

Job Competencies and Skills in Latin America: a Look from Industry 4.0

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ABSTRACT: *An increasingly globalized world and the establishment of Industry 4.0 in Latin America makes imperative to ask if the engineering graduates of Higher Education Institutions in the region have the necessary skills to be competitive in the current context and what skills they must develop to be employable in a hyperconnected world. Based on the analysis, the current trend shows a greater relevance for soft skills over hard skills within the context of employability to deal with Industry 4.0 in Latin America and Caribbean (LAC).*

Research has shown that, given the current approach to employability skills within the framework of Industry 4.0 in LAC; the joint working of the University-Government-Company triad is increasingly important to support the know-why, know-what and know-who and continue strengthening the know-how of the people. This in order to overcome the economic and social challenges of the first twenty years of the 21st century and, thus, impact on individual and regional employability in the future.

KEYWORDS: *competencies, Employability, Industry 4.0, Job Market, Skills, Soft Skills.*

I. INTRODUCTION

The skills and competencies required to remain at the forefront of the new technological revolution the world is in now, Industry 4.0, have not been developed in the same way worldwide. This is the case in Latin America and the Caribbean (LAC), where no progress has been made in the fundamental social conditions to be able to use its great potential in terms of employability and young labor force [1].

In this sense, one of the biggest concerns in technological, social and cultural advancement in the workplace is the decrease in wages and the increasing unemployment faced by people who are less prepared for the changes that are coming [2].

As Zilberman asserts, the potential of technology through artificial intelligence, robotics, and the automation of many processes will redefine most jobs and eliminate some others in the short term [3]. With all these current and future changes that directly influence the labor market, it is worth highlighting the relevance of the current analysis that is carried out on the skills that make people more or less employable.

First, the perception that industries or organizations possess is relevant in deciding what is important to them when selecting a candidate for a job; but there is also the perception of people (graduates) and Higher Education Institutions (HEIs) to be employable and provide employability tools, respectively.

In this sense, prior to the first Industrial Revolution, physical and manual dexterity were considered as the main demonstrations of the “talent” that a worker had. Then, over time, between the first and the third Industrial Revolution, it was considered that the predominant variable was the experience of people, since someone who knew how to execute a specific task, did not necessarily do it correctly, that is, optimizing resources and time.

However, with the entry of Industry 4.0, the skills that people possess (knowing how to do and knowing how to be) are now considered as the most important characteristics to highlight for the selection of personnel and, therefore, to increase the employability factor. [4].

II. THEORETICAL FRAMEWORK

Employability skills and competencies

Among the most relevant concepts for this article are firstly the concept of competencies or skills (these concepts are used interchangeably in the literature reviewed and in accordance with the conceptual constructions elaborated by representative authors on this topic). Because this term can have many different meanings according to the multiple contexts in which it is applied (such as psychological, pedagogical, linguistic, etc.); it is important to clarify that those definitions that seek to understand the competence or ability referred to the performance that a person possesses to carry out any activity (especially in the workplace), were taken as the main reference [5].

As already mentioned, in the research, and especially in the English language, the terms “skill” and “competence” are used as synonyms to refer to this same concept. Specifically, the term skill has gone from being something that is reasonable to something that is practical [6], which is closer to the essence of “competence”, as seen below.

Competence, in the context of this article, refers to the expertise, aptitude or suitability that one has to do something or intervene in a specific matter [7]; to the ability to do something successfully or efficiently; to the ability to do something well, that is, with expertise [8].

In this way, competence can be conceived as an underlying (implicit) characteristic in the individual that is causally related to a standard of effectiveness and / or superior performance in a job or situation [9]. As for the firm Ernst & Young, it defines competition as a characteristic of the person, whether innate (natural) or acquired, that is related to a situation of success in a job [10]. Within a job function or role, competencies are expressed in real work situations through performances that respond to quality and productivity requirements.

Moreover, as observed in Figure 1, it is pertinent to clarify that competence is viewed as the main term that encompasses more specific concepts such as knowledge, skills, abilities, etc., which gives greater importance to what can and spread as competence [11].

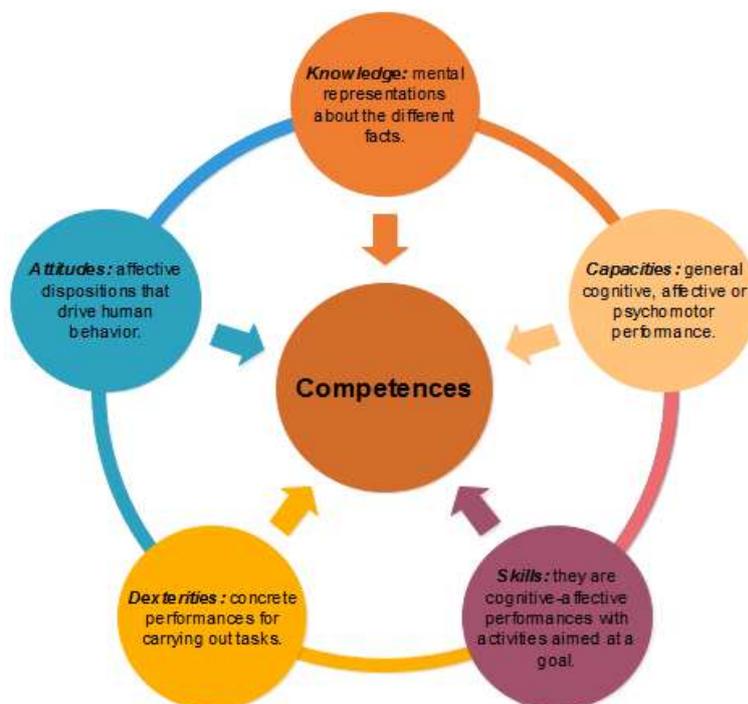


Figure 1. Main components for the term competition. Source: Authors based on Tobón (2013).

In this way, knowledge is one of the bases of competence, and differs from the first one that the former does not imply action on the part of the person, the last one does.

But also, the capacities, abilities and skills are all constituted as components of the competencies and are organized hierarchically, that is, the capacities contain the abilities and these, in turn, the skills [11].

