INTERCONNECTIONS BETWEEN ACTIVE LEARNING METHODOLOGIES IN HIGHER EDUCATION AND THE CONSTRUCTION OF SOFT SKILLS: A PROPOSAL ON ONTHOLOGICAL LEARNING PATHS FOR THE TRAINING OF YOUNG PROFESSIONALS IN THE AREA OF INFORMATION TECHNOLOGY

INTERCONEXÕES ENTRE METODOLOGIAS ATIVAS DE APRENDIZAGEM NO ENSINO SUPERIOR E A CONSTRUÇÃO DE SOFT SKILLS: UMA PROPOSTA DE ONTOLOGIA EM TRILHAS DE APRENDIZAGEM PARA FORMAÇÃO DE JOVENS PROFISSIONAIS NA ÁREA DE TECNOLOGIA DA INFORMAÇÃO

INTERCONEXIONES ENTRE METODOLOGÍAS ACTIVAS DE APRENDIZAJE EN LA EDUCACIÓN SUPERIOR Y LA CONSTRUCCIÓN DE SOFT SKILLS: UNA PROPUESTA DE ONTOLOGÍA EN CAMINOS DE APRENDIZAJE PARA LA FORMACIÓN DE JÓVENES PROFESIONALES EN EL ÁREA DE TECNOLOGÍA DE LA INFORMACIÓN

Patrícia Wazlawick
ORCID 0000-0002-4902-0526

Faculdade Antonio Meneghetti, AMF
Universidade Federal de Santa Catarina, UFSC
Restinga Sêca, RS, Brasil
Florianópolis, SC, Brasil
ontopsicologia@amf.edu.br

Raul Sidnei Wazlawick
ORCID 0000-0003-4293-1359

Universidade Federal de Santa Catarina, UFSC
Florianópolis, SC, Brasil
raul@inf.ufsc.br

Abstract. In higher education today, there is an interrelationship between the application of active learning methodologies and the development of human skills (soft skills) in students, found in various educational proposals and institutions. This study consists of exploratory research of quantitative and qualitative nature, having as its theme to study the human, behavioral, interrelational and socio-emotional competencies and skills that can be developed in young students in Information Technology (IT), from universities that align human development with technical learning, enabling new healthy impacts to the integral well-being of these subjects. During the research, a systematic literature review (SLR) was conducted on the topic of soft skills in the IT area, selecting a group of primary and secondary studies and answering research questions and formalizing a.n ontology (classification and structuring) for the soft skills required for the professional in the period of transformations started with the Covid-19 pandemic. The more than eighty soft skills found in the literature were classified according to seven criteria: interpersonal or intrapersonal; emotional and/or analytical; initial or advanced. Thematic axes in learning paths for the development of such soft skills are also presented here. The classifications produced offer the possibility of formalizing innovative learning activities in higher education for the development of specific soft skills aimed at a holistic education for students, and the creation of development programs and programs for holistic training with an emphasis on soft skills for professionals and continuous updates in companies and organizational settings, such as in corporate universities.

Keywords: soft skills; ontology; IT professional; active learning methodologies; learning paths.

Resumo. No ensino superior atual, existe uma inter-relação entre a aplicação de metodologias ativas de aprendizagem e o desenvolvimento de habilidades humanas (soft skills) nos estudantes, encontradas em diversas propostas educacionais e instituições. Este estudo consiste em uma pesquisa exploratória de natureza quantitativa e qualitativa, com o tema de estudar as competências e habilidades humanas, comportamentais, interpessoais e socioemocionais que podem ser desenvolvidas em jovens estudantes de Tecnologia da Informação (TI), provenientes de universidades que alinham o desenvolvimento humano com a aprendizagem técnica, possibilitando novos impactos saudáveis no bem-estar integral desses sujeitos. Durante a pesquisa, foi realizada uma revisão sistemática da literatura (RSL) sobre o tema das soft skills na área de TI, selecionando um grupo de estudos primários e secundários e

respondendo a questões de pesquisa, formalizando uma ontologia (classificação e estruturação) para as soft skills requeridas para o profissional no período de transformações iniciado com a pandemia de Covid-19. As mais de oitenta soft skills encontradas na literatura foram classificadas de acordo com sete critérios: interpessoais ou intrapessoais; emocionais e/ou analíticos; iniciais ou avançados. Os eixos temáticos em trilhas de aprendizagem para o desenvolvimento dessas soft skills também são apresentados aqui. As classificações produzidas oferecem a possibilidade de formalizar atividades de aprendizagem inovadoras no ensino superior para o desenvolvimento de soft skills específicas voltadas para uma educação integral para os estudantes, e a criação de programas de desenvolvimento e programas para formação integral com ênfase em soft skills para profissionais e atualizações contínuas em empresas e contextos organizacionais, como em universidades corporativas.

Palavras-chave: soft skills; ontologia; professional de TI; metodologias inovativas de aprendizagem; trilhas de aprendizagem.

Resumen: En la educación superior actual, existe una interrelación entre la aplicación de metodologías activas de aprendizaje y el desarrollo de habilidades humanas (soft skills) en los estudiantes, encontradas en diversas propuestas educativas e instituciones. Este estudio consiste en una investigación exploratoria de naturaleza cuantitativa y cualitativa, con el objetivo de estudiar las competencias y habilidades humanas, comportamentales, interpersonales y socioemocionales que pueden ser desarrolladas en jóvenes estudiantes de Tecnología de la Información (TI), provenientes de universidades que alinean el desarrollo humano con el aprendizaje técnico, posibilitando nuevos impactos saludables en el bienestar integral de estos sujetos. Durante la investigación, se realizó una revisión sistemática de la literatura (RSL) sobre el tema de las soft skills en el área de TI, seleccionando un grupo de estudios primarios y secundarios y respondiendo a preguntas de investigación, formalizando una ontología (clasificación y estructuración) para las soft skills requeridas para el profesional en el período de transformaciones iniciado con la pandemia de Covid-19. Las más de ochenta soft skills encontradas en la literatura fueron clasificadas de acuerdo con siete criterios: interpersonales o intrapersonales; emocionales y/o analíticos; iniciales o avanzadas. Los ejes temáticos en las rutas de aprendizaje para el desarrollo de estas soft skills también se presentan aquí. Las clasificaciones producidas ofrecen la posibilidad de formalizar actividades de aprendizaje innovadoras en la educación superior para el desarrollo de soft skills específicas orientadas hacia una educación integral para los estudiantes, y la creación de programas de desarrollo y programas para formación integral con énfasis en soft skills para profesionales y actualizaciones continuas en empresas y contextos organizacionales, como en universidades corporativas.

Palabras clave: soft skills; ontología; profesional de TI; metodologías innovadoras de aprendizaje; rutas de aprendizaje.

1. INTRODUCTION

Over the past years, in the contexts of academic and professional training and within organizations, especially in companies in the field of Information Technology (IT), there has been much discussion and emphasis on hard skills and the dynamics of soft skills. It has been observed that during the period spanning the late 20th century, the early years of the 21st century, particularly during the Covid-19 pandemic and the post-pandemic era, the emerging global contexts and their contemporary issues have shifted focus to the interrelationships between these skills and competencies. There has been an increased emphasis on the need for the development, training, and formation of soft skills for professionals in various fields, with particular attention to IT professionals.

In contemporary times, the world is becoming increasingly fast-paced, and the impact of changes is caused, in turn, by connectivity and significant technological advancements in the field of Information Technology, in what is designated as the Knowledge Era. This rapid and continuous movement generates uncertainty, makes relationships and situations increasingly complex, and increases ambiguity and unpredictability about the future.

Furthermore, another reason is related to the moments during the Covid-19 pandemic and the post-pandemic contexts. By analyzing various situations that have become recurring phenomena in these scenarios, it is observed that there may be interrelationships between the development of soft skills in students and newly graduated young professionals and improvements in their mental health issues.

