of an Engineer
Soft Skill	How much "Leadership" impacts "Teamwork"
Index	How much "Ability to negotiate and manage conflicts with diverse teams" impacts "Leadership"
Index	How much "Encourage others to develop their strengths to achieve a common goal" impacts "Leadership"
Index	How much "Ability to use interpersonal skills to train and develop others" impacts "Leadership"
Soft Skill	How much "Multiculturalism" impacts "Teamwork"
Soft skill	How much "Networking" impacts "Teamwork"
Core competence	How much "Ethical Perspective" impacts the soft skills of an Engineer
Soft Skill	How much "Professionalism" impacts "Ethical Perspective"
Soft skill	How much "Social Responsibility" impacts "Ethical Perspective"
Soft skill	How much "Personal Ethics" impacts "Ethical Perspective"
Core competence	How much "Emotional Intelligence" impacts the soft skills of an Engineer

Continued

Soft Skill	How much "Motivation" impacts "Emotional Intelligence"
Index	How much "Being persistent" impacts "Motivation"
Index	How much "Having passion for the goals" impacts "Motivation"
Index	How much "Possess self-esteem, optimism and confidence" impacts "Motivation"
Soft Skill	How much "Control of Emotions" impacts "Emotional Intelligence"
Index	How much "Ability to learn with the own mistakes" impacts "Control of emotions"
Index	How much "Possessing self-control" impacts "Control of emotions"
Soft Skill	How much "Lifelong Learning" impacts "Emotional Intelligence"
Soft Skill	How much "Self-Direction" impacts "Emotional Intelligence"
Core competence	How much "Creative Thinking" impacts the soft skills of an Engineer.
Soft Skill	How much "Creativity" impacts "Creative Thinking"
Soft Skill	How much "Innovation" impacts "Creative Thinking"

Source: Own authorship.