Furthermore, it should be noted that unlike all the other concepts with which competencies are contrasted, these need or must be demonstrated with actions, that is, they must be evaluable, measurable and demonstrable [12].

Now, speaking specifically of labor competencies, some explanations made by various authors can be cited, who, based on their research, have proposed them as a set of human requirements made up of cognitive, physical and socio-affective elements that the worker needs to the successful performance of its functions in accordance with the principle of proven suitability and the organization's strategy [13].

They are also understood as those skills that they have, or attributes and skills that the person will develop in the workplace [14]. This in order to perform the functions assigned according to the position or job title and, in this way, be more competitive compared to demands of organizations, and, in this way, the entry and permanence in the world of work [15] and the improvement of the performance (potential) of workers [13] [16].

According to the definitions, the competencies in general have a collective character regarding their conformation. The ultimate goal of this gathering of elements is to build the person who is prepared both for everyday situations and for specific areas, such as the workplace.

For these specific cases, the demonstrable and evaluable characteristics that the competencies possess are especially relevant; in Figure 2 the items that allow evaluating and qualifying certain competence in a person are presented, taking into account both exogenous factors (environment) and endogenous (personality) and its development over time [11].

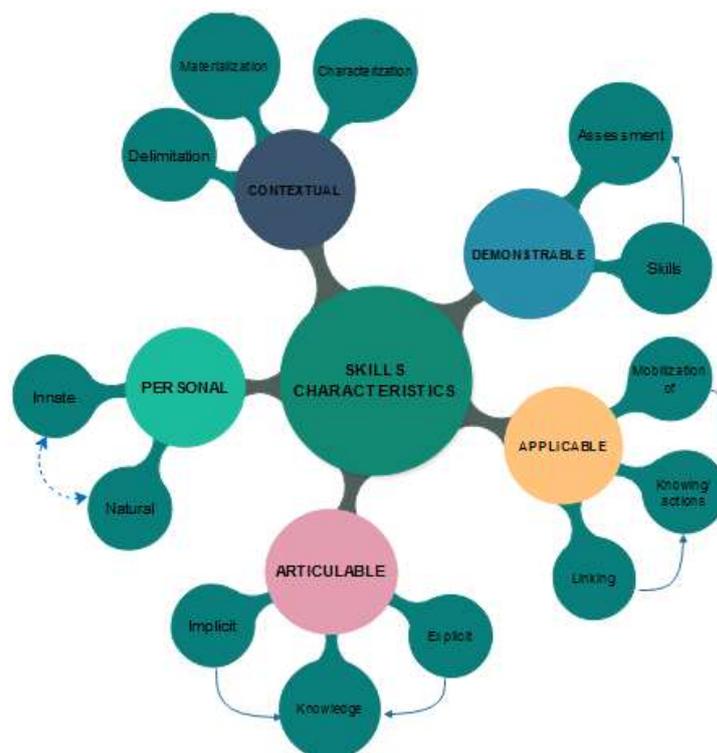


Figure 2. Most important characteristics of the competencies. Source: Authors based on Tobón (2013).

This characterization makes it imperative to know firstly what is generally understood by employability and, secondly, how employability skills are classified when it comes to facilitating the triad confined by the University, Professionals and Organizations developing those skills that make people more competent in the job market?

Employability and classification of employability skills and competencies

First of all, the origin of the concept employability (which can be understood literally as the ability to obtain and keep a job) does not lie at a fixed point, but began to be used around the beginning of the 20th century and half of it until it was taken up in the 1980s [17]. When it was defined as the degree of adequacy between the psychosocial characteristics of a person who demands employment and the typical profile of the person employed in a given context.

Although the concept has been defined on multiple occasions and in various ways due to the imbalances and increasingly demanding needs that exist between labor supply and demand (it was conceived more as a basic fulfillment of the total employable people into the total workforce, that is, unemployed and unemployable) and to the difficulty in the market in finding people who could meet the specific requirements, from a qualitative and quantitative point of view [18]. In recent years it has been more important the personal aspect or the qualities that people possess, referring to the competencies that each individual has.

Therefore, into the term employability is now included the obtaining and the maintainability or not of a job, a characteristic strongly linked both to external social, economic or political factors [19]. It is included also, the capacities or tools of personal order of which an individual is available [20] and in which students and graduates can discern, acquire, adapt, and continually improve the personal skills, understandings, and attributes that make them more likely to find and create meaningful paid and unpaid work and to benefit themselves, the workforce, the society, and the economy [21] [22].

Secondly, there are several ways to classify competencies based on the specific needs of organizations or contexts, where a categorization is required. Some of the different relevant classifications can be framed into three major categories, which are: basic competencies, generic or transversal competencies and specific competencies [23] [24] [25].

Basic competencies: they refer to the performance behaviors that people must demonstrate, associated with their basic training in mathematics, reading, verbal and written expression, among others. They are those that are required to possess a minimum employability profile to enter a job.

Generic competencies: these are common performance behaviors in various occupations such as computing, teamwork, planning and second language skills.

Specific competencies: they are related to associated performance behaviors, technical or specific knowledge specific to the profession or trade, within a productive function, such as the specific operation of a machine, the use of specific programs, etc.

Finally, some reviews classify job skills into more specific groups and it can be seen how the job skills approach is based on the development and improvement of people's employability conditions, as shown in Table I [26] [27] [28].