Soft skills are life skills, interpersonal skills and competencies, employability skills, socio-emotional competencies, interpersonal competencies, social competencies, 21st-century skills, self-developed skills, interactive and human skills, essential human skills, transversal competencies, and transferable skills. These are skills that contribute to self-knowledge, personal and professional development, success in life, and growth in the world of work. These skills can be learned in a training context, and there can be formalized teaching-learning approaches to develop soft skills during university education for young people. These skills are valuable and important to develop in the new generations of young people, and various authors have confirmed that they can be taught. They are related to emotional intelligence, positive attitudes towards oneself, relationships, the world, and life, willingness to learn, and self-management in various important aspects as a person and as a professional.

Competencies, in turn, are understood as two types of competencies: hard skills and soft skills, differentiating between technical skills and behavioral and interpersonal skills. The term soft skills is used for interpersonal, social, and emotional competencies, considered transversal to various fields of knowledge and life. They are primarily required when interacting with other people within an organization and are personal skills that correspond mainly to the cognitive and social realms. The soft skills are attitudes that determine a person's behavior, complementing technical skills.

The soft skills, or non-cognitive competencies and skills, are attitudes and practices that affect how an individual approaches learning and interacts with the world around them. They are a set of abilities that enable better performance in work and personal relationships. The soft skills are a broad set of skills that can be acquired in various environments (school, work, home, volunteering) and are relevant for any type of job. In the Knowledge Era, soft skills play an essential role in differentiating human work.

This article is the result of a quantitative and qualitative research, with the aim of studying the human, behavioral, interrelational and socio-emotional competencies and skills that can be developed in young students in the area of Information Technology (IT), in a university that aligns human development with technical learning, enabling new healthy impacts on the integral well-being of these subjects.

The research is a systematic literature review (SLR) following an adaptation of the process developed by Kitchenham (2007), Kitchenham and Charters (2007) and Kitchenham et al. (2010). According to Kitchenham et al. (2010), a systematic literature review is an effective way to aggregate knowledge on a topic or research question, as the most reliable evidence comes from the aggregation of empirical studies on a given topic. A systematic literature review aims to systematically find relevant studies for a research question, using and applying a transparent and unbiased research strategy.

SLR is present in numerous current studies. It involves a systematic process for searching studies that address a defined research question, as well as a systematic presentation and synthesis of the characteristics of the selected studies (Kitchenham et al., 2010).

The SLR procedure is organized into the phases of definition, execution, and analysis, according to the guidelines and instructions of Kitchenham (2007), Kitchenham and Charters

(2007) and Kitchenham et al. (2010). First, a protocol for the review is defined, determining a research question, inclusion and exclusion criteria, as well as data sources and search strings. Second, in the execution phase, the protocol review is applied to search for and identify studies relevant to the overall objective and research questions, considering the inclusion and exclusion criteria defined in the protocol. Third, the analysis phase involves analyzing the selected studies and extracting data to answer the defined research questions and achieve the objective of the systematic literature review.

In the initial research that gives rise to the present study the general research objective was outlined as performing an analysis and synthesis of an ontology (classification and structuring) regarding what soft skills are present in scientific studies for IT professionals in the 21st century.

2. RELATED STUDIES

Active teaching and learning methodologies are an object/phenomenon of study in several areas of knowledge, as pointed out by Biggs (1999); Gainor, Bline, and Zheng (2014); Kane (2004); Morán (2015); McDowall, Jackiling, and Natoli (2015). The studies cited demonstrate that active methodologies can help students improve their academic performance, as well as the development of competencies, skills and attitudes for their lives and required by the ever-changing job market.

Carrión, Soria, and Medina (2022) in a meta-analysis study of transversal competencies1 for the employability of university students problematize that young professionals trained in universities face a rapidly evolving labor market. However, they find that the training of these same young people does not follow the same pace of development of the labor market or the same orientation, as there are differences between the skills developed by university students and those demanded by employers and between those perceived by university managers (Romero et al., 2021; Hoffmann, 2021a; 2021b; Fuentes et al., 2021). Mina and Barzola (2020), in a study on soft skills in education and business, highlight the urgency that:

> It has been shown that the supply of training institutions at the level of secondary education and technical higher education is not adequately linked to the demand of the productive sector, both in terms of the number of workers needed and the work skills required, generating losses in the employability of young people and in the development of their working life (p. 54).

Considering this context, the authors ask: do transversal skills increase the level of employability of university students? What is the type and level of insertion of transversal skills in university education? Are there more conducive methodologies in the university that help to develop transversal skills? The same authors realize that "higher education institutions have the obligation to continuously reform the professional profile of students, in order to adapt it to the needs of productive, academic and scientific contexts" (p. 22) and point out that soft skills are a dynamic factor for employability.

Considering these issues and the context of both the current labor market and universities, the situations in which the reality of industry 4.0 (the connected industry) is evident, the Covid-19 pandemic that generated the disruptive leap to remote work and the imperative need to reach

[1] Another expression that refers to soft skills.

and develop skills related to Information and Communication Technologies (ICTs). Filatro (2021), when studying soft skills in teaching, highlights that what is innovative in the educational field that can meet the demands for the development of these same skills in contemporary times are active teaching and learning methodologies.

Mina and Barzola (2020) also, when studying what employers say about soft skills as important requirements in employees according to the current scenarios of the labor market, point out that:

> Employers mention that among the difficulties in finding a suitable worker is the lack of integral professionals, capable of having excellent interpersonal relationships, with mastery of languages, leadership and skills for teamwork, which has led to an employability crisis (...). Companies are looking for workers with greater assertiveness in the face of the challenges of a job market that is dynamic, which implies that the person has a high level of adaptability, orientation towards achievement, and tolerance for frustration (p. 50).

One of the possible solutions to the needs and demands posed by the realities exposed in the ideas above points to the use of active learning methodologies. As a scholar in several studies on the emergence of active learning methodologies, in all areas of school and academic training in Brazil, with numerous published materials, Filatro (2021) weaves the term innovative-active methodologies – together with Cavalcanti (Filatro and Cavalcanti, 2018), this term being "a pun that extends active methodologies to encompass innovative foundations and practices" (p. 18). The authors then classify innovative-active methodologies into four categories, namely: (a) (creative) methodologies; (b) agile methodologies; (c) immersive methodologies; (d) analytical methodologies.

An overview of these methodologies, according to the classification proposed by Filatro and Cavalcanti (2018), can be seen in Table 1.

Table 1. Innovative learning methodologies

Methodology	Brief Introduction
(Cri)active methodologies	They are based on the student's protagonism, co-creation and action-reflection, with active and collaborative learning. They include approaches such as Project-Based Learning, Problem-Based Learning, Case Studies, Design Thinking, Empathetic Case, Reverse Coaching, DT express, among others.
Agile Methodologies	Focused on the attention economy, mobile and ubiquitous learning, continuous connection, microlearning and just-in-time learning. They encompass strategies such as Minute Paper, Pecha Kucha, Elevator Speech, among others.
Immersive Methodologies	Related to the learning experience and engagement/motivation with immersive technologies. It is based on the type of experiential and immersive learning, involving media and technologies. It includes resources such as Games and Gamification (Structural Gamification and Content Gamification), Augmented Reality Objects, Virtual Reality, Digital Simulators, Roleplaying, among others.
Analytical Methodologies	Directed to data analysis, adaptation and use of artificial intelligence in Education, learning analytics, adaptation/personalization human-computational intelligence, with adaptive and personalized types of learning, seeking to emphasize assessments. They are expressed through techniques such as Collective Diagnosis, Digital Diagnosis, Participation Statement, and Learning Trails, among others.

Source: Adapted from Filatro and Cavalcanti (2018)

Active methodologies have emerged in the area of Education with the aim of building knowledge and developing skills and attitudes in classrooms and in all educational contexts, updating pedagogical practices that change the classroom environment, according to Nagib and Silva (2020), in a research carried out to investigate the adoption of active learning

methodologies in undergraduate teaching in Accounting. For Silva and Scapin (2011), active methodologies can be defined as the set of techniques that transform the school and academic environment, and for this both the role of the teacher and the student are modified, emphasizing the greater autonomy of the student in the construction and appropriation of knowledge.