Table I: Classifications for job skills

Category/ Country	Mexico	Chile	Colombia	USA
Basic skills	They are linked to the general levels of reading, writing, arithmetic, etc.	Acquired in the initial education cycle. It allows progress in education and integrates people into society.		Central or core competencies
Generic or Transversal competencies	Associated with any type of occupation (teamwork, effective communication, etc.)	(ABOUT EMPLOYABILITY): Specifically required to enter, maintain, develop at work and generate job mobility.	Not linked to a particular occupation, or economic sector, position or type of productive activity, but they enable entering work, staying in it,	

		(BEHAVIORAL): They explain the superior performances in the world of work, associated mainly with personal attributes rather than with a minimum standard of performance. (proactivity and innovation, for example).	learning and transferring knowledge.	
Specific competencies	These are the competencies of a specific job or position	(FUNCTIONAL): Transversal or specific technical competencies to carry out activities typical of a job function, according to the standards and quality established by the company or sector.	Necessary for the performance of functions specific to occupations in the productive sector. They are synonymous with mastery of knowledge, skills and attitudes that lead to the achievement of results in an occupation.	auxiliary skills

Source: authors based on Ministerio de Educación Nacional (2003), Fundación Chile (2010) and Irigoien & Vargas (2002)

III. METHODOLOGY

The article is presented as a theoretical-descriptive and documentary review, whose construction is the scientometric recognition and analysis concerning the subject. In this case, this examination is limited to the published articles associated with job competencies and / or skills that are essential for a better employability opportunity in the current job field within the framework of Industry 4.0, taking into account the global scope, but with emphasis on the results that can be obtained for LAC, mainly..

The review and analysis units include all those documents that meet the specific variables, such as belonging to the most important bibliographic databases, their registration as publications with secondary and tertiary information sources (scientific or academic) and that are found in a recent scale (2010-2019).

In the first instance, a general review of the state of the art is carried out in the 2015-2019 period of job skills and/or competencies, including the keywords *COMPETENCIES*, *EMPLOYABILITY* and *SKILLS*. Thus excluding skills that are not related to employability and work environment and making exclusive use of the English terms to generate greater coverage in the search for information.

A list of the skills and / or competencies found is made below and a it is added a new filter including the keyword *ENGINEERING* (thus excluding careers other than engineering) and *LATIN AMERICA*, allowing scientometrics to be carried out within the LAC region.

Secondly, the Web of Science database is used to select the relevant articles with job skills. For this, the search parameters are established by selecting terms such as “*work skills*” in order to have a wider selection of the articles to be reviewed. Next, terms such as “*work competence*” and “*job skills*” are added, all of them separated by means of the OR command, ensuring non-exclusion of articles that contain at least one of these terms.

Subsequently, the term “*employability*” is added using the AND command to select articles that, in addition to containing any of the terms named above, are strictly accompanied by employability.

Finally, using Software R  (through the bibliometrix package) and VOSviewer  it is possible to obtain the most relevant information on the selected articles within the framework of Industry 4.0.

IV. RESULTS AND DISCUSSION

State of the art of employability skills

After performing the state of the art search under the following parameters: *employability* AND (*competencies* OR *skills*), 78 job skills and/or competencies were found (all of them from previously reviewed articles within the context of Industry 4.0 in the time window 2015-2019). They are assigned a unique abbreviation (most of them in Spanish) for better identification in the graphic analysis and are listed in Table II, which shows the authors who specifically identify the skill. It should be noted that the distribution shown below does not necessarily represent the author's exclusive use of the term (as they may appear in more publications) and that the planning and organization ability appears as one within the analysis under the abbreviation PyO.

Table II: Outstanding skills in the framework of Industry 4.0

[29] Li & Sun, 2011	[30] Pengnate, 2018	[31] Yuzainee, Zaharim, & Omar, 2011	[32] Prakash & Bellappa, 2012	[33] Ward, Baruah, & Gbadebo, 2017
1. Achievement orientation (OrL)	3. Adaptability (Ad)	11. Planning capacity (PyO)	13. Curiosity (Cu)	17. Analysis ability (HA)
2. Diligence (Dil)	4. Knowledge application (ApC)	12. Professional development (DP)	14. Enthusiasm (Entu)	18. Leadership (L)
	5. Attention to detail (AtD)		15. Financial management (GF)	19. Interpersonal skills (HabI)
	6. Commitment (C)		16. Communication in English and foreign languages (CI)	
	7. Cooperation (Coop)			
	8. Information processing (Information retrieval) (InfR)			
	9. Know how to listen (E)			
	10. Self-awareness (S-A)			
[34] Abdulwahed, Balid, Hasna, & Pokharel, 2013	[35] Bhardwaj, 2015	[36] Fugate, Kinicki, & Ashforth, 2004	[37] McArdle, Waters, Briscoe, & Hall, 2007	[38] Ahmad, Zainal, Idris, & Rahmat, 2012)
20. Analytical thinking (PA)	25. Emotional intelligence (IE)	27. Career identity (IC)	28. Proactivity (P)	32. Computer skills (ITC)
21. Business management skills (HGN)	26. Self-confidence (S-C)		29. Self-efficacy (S-E)	33. Computational thinking (PC)
22. Creative thinking (PCr)			30. Self-esteem (Autoe)	
23. Critical thinking (PeC)			31. Social support (AS)	
24. Cultural and social awareness (CCS)				
[39] Rivera et al., 2012)	[40] Rasul, Rauf, Mansor, Yasin, & Mahamod, 2013)	[41] Vázquez, 2014)	[42] Neghavati, 2016)	[43] Singh & Singh, 2017
34. Punctuality (Punt)	36. Entrepreneurship ability (HE)	37. Learn to learn (AA)	38. Global citizenship (CG)	39. E-learning (E-l)
35. Teamwork (WT)				
[44] Sisodia &	[45] Picatoste,	[46] Amslem	[19] Bargsted,	[47] Yusof, Mustapha,

Agarwal, 2017	Pérez-Ortiz, & Ruesga-Benito, 2018	& Gendron, 2019	2017	Mohamad, & Bunian, 2012
40. Oral and written communication skills (HabC)	43. Ethical awareness (CE)	47. Assiduity (Asi)	48. External locus of control (Extl)	50. Problem resolution (ResP)
41. Self-management (Autog)	44. Flexibility (F)		49. Internal locus of control (Intl)	51. Social media management (<i>networking</i>) (MSM)
42. Use of Information and Communication Technologies (TIC's) (IT)	45. lifelong learning (AP)			
	46. self-direction (S-D)			
[48] Rosales, 2014	[49] Misra & Khurana, 2017	[50] Gao & Zhang, 2013	[51] Silva Laya, 2016	[52] Albert-Gómez, García-Pérez, & Pérez-Molina, 2017
52. Independent learning (autodidactism) (AI)	54. Initiative (Ini)	63. Career aspiration (AC)	64. Innovation skills (Hinn)	68. Autonomy (Aut)
53. Creativity (Cr)	55. Integrity (Int)		65. Negotiation skills (N)	69. Multicultural Skills (HM)
	56. Learning capacity (CapA)		66. Social responsibility (RS)	70. Motivation (motivation to others, self-motivation) (Mot)
	57. Numerical skills (HabN)		67. Practical skills (HP)	71. Polyvalence (<i>Multitasking</i>) (Pol)
	58. Project management (GP)			72. Organizational capacity (PyO)
	59. Resilience (Resil)			73. self-advocacy (Autod)
	60. Self-control (Autoc)			74. self-reflection (S-R)
	61. Social intelligence (IS)			75. self-reliance (Autos)
	62. Work ethic (WE)			76. Time management (GT)
				77. Transdisciplinarity (TransD)
				78. Collaboration Skill (Colab)

As can be seen, the authors consulted place a special emphasis on soft skills rather than those called core skills, coming to group them into *personal skills, fundamental skills, cognitive skills, contextual skills, social skills, generic skills, self-perceived employability skills, language skills, instrumental skills, and motivational or attitudinal skills*. This include adaptability, knowledge application [30], leadership [33], flexibility, global awareness [45], teamwork [39], resilience [49], oral and written communication, use of ICT's [44] and social responsibility [51], respectively.

It should be noted that although the authors include skills such as questioning ability, stress tolerance [30], healthier lifestyle, interest in spirituality [32], occupational psychology [44], written expression [48], reasoning ability, job-seeking skills [49], working spirit [50] and self-image management [52]. Those were not taken into account as they were ambiguous and/or irrelevant to this article, as well as competencies such as “knowing how to express yourself in public”, “honesty”, “respect” or “knowing how to prioritize” are not included; since they were considered as part of macro skills such as work ethic, oral communication skills and writing, planning and organization skills, respectively, among others.

Starting from the search equation *employability AND (competencies OR skills)*, the keywords *Latin America* and *engineering* (both under the AND command) are added, finding the total number of articles in the time window 2015-2019 in the databases consulted. Unfortunately, the specific results for LAC are so scarce that they are ignored and only those that include the *engineering* keyword are taken into account.

As shown in Figure 3, a schematic color scale graph is performed that shows the annual behavior of the search results of the skills analyzed in the time window (exemplified for the years 2017-2019), with the abbreviations respective to each ability (See Table II).

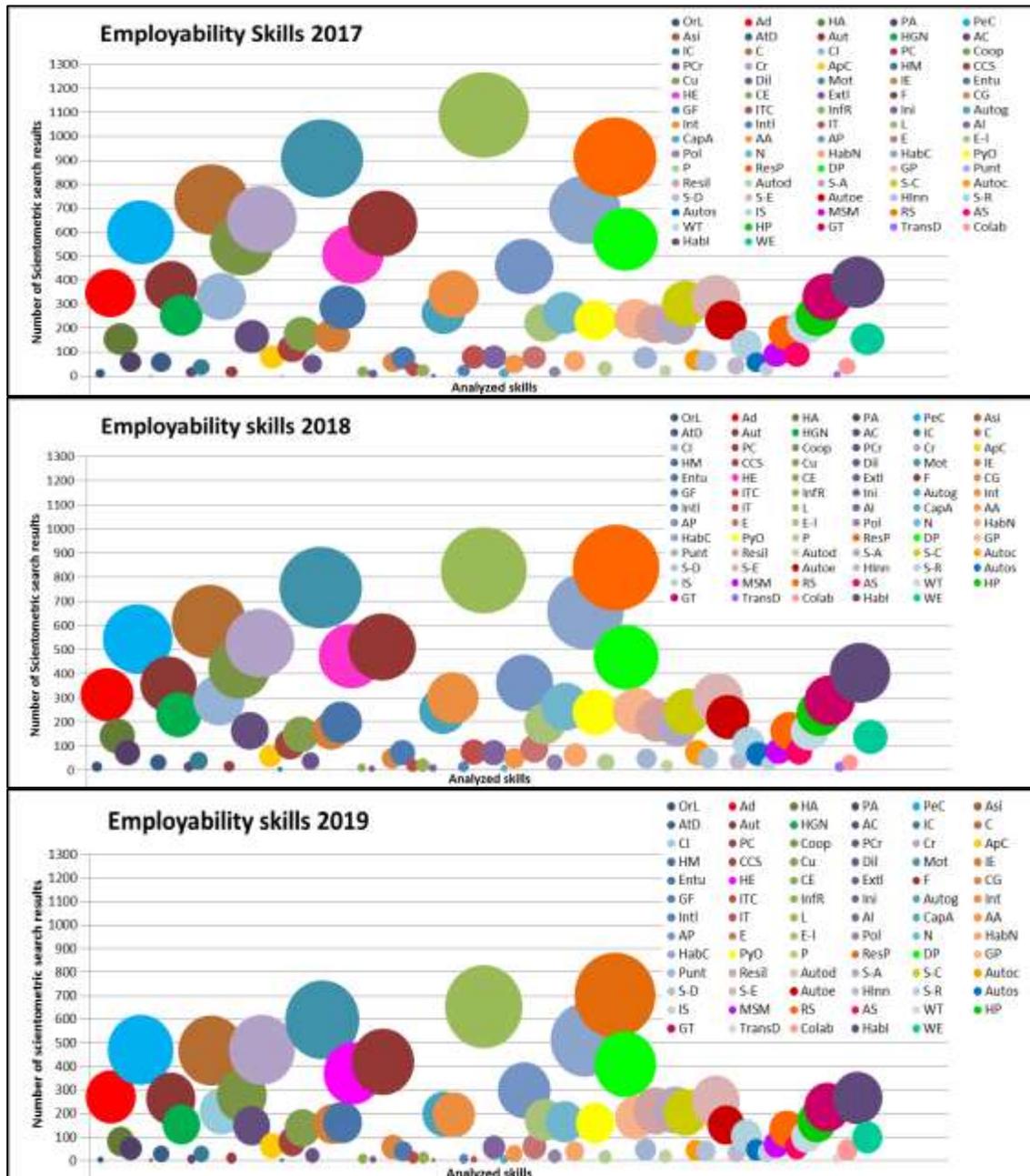


Figure 3. Annual behavior of the number of search results of employability skills 2017-2019.