To this end, the teacher leaves the position of the one who knows and transmits knowledge, to develop a role with skills of director, tutor and mediator of the teaching and learning process, in order to encourage the student to be the main actor in this time, since the competencies, skills and attitudes that he/she starts to develop in this new scenario of education and training are those demanded by his future as a professional. These actions take place in higher education institutions, which in turn have the role and objective of training citizens/professionals endowed with technical-theoretical knowledge (hard skills) and human and interrelational competences, behaviors, skills, and attitudes (soft skills) (Nagib and Silva, 2020).

Active teaching and learning methodologies emerged to make the classroom an environment in which technical-theoretical knowledge can be built aligned with the development of students' soft skills, emphasizing a maker culture logic to the detriment of the traditional classroom methodology with the classic lecture. The maker culture is based on the conception that the people involved in the teaching and learning process – students and teachers – should be able to do, to get their hands dirty, manufacturing, building, repairing, and changing objects and situations of the most varied forms, types, and functions with their own hands.

And all this within an environment and context in which there is collaboration and exchange of information and knowledge between groups and people. Generally, maker culture activities are based on three pillars, which are: creativity, collaboration, and sustainability. With active teaching and learning methodologies, methods are put into practice in which the teacher is no longer the main responsible for the construction of knowledge, encouraging the student to be more active in this process, which also makes him a builder and developer of his hard and soft skills (Villiers, 2010).

However, a fundamental issue in this process of applying active teaching and learning methodologies for success in their implementation, in the view of Nagib and Silva (2020) is the decision, engagement, and change of the mindset of teachers.

In the same way that teachers must be willing to know and learn in order to make the decision to use these new methodologies, because they understand the importance and their differential, students must also be willing to use the methods of active teaching and learning methodologies. In addition, some active methodologies may be more suitable for some specific curricular components and for others not.

Nagib and Silva's (2020) research also found that the adoption of active methods can promote creativity, experiences, knowledge, human, and behavioral skills, attitudes, and values that add up to professional technical skills and abilities. In this way, the adoption of active methodologies can change the profile of the professional who will graduate, as they help to develop soft skills together with hard skills, prospering in the formation of a more desired professional in the job market in most areas. Several current studies, such as that of Nagib and Silva (2020) demonstrate that active and innovative learning methodologies help in the construction and development of soft skills in higher education students.

A very technical area, Civil Engineering, has made great use of the proposal of soft skills for the innovation of academic-university curricula and has identified the need to work with them during the training of students, for a better preparation of these, required for the urgent

needs of society and companies in emerging contexts. One of the examples is Germany, as Munir (2021) points out:

> He refers to Germany by emphasizing the need for *soft skills* in engineering education. Germany is known for its cutting-edge engineering technologies. German engineers and their products are in demand all over the world. This is also because they have kept up with global changes. They pay more attention to the actual needs of the customers, and this has also impacted the requirements of their Engineering graduates. Social skills are being given more importance. They are required to have the ability to deal with people, to communicate, to offer convincing arguments and they must do all of this in excellent English. International companies are looking for Engineering graduates with the ability to work in different cultures (p. 170).

In this sense, and already in the view of Oliveira and Chiorato (2017), the authors mention that active methodologies should be used as a complement to the traditional method and not as a complete replacement for the latter. According to the authors, the traditional lecture is not completely replaced, but is approached together with active methods, so that active methodologies are complementary instruments and tools and cannot be considered solutions to all the challenges of higher education.

Another relationship with important variables for the adoption of active methodologies in Higher Education is pointed out by the study by Nagib and Silva (2020), which aimed to "identify and analyze the relationship between the adoption of active methodologies, the life cycle and teacher qualification in undergraduate education in accounting sciences" (p. 160). To this end, the authors created a diagnostic tool that enables evaluations of the teaching staff of an HEI (Higher Education Institution).

According to the conclusions of the study by Nagib and Silva (2020), academic qualification is negatively related to the adoption of active methodology categories. According to the data and the results of the research, the teacher with the most academic titles or with the longest time teaching is not the teacher who most adopts active methods, but the one who works the most traditional methodologies in Higher Education. Often, it can be seen that there are some aspects of the mentality and posture of this teacher, which connote the lack of interest in change on the part of the teachers, a certain stability in a comfort zone, maintaining the status quo of traditional teaching, with a focus on content-based education, without thus investing more intensely and deeply to contribute to the development of soft skills of their students.

On the other hand, "teachers with more experience in the classroom and in the job market tend to use more active methods" (Nagib and Silva, 2020, p. 160). For the authors, the contributing factors of this relationship and this increase may be related to the professor's degree throughout his career, to the realization of a greater number of continuing education courses (with investment from the higher education institutions themselves)[2], and due to the change in the profile of students currently entering universities.

As the profile of students fresh out of high school has been changing a lot and quickly – especially in the post-pandemic period, considering from the years 2021 and 2022 – teachers, undergraduate courses and HEIs are verifying that new ways of working with this public are needed in their training in Higher Education. Meneghetti (2022) points out that it is important

[2] Nagib and Silva (2020) point out that "if the HEI wants to invest in the application of active methods in the classroom, it must first invest in teacher training" (p. 160).

to have the ability to speak and communicate with the new generations, because "old academies of the past, glorious, famous, no longer know how to speak to the current world, because they are out of time, they have cultural stereotypes that are incommunicable today" (p. 21).

Along with this, it is necessary to train people who are aligned with market perspectives. The application of active methodologies broadens and favors the development of soft skills, because the profile of professionals demanded by the labor market is guided and oriented, contemporaneously, by a professional who is more communicative, who has analytical capacity, who knows how to relate to colleagues, to the work team, to customers and suppliers, who performs many tasks, who is able to seek problem solving, observation skills, action skills, decision-making, time management, among other relevant soft skills. Soft skills are a set of skills, attitudes, and behaviors demanded by society and the labor market, and correctly implemented active methodologies are able to assist in the development of these competencies and skills in university students (Nagib and Silva, 2020).

Just as we are living the reality of industry 4.0, we are living moments of great transformations in the area of education, and this new context demands new skills, competencies, and knowledge from the subjects. However, a great contradiction exists and is verified: what is observed in most contexts of reality in Brazil is that "the structure of the educational process (...) It has been immune to the various revolutions faced by society over the centuries. Undoubtedly, the school is an old-fashioned, conservative, and rigid social institution" (Silveira, 2016, p. 117).

This traditional school model is well established and continues to be practiced. Attention must be given to the issue that it is a model that is being adorned with "a superficial layer of technology that lends to it an appearance of modernity, without, however, changing anything essential to it", as seen in Figueiredo (2016, p. 812).

Another alternative that currently exists comes from the maker movement (mentioned above) with the Fab Labs and focus on the development of protagonism and autonomy of students, with problem-solving methodologies, the focus shifts from the teacher to the student, who is placed at the center of the learning process itself. Brockveld, Teixeira, and Silva (2017) point out that the maker movement has been considered the next educational and technological leap, presented as an alternative to the traditional class model. He also emphasizes the pyramid of learning, elaborated based on the discussions of Magennis and Farrell (2005):

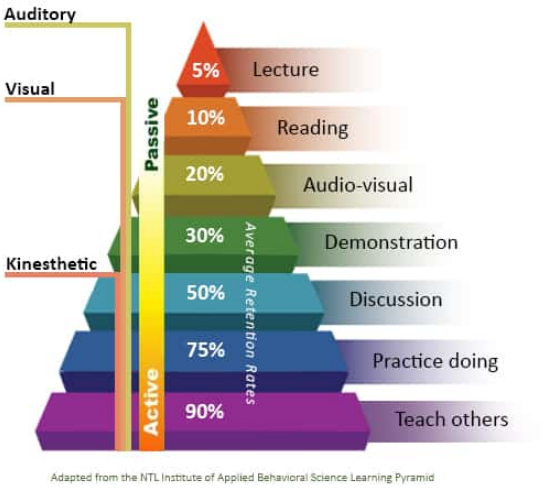

Figure 1. Learning Pyramid
Source: Loveless (2024)

Figure 1, entitled Learning Pyramid, based on the studies of Magennis and Farrell (2005), shows the highest levels of knowledge retention rates through the following forms of knowledge transmission and/or actions/activities: 90% in the activities of teaching others; 75% in learning by doing and practicing all kinds of knowledge; 50% in group discussion activities; then, 30% in demonstration activities; 20% using audiovisual resources; 10% in reading activities and 5% when attending a common/traditional class and/or attending a lecture.

Following the same epistemological line of understanding for innovation and changes in higher education, Escobar and Fernández (2021) in a study on transformation in education and for the transformation of students emphasize transdisciplinary processes in higher education. They present Transformative Education as a possibility of solution in contemporaneity, in such a way that education is no longer limited to the acquisition of knowledge and cognitive intervention, but rather that we work on exchanges and improvement of practical attitudes with students.

According to Escobar and Fernández (2021), the competency-based pedagogical approach requires, first, that educational institutions configure and build interdisciplinary, flexible, broad, and reasoning-centered Teaching Plans, with student contributions. In addition, they allow the development of essential skills for life and work, that is, creativity, entrepreneurship, reflection, communication, critical thinking, problem solving, collaboration, risk-taking, innovation and many other important skills for the new scenarios of life, work, and society in the 21st century.

Similarly, Fuentes et al. (2021), in a study on the evaluation of soft skills in Higher Education, with 50 students in the areas of Psychology and Administration, in the last semesters, in HEIs in Colombia, highlight that the labor market observes and demands the presence of soft skills in its professionals. This is a change and an opportunity in the context of the academy, through the articulation, updates, and improvements of the curricula of the Undergraduate Courses, to strengthen associated conducts for the development of each of the competencies and skills called soft skills.

For Fuentes et al. (2021), soft skills have been the subject of research of main interest by different authors in recent years. The observation of listening behaviors, ability to plan questions, presentation, self-confidence, influence, leadership, support, initiative, organization, and teamwork are the main competencies also proposed in the study by Groh et al. (2015) to identify the presence of soft skills in students and establish possible intervention strategies in higher education programs. According to Fuentes et al. (2021):

> The 21st Century seeks to ensure that professionals have skills in strategic thinking, systems thinking, decision-making, openness to change, ethics, leadership, communication, among others, in the face of a changing and competitive world in which knowledge and the relationship between theory and practice are not present only at work. Teamwork, listening skills, influencing skills, initiative and organization should also prevail, allowing the achievement of not only personal but also business goals, as well as the management of emotions and socialization processes should make a difference in educational and organizational scenarios, both at operational and managerial levels, and that these allow stability and job immersion in recently graduated professionals with little work experience related to the occupational profile (p. 59).

The authors conclude their study by highlighting the importance of understanding that Higher Education, in all its various areas, is committed to creating learning strategies and continuous development of students' socio-emotional competencies and skills. As highlighted

by the Conferencia del Banco de Desarrollo de América Latina (CAF, 2018), cited by Mina and Barzola (2020):

> The times we are living in are of great changes and will not go backwards, this has important implications at all educational levels, since *soft skills* will be the most important. In a world where information is abundant and of all kinds, it is necessary to have criteria to know which information is valuable and which is not (p. 52).

Due to these important and emerging issues, with several actions and new ways of learning and working in the classroom, such as the proposal of active and innovative learning methodologies, the maker culture, and the Fab Lab, among others, we will contribute to improve the skills of future professionals and prepare them to live, act and work in a constantly changing world: competitive and dynamic (Fuentes et al., 2021).

3. METHOD

In the first part of the research, a systematic review of the literature[3] on soft skills in the IT area was carried out, analyzing the state of the art, and selecting a set of primary and secondary studies. In its first moment, the research objective was to carry out an analysis of the literature with the consequent synthesis of an ontology (classification and structuring) for the soft skills required for the professional in the period of professional transformations started with the Covid-19 pandemic.

As the first steps in organizing the research method, after defining the general objective, the research question (RQ) was defined as follows: what would the formalization of an ontology for soft skills be?

In this SLR, the research question was organized with the objective of investigating possible classification criteria for such competencies in order to build a complete ontology in the future. A total of 153 articles were analyzed, selected from an initial group of 780, including empirical and theoretical studies. Then, data were extracted from 15 articles[4], leading to 80 non-repeated soft skills, surpassing in number all other studies conducted in this area previously.

After the definition of the search question, the first moment of the research included a SLR for secondary studies and the second moment included a SLR for primary studies. All the systematic reviews performed for this work occurred between the beginning of September 2021 and April 2022, encompassing the first and second moments of the research procedure.

Searches were performed in bibliographic databases using keywords related to the theme under study. The search strings used in each data repository in the first moment are shown in Table 2. Prospero[5], SciELO[6], and Springer Link[7] databases were used.

---

[3] *Systematic Literature Review* (SLR).
[4] From the application of the inclusion criteria and exclusion criteria defined in the SLR carried out in the post-doctoral research (in progress).
[5] PROSPERO: http://crd.york.ac.uk/prospero
[6] SciELO: http://scielo.org
[7] Springer Link: http://link.springer.com

Table 2. Search strings used in databases at the first moment of the search

Database	Search String
PROSPERO	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming)) AND ((SLR) OR ("systematic review of literature") OR ("systematic mapping") OR (SML) OR ("secondary study"))
SciELO	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming)) AND ((SLR) OR ("systematic review of literature") OR ("systematic mapping") OR (SML) OR ("secondary study"))
Springer Link	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming)) AND ((SLR) OR ("systematic review of literature") OR ("systematic mapping") OR (SML) OR ("secondary study"))

Source: data elaborated in this research

As shown in Table 3, articles with secondary studies were recovered only from Springer Link. The 51 articles that returned were used at the first moment of the research.

Table 3. Number of articles found in each database at the first moment of the search

Database	Filter	Articles
PROSPERO	Registered research protocols	0
SciELO	Research articles	0
Springer Link	Research articles	51
Total		**51**

Source: data elaborated in this research

Continuing the research, according to the general objective established and the research question, inclusion and exclusion criteria were defined to select the relevant studies. In this stage, the articles obtained were screened to exclude those not considered relevant to respond to the RQ. The following inclusion criteria were defined:

- Studies must be written in English, Portuguese and/or Spanish[8];
- Studies should be published between 2006 and December 2021, comprising a period of 15 years of scientific productions;
- Studies should be related to soft skills;
- Studies that present and/or discuss the formation of an ontology for soft skills;
- Studies that respond directly to the RQ of this study.

Among the exclusion criteria, the following were applied:

- Short articles;
- Duplicate articles;
- Articles not written in English, Portuguese and/or Spanish;
- Articles not focused on soft skills and/or entrepreneurial skills;
- Articles that are not directly related to the areas of Computer Science, Systems, Information Technology and/or related engineering areas;
- If the study was published in more than one journal or conference, the older version is excluded;
- Articles not peer-reviewed, such as book chapters, technical reports, documents, abstracts or presentations.

[8] These three languages were chosen because we are dealing with the Iberic-American context.

Next, the titles, abstracts, and keywords of the articles were read for applying the inclusion and exclusion criteria, resulting in eleven articles included and forty articles excluded.

Then, the eleven selected articles were read completely, and the inclusion and exclusion criteria were applied again. Eight articles were excluded after that, and the three remaining articles were considered for data extraction.

It was performed a partial analysis of the three articles selected at the first moment of the research, which shown that they all worked with software developers, testers, and IT students. Regarding soft skills identified in those studies, the following were reported in two or even the three papers: ability to communicate clearly, critical thinking, solving complex problems, ability to make partnerships, collaborate with other people and teamwork, ethical posture, integrity, innovation, creativity, rapid learning, and lifelong learning.

As the SLR articles included with secondary studies were few, in the second moment of research the search string was redefined to cover primary studies. Table 4 presents the configuration of the search strings for primary studies that were used in the PROSPERO, SciELO, and Springer Link databases.