In general, the trend is maintained in the time window, with the skills with the highest number of search results (2017, in all cases), in their order and as illustrated in Figure 4: Leadership (1090), Problem solving (916), Motivation (909), Commitment (737), Oral and written communication skills (696) and Creativity (656).

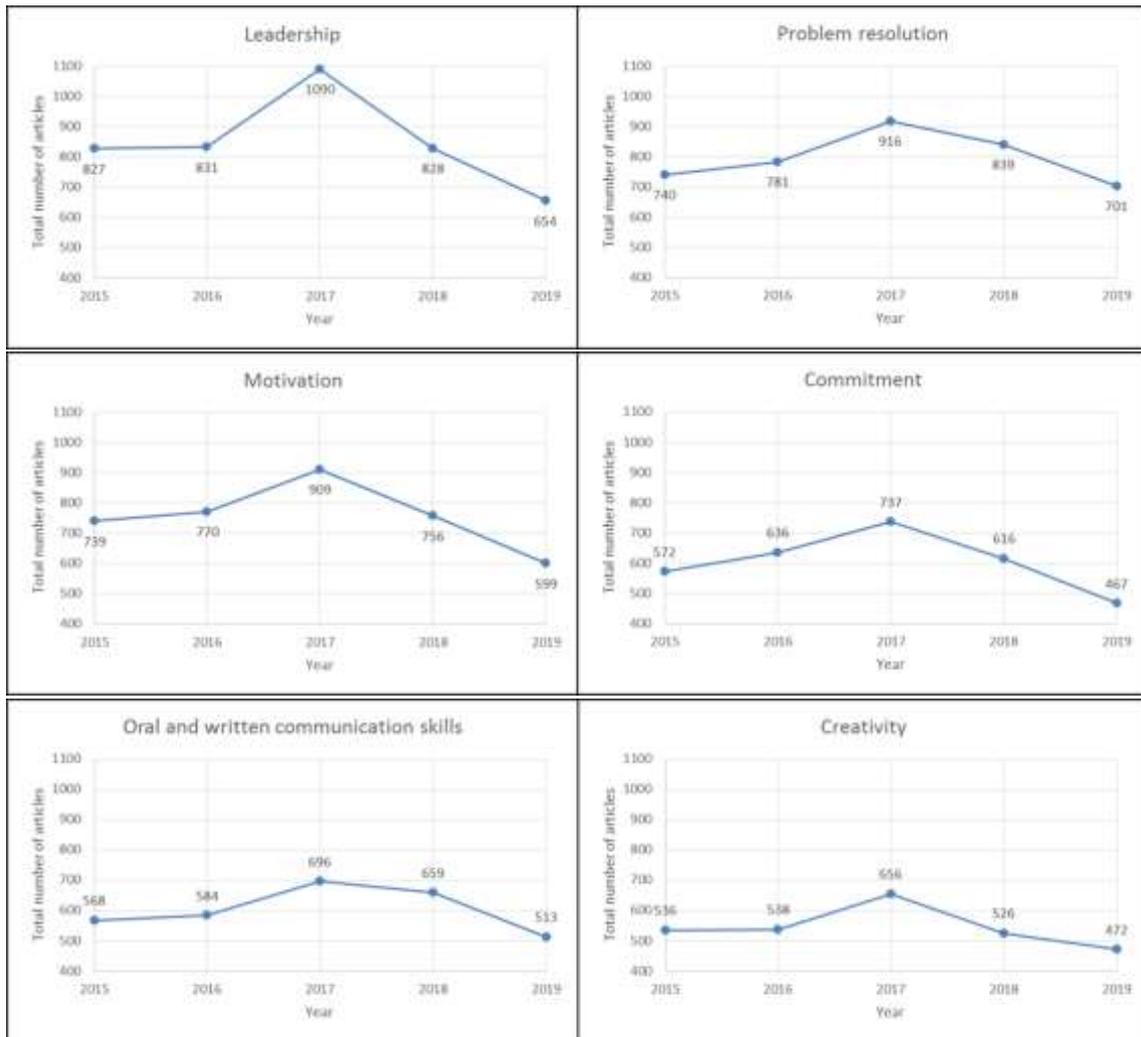


Figure 4. Most representative skills for the period 2015-2019.

Although a negative trend is observed in all cases in the number of search results for these skills, it cannot be inferred that they are necessarily becoming obsolete or irrelevant. In this sense, although skills such as flexibility, critical thinking, emotional intelligence, versatility, innovation and teamwork are essential aspects that current professionals must strengthen to respond to the demands of today's labor market and increasingly automated and flat organizations (self-organization), the skills presented in Figure 4 are cross-cutting to the foundation of the impending Industry 4.0: hyperconnection [53].

In this sense, another interesting result that can be seen in Figure 3 to Figure 5 is the predominance that the year 2017 had in the number of articles published on the subject and the importance that the authors gave on soft skills.

In particular, the year 2017 was largely focused on the relevance of graduates maintaining internal and external communication networks (networking) that allows them, in the first place, a personal reinvention (what differentiates them from others, what is their added value as a person, how can you turn your weaknesses into similar strengths and similar questions) [54]. Secondly, the tendency to invest more in personal skills in order to have greater employability in the medium and long term [55]; and above all, to the empowerment of what call the “Exit Competencies: Know How”: skills that include problem solving, learning, planning capacity, analysis and reflection skills, all contained within of the aforementioned soft skills framework [56].

However, developing these skills represents an even greater challenge for those who are newly admitted to LAC. According to the Inter-American Development Bank (IDB), gender, the socio-economic condition of the home and cognitive skills are among the predictors of youth working conditions at age 22.