Table 4. Search strings used in databases at the second moment of the search

Database	Search String
PROSPERO	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming))
SciELO	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming))
Springer Link	("soft skills") AND ((informatics) OR (computer) OR (technology) OR (programming))

Source: data elaborated in this research

Table 5 shows the number of articles found in each database at the second moment of the research. The total number of articles is 729, including duplicate articles.

Table 5. Number of articles found in each database at the second moment of the research

Database	Filter	Articles
PROSPERO	Registered research protocols	7
SciELO	Research articles	68
Springer Link	Research articles	654
Total		**729**

Source: data elaborated in this research

In the second moment of the research, PROSPERO returned seven articles, SciELO, 68, and Springer Link, 654, totaling 729 articles that returned at this time. (Adding to the 51 articles that returned at the first moment of the research, the total number of articles in the first and second moment of the research reached 780).

Continuing the second moment of the research, as done in the first moment, the selected articles were analyzed. Inclusion and exclusion criteria were used to select the articles for final analysis. This phase consisted of reading the titles, abstracts, and keywords of the articles, resulting in 153 articles included and 576 articles excluded.

Next, the 153 selected articles were read completely, and the inclusion and exclusion criteria were applied again. From those, 141 articles were excluded, and the twelve remaining articles were used for data extraction. After this final selection of the articles in the second moment of the study, the articles were analyzed and the data extracted, aiming to respond to

the RQ. Thus, fifteen articles were selected as a result of the first and second moments of the research for the extraction of final data.

In next moment of the research, several soft skills were extracted from the fifteen articles. After several readings, reflections, and qualitative analyses based on content analysis, considering the primary and secondary studies, we discovered 80 skills were found in the SLR were classified according to seven criteria in our ontology: (a) Intrapersonal or Interpersonal; (b) Emotional and/or Analytical; (c) Basic or Advanced; (d) In a multicriteria training in learning paths for the development of soft skills with the goal of a possible orientation to work training in university and corporate/organizational contexts.

Based on these classifications, our study reached the resulting groups, which are shown in Table 6. The numbers in parentheses indicate the number of skills in each group and subgroup.

Table 6. Classification for as *soft skills*

Criterion 1	Criterion 2	Criterion 3	Soft skills
Intrapersonal (53)	Emotional (27)	Basic (17)	• Commitment • Confidence • Constancy • Credibility • Ethical posture • Focus • Honesty • Initiative • Integrity • Openness/adaptability/flexibility • Passion • Perseverance/persistence • Positive attitude • Proactivity • Respectability • Responsibility • Will
		Advanced (10)	• Creativity • Operate under pressure • Resistance • Self-awareness/conscientiousness • Self-confidence • Self-efficacy • Skills for emotional control • Stress tolerance • Uncertainty tolerance • Versatility
	Analytical (26)	Basic (7)	• Analysis and understanding of consequences • Discipline • Identify/recognize opportunities • Lifelong learning • Orientation to detail • Sense of risk • Setting goals
		Advanced (19)	• Agility • Cognitive skills • Computational thinking

Br. J. Ed., Tech. Soc., v.17, n.4, Oct-Dec, p.1324-1346, 2024
DOI http://dx.doi.org/10.14571/brajets.v17.n4.1324-1346
ISSN 2316-9907

			• Critical thinking • Decision making • Entrepreneurial intention • Fast learning • Independent work (autonomy) • Innovation (innovative thinking) • Multitasking • Quality orientation • Results orientation • Self-assessment • Self-management • Solving complex problems • Synthesis • Systematic planning and monitoring • Time management • Vision
Interpersonal (26)	Emotional (2)	Basic (1)	• Courtesy
		Advanced (1)	• Empathy
	Analytical (10)	Basic (3)	• Customer focus • Dealing with ethical and legal issues • Intercultural skills
		Advanced (7)	• Administrative skills • Business vision • Organizational skills • Preparing budgets • Resource management • Risk management • Strategic skills
	Emotional-analytical (14)	Basic (4)	• Cooperation • Participation • Project management • Sharing knowledge
		Advanced (10)	• Communication • Conflict management • Diplomacy • Leadership • Managing functional relationships • Negotiation • Partnering/collaborating/building networks • Persuasion • Speaking in public • Teamwork

Source: data elaborated in this research

In the second part of the research, the 80 soft skills were presented to students of the bachelor's degree in information systems[9] and to professionals/professors in the IT area for the selection, according to their evaluation, of which would be the most important soft skills for personal and professional development in the IT area.

[9] From a private higher education institution in the countryside of Rio Grande do Sul, Brazil.

Among the students[10], a total of 109 participated, being 94% male and 6% female, with an average age of 19 to 21 years. Among the professionals[11], all of them are also university professors in the area. There were ten professionals, 90% male and 10% female, with an average age of 35 years. A total of 119 subjects participated in the empirical stage of this research. Now, we are working on the configuration of 30 soft skills chosen by the subjects participating in the research for the construction of an instrument to evaluate those skills for the IT area.

One of the initial results pointed out by the research was the interrelationship between the application of active teaching-learning methodologies by professors in higher education, aiming at the construction and development of soft skills in undergraduate students. Therefore, in the other part of the research, pursuing the preparation of an ontology for soft skills, in addition to the initial criteria used, namely a) interpersonal or intrapersonal; b) emotional and/or analytical; and c) basic or advanced – the research advanced by identifying thematic axes in learning paths for the development of soft skills, in a multicriteria training, which is presented in this article.

After the formalization of the learning paths with the indication of soft skills by the research authors, using content analysis, they were sent for evaluation by experts. These experts assessed them according to their experience and professional practice. The experts unanimously validated that these learning paths can be used for the development of the suggested human competencies for university education and in organizational contexts for young students in the field of Information Technology.

Thus, in this article, we sought to develop a theoretical study that interrelates the application of active teaching and learning methodologies in higher education to obtain as a result the construction of soft skills in students.

4. RESULTS

The main result of this study, after the systematic literature review conducted in this research, is proposal for an ontology of soft skills organized in learning paths for the development of young people at the university.

The concept of learning paths emerged as a specific construct focused on greater training of professionals in the workplace. It is in the corporate environment that learning paths emerge, as a corporate teaching methodology. They were designed and conceived as possible paths for learning and professional development, exempting themselves from the rigidity and inflexibility of traditional training and education programs for new professionals[12].

For Filatro (2021), "learning paths provide flexible paths according to the needs and interests of each learner" (p. 20). In this way, starting from a corporate teaching methodology and analyzing its benefits, it is possible to apply the method of learning paths also in higher

[10] A table consisting of 80 soft skills was presented to each of them, with the guidance that they read all of it carefully and choose twenty soft skills that they considered most important for training and personal and professional development in the IT area. The students worked in groups of no more than five or six people in a practical activity in the classroom, in the discipline "The World of Work and Technology" and chosen their twenty selected soft skills.

[11] The professionals/teachers received via WhatsApp a presentation of the research in progress, and they were also asked to select twenty soft skills that they considered most important for training and personal and professional development in the IT area. They returned the messages with the selection containing twenty soft skills according to their choice.

[12] Checked in: "Learn what it is, benefits, and how to set up a learning path" February 2022. Available at: www.https://blog.saraivaeducacao.com.br/trilha-de-aprendizagem / Accessed on: December 03, 2022.

education institutions to provide and ensure better student learning, regardless of the Undergraduate Course and the project.

One of the main scientific and social relevance for the conception and formalization of learning paths is the fact that it is known that learning is not consolidated in the same way for all students, because each student has their own potentials, as well as their own limitations and singularities in the teaching and learning process. Mainly due to the observation of this phenomenon, the need arose to think of methods that contemplate each subject of learning ensuring that the same happens to each student.

It is understood that the same educational solution can be contained in different tracks and in different domains or contexts. In addition, competitiveness in the labor market increases the search for professionals who are increasingly qualified in a wide range of soft skills. Especially the search for professionals trained to solve problems, so that the learning paths can contribute, greatly, to the development of these competencies and skills.

As understood and presented by Lopes and Lima (2019), the learning paths:

> ...can be understood as a systematic and multimodal set of learning units, containing different navigation schemes, which can range from linear, prescriptive models, through more hierarchical models, to network models, whose navigation is freer, and with the purpose of developing skills. These navigation schemes can be customized, based on variables such as objectives, student profile, and learning characteristics (p. 167).

Learning paths, therefore, are a more flexible proposal for the development of students' skills and abilities and allow them to identify not only what to learn, but how to learn and how to continuously improve their learning. One of the main points of working with learning paths, therefore, is the development of students' autonomy.

Learning paths can also be understood as alternative and flexible paths of professional development, focused on the development of specific skills for the world of work and life, which vary according to the choice or profile of each apprentice (Filatro and Cavalcanti, 2018). In the learning paths, people learn by performing practical activities, working, and training, allowing interconnection between theory and practice, between knowledge and action[13].

According to the study by Lopes and Lima (2019), in the Portuguese language, the term "learning path" can be equivalent to some other terms, such as learning path, learning path, training itinerary and learning route. In the English language, on the other hand, learning paths correspond, in their meaning in translation, to learning paths, learning pathways and learning tracks. In Spanish, on the other hand, the terms equivalent to the learning path would be itinerarios de aprendizaje and rutas de formación (training routes). All these terms are synonymous in the three languages presented and are intrinsically related to the concept of lifelong learning.

For Filatro and Cavalcanti (2018), learning paths as alternative and flexible paths for personal and professional development are a relevant proposal for contemporary university education. They can be called routes, paths, trajectories or journeys of learning, development, and knowledge. In this logic of learning, each person can follow a different path from the ones taken by others. The learning paths allow a personalization of learning, which can be at the student's choice, characterizing a customization of learning.

[13] Available at: www.http://inteletto.com Accessed on: 03 Dec. 2022.

Inspired by the logic of learning paths, in the third stage of this research, a proposal was formalized for the classification of soft skills organized and made available in learning paths for the development of young people at the university, which will now be presented. It should be noted that the model/idea of learning paths was used as a concept for the advancement of this research in the proposal of an ontology of soft skills that is being carried out, having a current direction with applicability in Education and training in Higher Education.

The learning paths proposed in this ontology concern competencies and skills in larger, broader sets of soft skills that can be grouped thinking about the training and development of people/professionals, either in the university context of academic training, with the use of activities of innovative methodologies, or in training contexts within companies and organizations, in their proposals for courses, training, updates, and continuing education of employees.

In this sense, as results, the proposal of the learning paths for the development of soft skills was designed and organized, in this research, in a classification that covers the following major areas: in the learning path focused on (1) *Innovation*, soft skills that are more directly related to actions and initiatives in competencies fostering innovative thinking and creativity are covered. The learning path with an emphasis on (2) *Emotional Intelligence* encompasses soft skills related to the subjective world of each person, including managing emotions, dealing with positive and negative feelings, and the "color" that pervades the dimension of psychic activity. This guides and conducts rational and thoughtful actions, as well as the full range of individual behavior. Learning to handle emotions and understand their true meaning, identifying the information they carry, and how they affect us, leads to significant development in a person's skills and abilities. This development results in greater self-awareness and improved interactions with others and the world, especially within the realm of mental health.

In the path of (3) *Discipline and Organization*, competencies and skills are developed that are fundamental for IT professionals and any professional in any field. These skills are versatile and support any job well done and excellence in the workplace. The path of (4) Lifelong Learning encourages understanding that an excellent professional needs to continue studying and learning throughout their life. It highlights the importance of continually acquiring new knowledge and skills in one's area of expertise, ideally on a daily basis. The logic of continuous professional development is essential for anyone who wants to grow and evolve both as an individual and as a professional.

In the path of (5) *Proactivity*, there is a focus on developing a proactive mindset with skills that drive spontaneous change without external stimuli. It involves internal, subjective motivation that takes initiative and produces results. Developing proactivity helps train individuals with a strong vision for the future, who can identify needs and anticipate problems, aiming to address them while various dynamics are in motion, rather than only reacting after problems have already occurred.

The learning paths in (6) *Leadership Development and Entrepreneurial Mindset and Technology* were initially considered separately in this research. However, peer review suggested the possibility of combining them, as they concern soft skills related to leadership and entrepreneurial abilities, with a focus on the business world, particularly in the IT field. Since these soft skills interrelate, they are proposed to be developed complementarily based on various analyses.

The (7) *Agile Development path* represents one of the most significant revolutions in the business world today, especially in IT companies. With a focus on people, their interactions,

and results rather than processes and tools, this learning path emphasizes agile methodologies, which can then be implemented in organizational contexts within IT.

Finally, the path of (8) *Grit, Ambition, and Determination addresses* the issue of finding young individuals who grow biologically and physically but often lack ambition and clarity about their goals and desires. While not universal, this is a common reality within undergraduate courses and companies.

Ambition means which specific action each subject wants to do, develop, and achieve (Meneghetti, 2010; 2013). The modes of formation, whether in the family, or in the current school seem not to have developed the ambition of young people, nor even driven them to think about what their ambition is. On the contrary, most of the time they seem to erase this desire in children, adolescents, and young adults (Meneghetti, 2019). In this track, the goal is to encourage and inspire the development of soft skills that allow people to discover and/or build their ambition, start dreaming, develop grit, determination, passion, and love for what they do. Professionals with a "twinkle in their eye" and guided by their own sense of life, for the development of their own life project, more than just repeating a biological cycle.

The American psychologist, Angela Lee Duckeworth (2016), carried out a longitudinal research with hundreds of research subjects for years studying what made them successful, including discussing whether it was intelligence or will. She found a new theoretical-empirical construct, to her surprise, not intelligence, but an amalgam of will, passion, and perseverance that she defined and formalized in the concept of grit (or determination).

For Duckeworth (2016), very successful people exhibited a kind of fierce perseverance that manifested itself in two forms. At first, these people were more persistent and hardworking than average. Secondly, these people knew very well, deep within themselves, what they wanted. They, as the author points out, "had not only perseverance, but also direction" (p. 20). "It was this combination of passion and perseverance that made successful people special. In a word, they had grit" (Duckeworth, 2016, p. 20). Therefore, it is understood that the interconnection between determination, passion and perseverance can be stimulated in a learning path for the development of soft skills that encourage the development of these, and together, the ambition of young people (Meneghetti, 2010; 2013; 2021).

In this proposal, it is also verified that some soft skills can be repeated or appear in more than one learning path, which is not a failure or limitation. To train people and professionals of human value, with skills and abilities, technical, cognitive, social, and interrelational knowledge, it is necessary, above all, to have a comprehensive education. And there, another important point that this research reaches with the classifications and ontologies of soft skills – and even more so now with the learning paths, already having an interesting interrelationship in new research that is beginning to emerge in the current literature, since several studies point to the importance of a new concept in the discussion of human competencies and abilities. Behavioral and technical – These are the fusion skills, considering the personal and human development of professionals amid the development of artificial intelligence[14].

The criteria for choosing and formalizing the proposal of soft skills presented in learning trails were applied by a content analysis (Bardin, 2015), with several readings and rereadings of the soft skills with which this research and study is working, resulting from the SLR carried out in the postdoctoral research mentioned in the introduction of this article, focusing on those that are closest directly to the idea/proposal of the aforementioned trail.

[14] Fusion skills will not be presented in this article, but they are part of the complete research.

The eight learning paths for soft skills training proposed by this research are now presented in Table 7.