Secondly, there is the paradox of working to gain experience and the experience requirement to be able to work. Young people perceive a market with a segmented offer according to whether they are jobs for the fulfillment of immediate or more distant goals. The first job "is always precarious" and serves, above all, to acquire the necessary experience to qualify for better jobs in the future. The second job is the one that "allows you to continue studying", young people opine [57].

Finally, there is the preparation of graduates to be employable in the current job market. Although the region has been strengthened in terms of employability, the accentuation of Industry 4.0 in the region supposes an adaptation and faster evolution of the skills that are required in organizations of the 21st century: skills increasingly focused on knowing how to be than just knowing how to do.

Although the results do not seek to discredit the technical or hard skills that engineers in LAC require to exercise their profession, it is clear to see the predominance that experts give that graduates, universities and organizations migrate towards the strengthening of skills that dignify the know-how and enhance the soft skills of people.

State of the art of scientific production in employability

In the state of the art search carried out in the Web of Science database, a total of 477 documents were obtained with the specified parameters and belonging to a broader time window, 2010-2019. Of these, only those belonging to the "Article" category were chosen, leaving a total of 445 documents, on which the corresponding analysis is made.

In this way, relevant data are obtained such as the total number of authors who are part of the articles analyzed (1339) and their characterization according to their production of articles by single authorship (83) or by multiple authorship of documents (1256), among others, as shown in Table III.

Table III: Overview of search results obtained

Description	Results
Documents	445
Resources (Magazines, Books, etc.)	363
Keywords Plus (ID)	1106
Author's Keywords (DE)	1486
Time frame	2010-2019
Average number of citations per document	5,903
Authors	1339
Authors' appearances	1485
Authors of single-author documents	83
Authors of multiple authorship documents	1256
Single author documents	85
Documents by Author	0,332
Authors by documents	3,01
Co-authors by documents	3,34
Collaboration index	3,49

In the analysis of the extracted information, an increase in the production of articles published per year for the selected time frame (2010-2019) can be verified: while for 2010 there was a scientific production of 20 articles pertaining to the topic, For the year 2019, there are already 65 publications, which represents an increase compared to the base year of 325%.

Furthermore, as illustrated in Figure 5, for this time window the consolidated year in which the most articles were published was 2017 with 70 documents. The results reveal an annual percentage growth rate of 13.99% in scientific production of related articles.

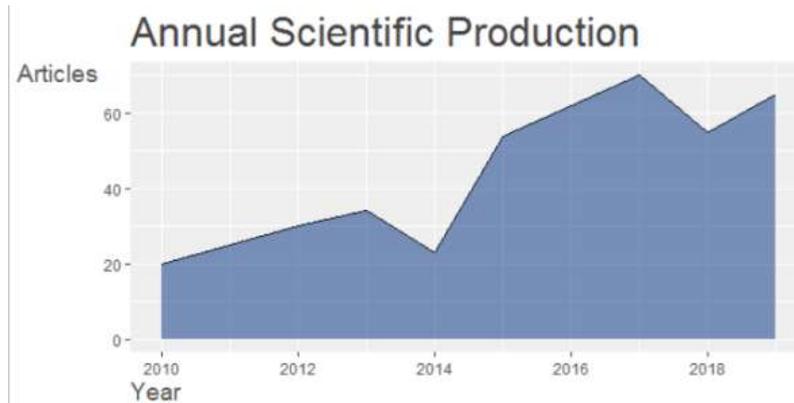


Figure 5. Annual production of articles for the period 2010-2019. Source: Authors based on bibliographic data

In the case of the average number of annual citations, the articles that have been published for the longest time are, of course, those with the highest number of citations, although there are exceptions depending on the relevance of the article to the subject of study analyzed. In contrast, according to Figure 6a, the most recent articles tend to have lower average annual total citations.

However, linked to this characteristic, also exists the number of citations that the articles may have, but distributed for the years in which they can be cited in the chosen period. In this way, it is observed that the articles published in 2010 have an approximate annual citations distribution of 3.2 citations / year, a number that decreases (with the exception of 2019) as the articles are more recent, as observed in Figure 6b.

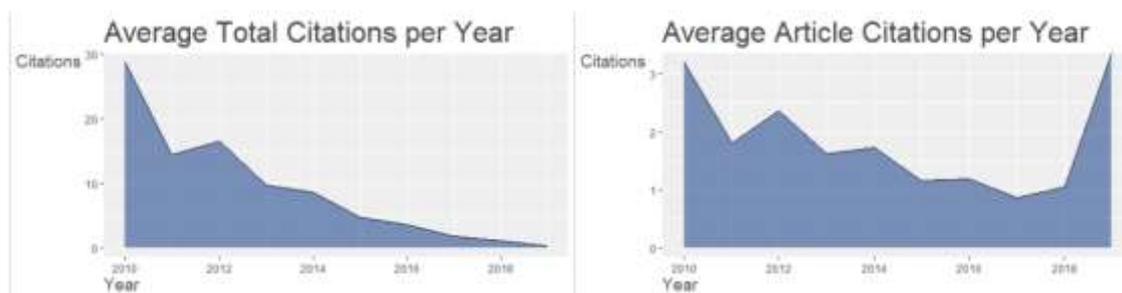


Figure 6. (a) Total average of citations per year. (b) Average article citations per year. Source: Authors based on bibliographic data

In the case of productivity by country, Figure 7 illustrates that United States leads the ranking, with 156 articles, of which 139 are the country's own publications (SCP) and 17 are Foreign Collaborative Publications (MCP) [58].

In second place is United Kingdom, with 32 publications, most of them authored by the country of origin. It is worth noting that the first Spanish-speaking country in the classification is Spain in fourth place and it has 27 publications.

Latin American countries appear up to the 12th, 14th and 15th positions represented by Mexico, Brazil and Colombia, respectively; each of them with 5 published articles, which shows the lag that the region has in terms of research and dissemination of knowledge on this particular subject.

Figure 8. Co-occurrence network of the keywords most used by the authors of the articles analyzed. Source: Authors based on VOSviewer data

Although all these concepts are important and are related to each other (according to their strength of cooperation), for the specific case of this article is necessary to specify those that explicitly refer to the skills necessary to develop people for employability.