Table 7. Learning Paths and Soft Skills Development

Nº	Path	Soft Skills
1	**Innovation Path**	Initiative + Vision + Creativity + Openness/Adaptability/Flexibility + Innovative Thinking + Critical Thinking + Functioning Under Pressure + Identifying/Recognizing Opportunities + Solving Complex Problems + Decision Making
2	**Emotional Intelligence Path**	Endurance + Stress Tolerance + Will + Positive Attitude + Function Under Pressure + Tolerange to Uncertainty + Confidence + Perseverance/Persistence + Self-Awareness/Conscientiousness + Responsibility + Self-Management + Stay Focused + Empathy + Self-Efficacy + Manage Functional Relationships
3	**Discipline and Organization Path**	Discipline + Critical Thinking + Constancy + Initiative + Stay Focused + Perseverance/Persistence + Proactivity + Will + Responsibility + Analysis and Understanding of Consequences + Setting Goals + Detail Orientation + Self-Assessment + Self-Management + Time Management + Cognitive Skills + Systematic Planning and Monitoring + Working Independently (Autonomy)
4	**Longlife Learning Path**	Openness/Adaptability/Flexibility + Commitment + Constancy + Initiative + Staying Focused + Passion + Perseverance/Persistence + Proactivity + Willingness + Responsibility + Creativity + Endurance + Lifelong Learning + Identifying/Recognizing Opportunities + Self-Management + Cognitive Skills + Critical Thinking + Synthesis + Working Independently (Autonomy) + Sharing Knowledge + Cooperation + Partnering/Collaborating/Networking
5	**Proactivity Path**	Vision (of the Future) + Responsibility + Initiative + Will + Identify Needs + Openness/Adaptability/Flexibility + Perseverance/Persistence + Self-Efficacy + Versatility + Identify/Recognize Opportunities + Sense of Risk + Agility + Fast Learning + Self-Assessment + Self-Management + Cognitive Skills + Orientation to Results + Critical Thinking + Systematic Planning and Monitoring + Decision Making + Autonomy + Risk Management + Strategic Skills
6	**Leadership Development Path & Entrepreneurial Mindset and Technology Path**	Openness/Adaptability/Flexibility + Commitment + Credibility + Initiative + Passion + Perseverance/Persistence + Ethical Posture + Proactivity + Responsibility + Willingness + Self-Awareness/Conscientiousness + Self-Efficacy + Function Under Pressure + Endurance + Stress Tolerance + Consequence Analysis and Understanding + Setting Goals + Identifying/Recognizing Opportunities + Sense of Risk + Agility + Quick Learning + Self-Management + Managing Time + Cognitive Skills + Innovation + Entrepreneurial Intent + Critical Thinking + Solving Complex Problems + Decision Making + Vision + Autonomy + Empathy + Risk Management + Strategic Skills + Computational Thinking + Sharing Knowledge + Project Management + Cooperation + Participation + Communication + Diplomacy + Public Speaking + Partnering/Collaborating/Building Networks + Managing Functional Relationships + Conflict Management + Negotiation + Persuasion + Teamwork
7	**Agile Development Path**	Openness/Adaptability/Flexibility + Commitment/Commitment + Credibility + Initiative + Passion + Perseverance/Persistence + Ethical Posture + Proactivity + Responsibility + Will + Self-

		Awareness/Conscientiousness + Self-Efficacy + Functioning Under Pressure + Resistance + Stress Tolerance + Consequence Analysis and Understanding + Goal Setting + Identifying/Recognizing Opportunities + Sense of Risk + Agility + Quick Learning + Self-Management + Managing the Time + Cognitive Skills + Innovation + Entrepreneurial Intent + Critical Thinking + Solving Complex Problems + Decision Making + Vision + Autonomy + Empathy + Risk Management + Strategic Skills + Computational Thinking + Sharing Knowledge + Project Management + Cooperation + Participation + Communication + Diplomacy + Public Speaking + Partnering/Collaborating/Building Networks + Managing Functional Relationships + Conflict Management + Negotiation + Persuasion + Teamwork
8	**Grit, Ambition, and Determination Path**	Openness/Adaptability/Flexibility + Commitment + Confidence + Initiative + Positive Attitude + Perseverance/Persistence + Responsibility + Will + Self-Confidence + Self-Efficacy + Creativity + Integrity + Emotional Control Skills + Uncertainty Tolerance + Passion + Goal Setting + Self-Assessment + Self-Management + Innovation/Innovative Thinking + Decision-Making + Autonomy + Vision + Lifelong Learning

Source: data elaborated in this research. Soft skills were found in the our SLR

After the content analysis, a first organized proposal of soft skills in learning paths was sent to five different professionals from the areas of Information Systems, Accounting, Administration and Philosophy[15], for their analysis and evaluation of the proposal that was being made to verify what would be the return of each of them in their classification.

The proposal, initially presented to each of the professionals, was sent to them due to the fact that they are people who work directly in the area in which this study is being carried out: IT, in the case of the two Information Systems professionals. Two others were chosen for being from areas related to Information Systems: Accounting Sciences and Administration. And the last, a professional in the field of Philosophy for being a professional and scholar of ontologies as well.

It should be noted that this first proposal of learning paths for the development of soft skills is a design that can be reviewed, expanded, improved, and innovated also with new discussions and research. The detailed reflective analysis carried out by the specialist professionals pointed out the selection made by them in relation to the soft skills previously signaled in each learning path, having as a criterion the choice of the presence of most of the soft skills selected and pointed out in the analysis of each one of them.

5. CONCLUSION

During this research, the study of what are soft skills and their importance in the contemporary context was initially carried out, especially in the configuration of emerging contexts due to the Covid-19 pandemic. A systematic review of the literature on scientific research in the period of the last 15 years, in nine different countries, namely: Chile, Mexico, the United States, Norway, Portugal, Brazil, Colombia, England, and the Netherlands, was carried out to understand its nature and relevance today, and, based on this SLR, to formalize a classification and ontology for the soft skills studied and found, organized in the following

[15] All of them are professionals working in their area of training, in the job market, and Master's, Doctor's and Doctoral students, researchers in their areas, with a professional experience between 10 and 15 years.

criteria: (a) intrapersonal or interpersonal; (b) emotional and/or analytical; (c) basic or advanced, and (d) in a multicriteria training in learning paths for the development of soft skills with the objective of a possible orientation to training work in university and corporate/organizational contexts.

The learning paths proposed in this ontology concern competencies and skills in larger, broader sets of soft skills that can be grouped with applicability in the training and development of people/professionals in the university context of academic training, with the use of activities of innovative methodologies, and also in training contexts within companies and organizations, in their proposals for courses, training, updates and continuing education of employees. Thus, in this stage of the soft skills ontology, they were organized into thematic axes in learning paths, in a multicriteria training, for the development of soft skills.

The study presented in this article corroborates the statement that the use of active teaching and learning methodologies contribute to the development of soft skills in young university students. It was also evidenced that the learning paths require the use of active methodologies to be implemented and produce the due results, as in this proposal, the development of soft skills in young students and professionals.

Finally, it was identified in this study that active teaching and learning methodologies develop soft skills and an ontology organized in thematic axes with a focus on human skills can be an orientation to the development of a contemporary comprehensive education aligned with the needs that the labor market and companies demand in the current emerging contexts.

In addition, with the formalization of a more complete ontology, other contributions are possible, such as:

- The creation of pedagogical projects for undergraduate courses in the area of Computer Science, Information Systems, Engineering, and Technology, for the development and training of future professionals with greater emphasis on skills and abilities both human and behavioral and technical (hard skills);
- Creation of development programs for integral training with emphasis on soft skills of professionals and continuous learning in companies and organizations, such as corporate universities;
- Creation of courses and extension activities for the development of soft skills;
- Assistance for updating hiring processes for companies in the IT area;
- Contribute to other related areas, regarding a deeper knowledge of soft skills and their ontology;
- Encourage professionals to develop their personal growth plans based on the knowledge and application of soft skills;
- Further research to continue the study in this area for new relevant findings.

From the SRL carried out in this research, it is verified that an ontology, a systematic classification becomes necessary, with the purpose of building cumulative knowledge about soft skills in the IT area. In addition, this need is present to build a basis for theoretical development, for explanations of interdependencies between them, for the identification of patterns and cause-effect relationships. Thus, the study built here provides a systematic classification of soft skills, specified in thematic axes and learning paths, which contributes to the growth of studies in the area, also providing a structure and organization for the existing knowledge about human and behavioral skills and abilities in the IT area.

It should be said that, as limitations of the study, the classification of soft skills presented here is not the only possible one, but a possibility of looking, reflecting, analyzing, structuring, and classifying them, from the perspectives studied here. Thus, it is necessary to encourage the realization of new research in which the classifications of soft skills presented here can be applied, to build and generate new understandings about the learning, development and

training of soft skills with IT students and professionals, as well as a greater scientific, theoretical, epistemological, methodological and application understanding of the complexity and interdisciplinarity of the knowledge of human and behavioral skills and abilities, i.e. soft skills.