Analytical deepening to the cluster job skills

With this in mind, the cluster was taken corresponding to "job skills" and it is observed the individual occurrences of the terms that are included there. As the results of the previous section showed, the terms obtained tend to give greater importance to soft skills, which again confirms their preponderance over hard skills. The most representative terms in English are presented in Table IV.

Table IV: Most important skills for the search cluster "Job skills"

Competencies	Frequency
People Management	12
Meta-analysis	10
Attitude	9
Leadership	7
Empowerment	7
Self-esteem	7
Social Skills	5
Future Work Skills	4
Ethics	4
Collaboration	4
Self Perception	3
Teamwork	3
Empathy	3
Collaborative Learning	3
Video Modelling	3
Analytics	2
Communication	2
Creativity	2
Decision Making	2
Emotional Intelligence	2
Problem Solving	2
Reliability	2

Clearly, those skills that are transversal and applicable to any type of work are those that stand out and, largely, have a greater occurrence in the extraction of keywords from the analyzed articles. This demonstrates the value that soft skills have on the adaptation of people to new work environments, which represent open and dynamic contexts and in which only people with better preparation and development gain the advantage over others.

State of the art from the Industry 4.0 concept and co-occurrence with related concepts

Finally, to make a greater emphasis on the future labor market and the skills required in this, a new search is performed in the time window 2010-2019. Now, it is made changing the parameters that are entered in the database: (*skill OR competence*) AND “*industry 4.0*”, thus ensuring that the results contain an interrelation between the concept of Industry 4.0 and the competencies or skills that this new concept involves.

Thus, 182 related articles are obtained, of which 166 are published over a period of three years: 36 for 2017, 45 for 2018 and 85 articles for 2019, as shown in Figure 9.

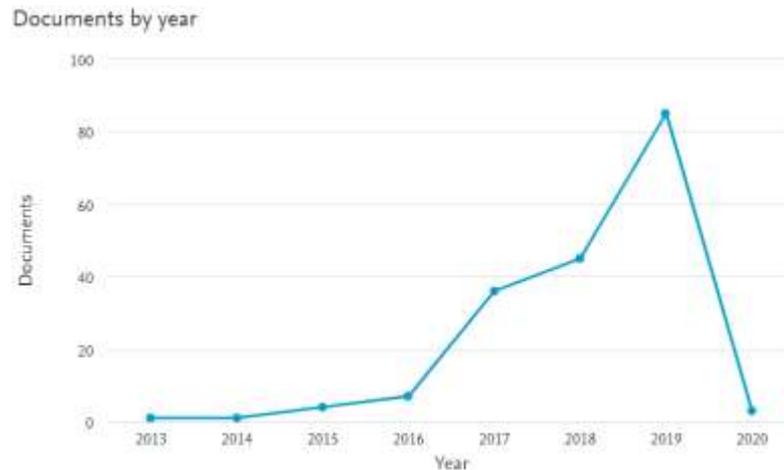


Figure 9. Annual production of articles for the search of the competencies in Industry 4.0. Source: Authors based on search carried out in Scopus Database

It is appreciated that the research and publication trend regarding the relationship between Industry 4.0 and the competencies that are necessary for a successful transition to it, applicable mainly in individual contexts (worker) until reaching broader ones (companies and government) is relatively recent and with an increasing trend.

Likewise, Engineering is established as the field from which the subject of Industry 4.0 and its relationship with the competencies or skills that it demands are addressed the most (80 articles in total). Subsequently, there are Social Sciences (58), where the subject is addressed from the soft skills and the personal aspects of workers facing such rapid and dynamic changes in the labor market due to the implementation of these new forms of production. In third and fourth place are Business Management and Accounting (BMA) (54) and Computer Science (54), respectively, where they are over all the more specific or technical competencies considered in the use, implementation and integration of technology within all production systems and services.

More specific fields of research appear, such as Psychology, Economics, Arts, Chemistry, etc., as can be seen in Figure 10.

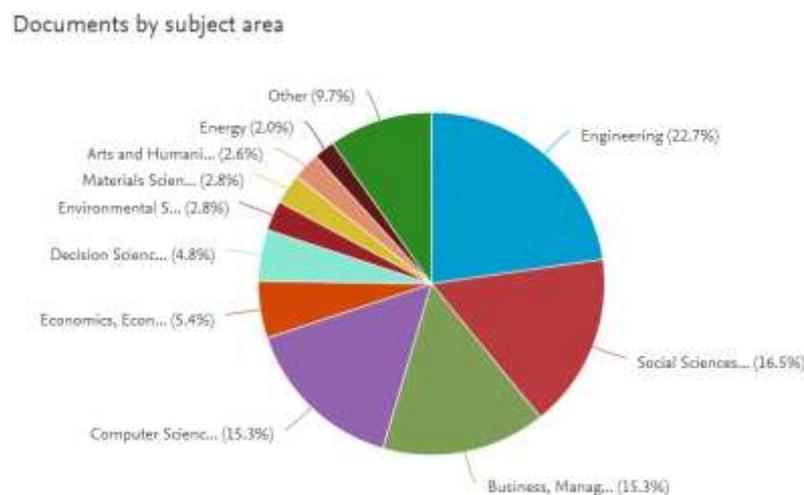


Figure 10. Classification of the articles obtained according to their subject area. Source: Authors based on search carried out in Scopus Database

In summary, although professionals must possess competencies in specific fields such as information technology (IT), analysis of large volumes of data (*Big Data*) and the use of statistical tools. It is also necessary to acquire skills that will allow them to work with others, express their ideas, establish

relationships, share knowledge, and thus train as integral professionals with greater added value for the labor market. [59].

In this sense, and in order to validate the aforementioned, a new co-occurrence network is carried out, using the VosViewer software, of all the terms established as keywords both indexed and those considered by Authors of publications.

Thus, there are 1156 keywords, with articles of mainly European origin (the only Latin American countries that stand out are Brazil, Chile, Colombia and Mexico). For these keywords is established a frequency limit of the term of two, with this, the list of keywords is reduced to 167, as shown in Figure 11.

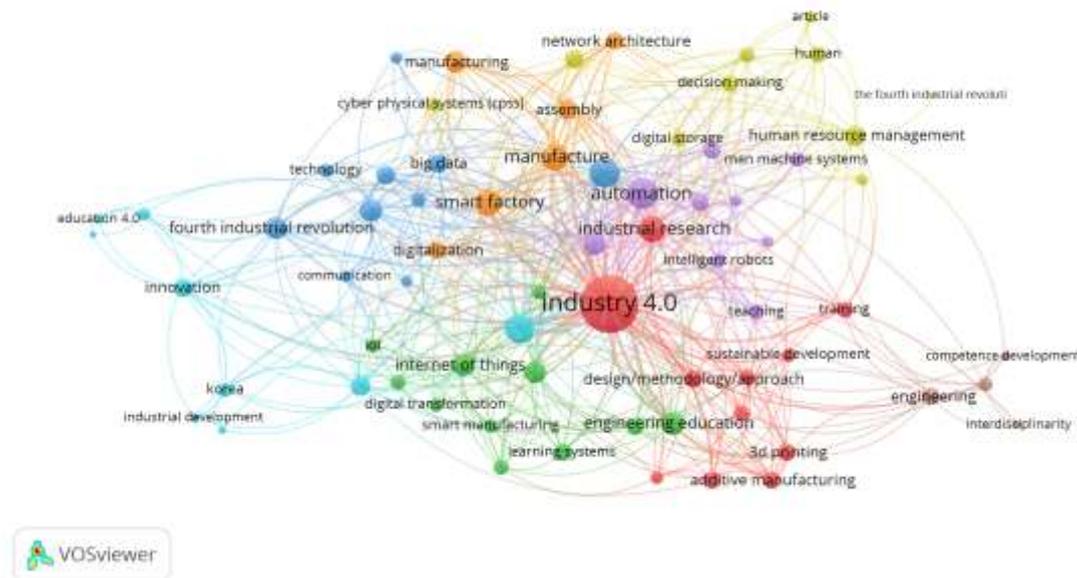


Figure 11. co-occurrence Network of the most representative concepts for industry 4.0. Source: Authors elaboration based on Vosviewer Data

Next, the total strength of the matching links with other keywords is calculated, with the highest scores according to this characteristic are *industry 4.0* (305), *automation* (92), *employment* (79), *industrial revolutions* (78) and *manufacture* (64).

In addition to these, there are concepts associated directly to the technical part of the Fourth Industrial Revolution such as *Smart Factory*, *Internet of Things (IoT)*, *artificial intelligence*, *embedded systems*, *digitization*, *engineering*, *data analytics*, *cyber-physical systems*, *value chains* and *big data*, among others.

Likewise, terms such as *human / people management*, *innovation*, *decision making*, *human engineering*, *personnel training*, *e-learning*, *knowledge management*, *active learning*, *communication*, *intercultural communication*, *leadership* or *human resources* are again recurring (see upper right cluster of Figure 11). This reveals the close relationship between these and the more robust skills for the development of Industry 4.0, which requires knowing how to express knowledge, specify collaboration and learning networks and adapt to new and changing environments.

V. CONCLUSIONS

Currently, jobs are constantly evolving and individuals with general skills (who can learn other specific skills in the process) are more valued, rather than extraordinary individuals in one aspect (who do not know how to adapt in different contexts).

In this sense, one of the best ways to combat the problems and inequality of society in terms of employability (in LAC, for example) is strengthening, from government entities, the individual participation

of the academy (Higher Education Institutions, students and graduates) and the training of the productive sector represented by the organizations, in the competencies and skills of people focused on knowing how to be: skills that will provide a higher rate of employability, better human talent and greater multi-perspective development.

This strengthening of collaborative effort between the educational, government and entrepreneurial sectors becomes especially important in societies that have historically lagged behind in terms of developing and implementing changes in the labor market, such as Latin America.

It is possible to think, then, that through the successful integration of strategies that allow people in these regions to be more competitive, they can reduce in the medium and long term scourges as marked as poverty, corruption or lack of opportunities, by providing massive form of the means, capacities, tools and spaces required for a better quality of life, through jobs consistent with the needs or requirements that arise in the local labor market.

The research has implicitly shown this approach from the state of the art that the literature presents in this regard with the entry of Industry 4.0 and the employment situation faced by graduates and professionals, especially in engineering in LAC in the first twenty years of the XXI century. How they respond to these new challenges will impact individual and regional employability in the future.

As it has already been reiterated, the collaborative effort made by the University, Government and Organizations triad will depend on how employable graduates are locally and internationally. In this sense, an upcoming investigative approach (a prospective study, for example) may well be based on the skills that are required in the most immediate future to be competitive and resilient in a changing labor market, which may well be inferred, are based on soft skills and their evolution in the world of work.

For any job it is necessary to have both general and specific competencies. However, the current trend shows a greater relevance for the former, specifically, the competencies or skills known as soft skills, which are transversal to any type of work, and therefore are more requested within the labor market.

However, the importance of these skills and their connection with the type of “hard” or more technical skills are reiterated once again, since the latter are a fundamental part for the effective development of employability in Industry 4.0.

Likewise, the research showed that an increasingly accentuated trend in the development of transversal skills that are compatible with the challenges of the Fourth Industrial Revolution has been occurring in a stronger way since 2017, a situation in which LAC is at a disadvantage; since the results of the publications are limited only to three or four countries in a region made up of 20 countries.

Consequently, such disadvantage substantially affects the development of the research field since it is not possible to know with certainty the current panorama that is presented in terms of employability within Industry 4.0 in Latin America in contrast to developed countries such as United States, Germany and some Asian countries.

Nevertheless, and despite everything, it is a laudable opportunity to promote research development in Latin America and focus mainly on knowing the local conditions and contexts and thus facing the important changes that the new models introduced by the Fourth Industrial Revolution represent. This would strengthen the skills of those entering the labor market of an increasingly challenging 21st century.

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