REFERENCES

Bardin, L. (2015). *Análise de Conteúdo*. Coimbra: Edições 70.

Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher Education Research & Development*, v. 18, n. 1, pp. 57-75.

Brockveld, M. V. V.; Teixeira, C. S. & Silva, M. R. da. (2017). A Cultura Maker em prol da inovação: boas práticas voltadas a sistemas educacionais. pp. 2-25. *Rio +30 Conferência Anprotec*.

Carrión, V. L. R.; Soria, Y. T. B. & Medina, J. L. F. (2022). Meta-analysis of soft skills in the employability of university students. *Revista Gestión de las Personas y Tecnología*, n. 43, pp. 20-42, abr..

Duckeworth, A. L. Garra. (2016). *O poder da paixão e da perseverança*. Rio de Janeiro: Intrínseca.

Escobar, G. S. & Fernández, M. A. (2021). Towards the transformation of students: a transdisciplinary process for higher education. *Revista Iberoamericana para la Investigacíon y el Desarrollo Educativo*, v. 12, n. 23, jul./dez.

Figueiredo, A. D. (2016). A Pedagogia dos Contextos de Aprendizagem. In: *Revista e-Curriculum*, São Paulo, v. 14, n. 3, pp. 809-836, jul./set. Programa de Pós-Graduação em Educação: Currículo-PUC/SP.

Filatro, A. (2021). *Soft Skills* na docência e metodologias ativas de aprendizagem. p. 18-20. In: *Caderno da 5ª Jornada Pedagógica Nacional de Educação Profissional*. 28 e 29/01/2021. Florianópolis: SENAI.

Filatro, A. & Cavalcanti, C. C. (2018). *Metodologias inov-ativas na educação presencial, a distância e corporativa*. São Paulo: Saraiva Educação.

Fuentes, G. Y.; Murcia, L. M. M.; Tellez, D. C. R. & Garcia, M. B. S. (2021). Evalucaión de las habilidades blandas en la educación superior. *Formación Universitaria*, v. 14, n. 4, pp. 49-60.

Gainor, M.; Bline, D. & Zheng, X. (2014). Teaching internal control through active learning. *Journal of Accounting Education*, v. 32, n. 2, pp. 200-221.

Groh, M.; Mckenzie, D. & Vishwanath, T. (2015). Reducing Information Asymmetries in the Youth Labor Market of Jordan with Psychometrics and Skill Based Tests. *The World Bank Economic Review*, v. 29, pp.106-117.

Hoffmann, G. (2021a). *O futuro da educação e o desenvolvimento das competências do século XXI*. Webinar. Available at: https://abmes.org.br/arquivos/documentos/GustavoHoffman_seminario_27_04_21.pdf Accessed on: 04 sep. 2022.

Hoffmann, G. (2021b). O futuro da educação. Informação verbal de curso. Apresentação oral em Painel. 2021b. In: *IV Congresso Internacional Uma Nova Pedagogia para a Sociedade Futura. Formação e Tecnologia Humana*: A educação do futuro já começou. Recanto Maestro: Fundação Antonio Meneghetti de Pesquisa Científica Humanista Cultural e Educacional.

Kane, L. (2004). Educators, learners and active learning methodologies. *International Journal of Lifelong Education*, v. 23, n. 3, pp. 275-286.

Kitchenham, B. (2007). *Diretrizes para realizar Revisões Sistemáticas de Literatura em Engenharia de Software.* Versão 2.3, Escola de Ciência da Computação e Matemática Keele University.

Kitchenham, B. & Charters, S. (2007). *Diretrizes para realizar Revisões Sistemáticas de Literatura em Engenharia de Software.* Escola de Ciência da Computação e Matemática Keele University.

Kitchenham, B.; Pretorius, R.; Budgen, D.; Brereton, O. P.; Turner, M.; Niazi, M. & Linkman, S. (2010). Revisões Sistemáticas de Literatura em Engenharia de Software: Um Estudo Terciário. *Tecnologia da Informação e Software*, v. 52, pp. 792-805.

Lopes, P.; Lima, G. A. (2019). Estratégias de organização, representação e gestão de trilhas de aprendizagem: uma revisão sistemática de literatura. *Perspectivas em Ciência da Informação*, v. 24, n. 2, pp. 165-195.

Loveless, B. (2024). *The learning pyramid*. Education Cornes. Available at: https://www.educationcorner.com/the-learning-pyramid.html. Accessed on: 27 jan. 2024.

Magennis, S. & Farrell, A. (2005). Teaching and learning activities: Expanding the repertoire to support student learning. *Emerging issues in the practice of university learning and teaching*, v. 1.

McDowall, T.; Jackling, B. & Natoli, R. (2015). Relationships between vocational interests and learning approaches to advance the quality of student learning in accounting. *Accounting Education: An International Journal*, v. 24, n. 6, pp. 498-513.

Meneghetti, A. (2010). *I giovani e l'etica ontica*. Roma: Psicologica Editrice.

Meneghetti, A. (2013). A Autóctise histórica. pp. 29-37. In: Meneghetti, A. *Os jovens e a ética ôntica*. Recanto Maestro: Ontopsicológica Editora Universitária.

Meneghetti, A. (2019). *Pedagogia Ontopsicológica*. 6. ed. Recanto Maestro: Ontopsicológica Editora Universitária.

Meneghetti, A. (2021). *Psicologia do Líder*. 6. ed. Recanto Maestro: Ontopsicológica Editora Universitária.

Meneghetti, A. (2022). A operatividade da Ontopsicologia e o futuro da ONU. pp. 17-53. In: Fundação Antonio Meneghetti. *Antonio Meneghetti sobre... Pessoa & Sociedade*. Recanto Maestro: Fundação Antonio Meneghetti.

Mina, M. A. E.; & Barzola, D. G. (2020). Habilidades blandas en la educación y la empresa: Mapeo Sistemático. *Revista Científica UISRAEL*, pp. 41-57.

Morán, J. (2015). Mudando a educação com metodologias ativas. pp. 15-33. In: Souza, C. A.; Morales, O. E. T. (Orgs). *Convergências midiáticas, educação e cidadania: aproximações jovens*. Vol. 4. Ponta Grossa: UEPG/PROEX.

Munir, F. (2021). Do the engineering education institutions provide soft skills education? Views of South African Engineering professionals. *South African Journal of Higher Education*, v. 35, n. 4, pp. 162-179.

Nagib, L. de R. C. & Silva, D. M. da. (2020). Adoção de metodologias ativas e sua relação com o ciclo de vida e a qualificação docente no ensino de graduação em Ciências Contábeis. *Rev. Cont. Fin*., USP, São Paulo, v. 31, n. 82, pp. 145-164, jan./abr.

Oliveira, J. D. & Chiorato, V. H. (2017). A percepção crítica e reflexiva de graduandos sobre uma metodologia ativa na contabilidade. In: *Anais do 14th CONTECSI-International Conference on Information Systems and Technology Management*. São Paulo: FEA USP.

Romero, V.; García, S. & Palacios, J. (2021). Ecosistema con creatividad, investigación e innovación basado en las competencias transversales frente a las exigencias profesionales del siglo XXI. *Apuntes Universitarios*, v. 11, n. 1, pp. 386-400.

Silva, R. H. A. & Scapin, L. T. (2011). Utilização da avaliação formativa para a implementação da problematização como método ativo de ensino-aprendizagem. *Estudos em Avaliação Educacional*, v. 22, n. 50, pp. 537-522.

Silveira, F. (2016). Design & Educação: novas abordagens. pp. 116-131. In: Megido, V. F. (Org.). *A Revolução do Design: conexões para o século XXI*. São Paulo: Gente.

Villiers, R. (2010). The incorporation of soft skills into accounting curricula: Preparing accounting graduates for their unpredictable futures. *Meditari Accountancy Research*, v. 18, n. 2, pp. 1-22.