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Chapter 13
Key Competencies for Digital Transformation in Workplace

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Abstract There is the evidence that artificial intelligence and automation will affect and be present in portions of almost all jobs, either in a greater or lesser degree. Notwithstanding, these digital transformations will eliminate very few jobs and occupations over next decades. Taking this into account, this research intends to identify which competencies are more valuable for workers who work in a technological workplace, by the employers' perspective. It means this research will explore, listening employers' opinion, which competencies are the ones that makes a worker leads and responds positively to a digital implementation in their workplace. Results were gathered through a Delphi study, within a panel of six experts in the human resources for the technological industries field. It is finding that employers consider adaptability and creativity as the most important competencies for technological work. In addition, informatic competencies were less valuable by employers while considering the importance for workers dealing with digital transformations in workplaces.

It is now clear the evidence of the impact of automation and artificial intelligence in almost all jobs and functions of the current job market, as well as the urgency to understand the phenomena and to act within that. This conviction conducts academic and business worlds to concern about that, analysing and taking conclusions about next decades regarding workplace and workers capacities to deal with that. It seems crucial to understand the phenomena before it grows unduly and uncontrolled.

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There are also the companies need to clarify and help their own employees understanding the impact of automation in their workplace. This help seems to be important since impact and relevance of the increasing automation in production and services is yet seen for many as a cause of aggregate unemployment, causing fear and negative feelings.

Companies, mostly managers and decision-takers, should face this problem not in a negative but in a positive perspective, considering this not as a question *robot vs people* (which sees digital, robotic and artificial intelligence as a way of steeling jobs and functions of humans – where the first ones, robots, are collectors of the people's jobs) but the question of which competencies should an employee have or should develop to make himself as an adaptable employee, who has a positive reaction to a technological or digital change in his functions or even in his workplace.

As important to understand this problem of robotic, technological implementation and its presence in companies, is to understand which competencies are considered important for employees who face these digital transformations.

In order to define the key competencies for an employee with digital transformation in his workplace, which means competencies that make the worker leads and responds positively to a digital transformation in their workplace, it was developed a Delphi Study through a sample of Portuguese employers. During this chapter, it will be possible to understand which competencies are more valuable for employers within employees who deal with technological and robotic presence in their workplace.

13.1 Historical Review of Competencies

For the past decades, employee's competencies have played an important role within both the labour market and the academical literature. Realizing the importance of certain characteristics of the employees, companies, employers and academics have further look to these characteristics.

Furthermore, competencies have attracted much attention in practical and theoretical fields. Quoting Dubois (1998), Rothwell and Lindholm (1999) say 'there is growing interest in competencies in medium-sized and smaller organizations.

In the year of 1973, David McClelland, Professor of Psychology at Harvard University, wrote his paper, the "*Testing for Competence Rather than Intelligence*", (McClelland, 1973) stirring the field of industrial psychology. McClelland 'defined "Competence" as "a personal trait or set of habits that leads to more effective or superior job performance‖'(Chouhan & Srivastava, 2014).

The McClelland work was majority focused on application on the education sector, Boyatzis was the responsible for the business perspective of competence (Boyatzis, 2008). In his book "The Competent Manager", Boyatzis (1982) defines competency as "an underlying characteristic of a person which results in effective and/ or superior performance in a job".

Many definitions of the term "competency" have risen over the last years. According to Chouhan and Srivastava (2014), the definition that is most preferred is

that 'Competencies include the collection of success factors necessary for achieving important results in a specific job or work role in a particular organization'.

As Le Deist and Winterton (2005) say, in their "What Is Competence?" publication, "the concept of competence or competency (…) dominated the management strategy literature of the 1990s, which emphasized 'core competence' as a key organizational resource that could be exploited to gain competitive advantage".

Teodorescu (2006) devoted herself to understand not only the distinction, but also the approximation, of both concepts: competence and competency, analyzing information resulted from Dubois (1998) research.

According to Dubois (1998), competencies (plural for competency) are "those characteristics—knowledge, skills, mindsets, thought patterns, and the like—that when used whether singularly or in various combinations, result in successful performance". For these chapter, as for the research here presented, it was adopted this definition proposed by Dubois.

According to Blásquez, Herrarte and Llorente-Heras (2018), more attention to non-cognitive skills and competencies starts by the fact that the switch from university to work has become a crucial phase in graduates' lives. Due to that, it is important to know which competencies will enable these newly-graduates to benefit of gifted job chances. Additionally, authors refer to know these competencies is crucial not only from the perspective of the individual but also from the point of view of education policy.

These authors consider there are two main topics within the studies on this topic, first group observes the correlation between labour market outcomes and skills depending on their cognitive or non-cognitive nature, second one emphasis the specific competencies regardless of whether they are cognitive or non-cognitive.

These authors distinct skills into cognitive (measured by objectives tests) and non-cognitive (harder to measure, analyzed by means of self-reported information). Authors definition of competencies by type (cognitive or non-cognitive) is presented in Table 13.1.

Table 13.1 Competencies by type, by Blásquez, Herrarte and Llorente-Heras (2018)

Cognitive Competencies	Alertness to new opportunities
	Ability to come up with new ideas and solutions
	Willingness to question your own and others' ideas
	Ability to write reports, memos, or documents
	Analytical thinking
	Ability to rapidly acquire new knowledge
	Knowledge of other fields or disciplines
	Mastery of your own field or discipline
	Ability to use computers and the Internet
	Ability to write and speak in a foreign language
Non-Cognitive Competencies	Ability to mobilise the capacities of others
	Ability to make your meaning clear to others

	Ability to assert your authority
	Ability to negotiate eff ectively
	Ability to perform well under pressure
	Ability to coordinate activities
	Ability to use time efficiently
	Ability to work productively with others
	Ability to present products, ideas, or reports to an audience

Throughout the literature available, one can notice that some authors refer competencies transversal and transferable across not only jobs, but also personal situations (Baxter & Young, 1982; Teijeiro, Rungo, & Freire, 2013) while others distinct specific technical skills by occupation, task or job.

13.2 Digital Transformation and Competencies

It is also important to analyze literature regarding digital transformation in order to better understand its connection with key competencies of employees.

In this scope, recognizing the change technology creates in an organization, including its people, procedures and culture, Ghani and Jayabalan (2000) developed a framework analyzing the technology implementation effect on a company. According to these authors, technology implementation occurs through structural mechanisms that are designed in pursuance of manufacturing objective. Framework, showed in Figure 13.1, describes a firm's technology as an endogenous variable, following the evolutionary models, that undergoes frequent adaptations to remain technically competitive.
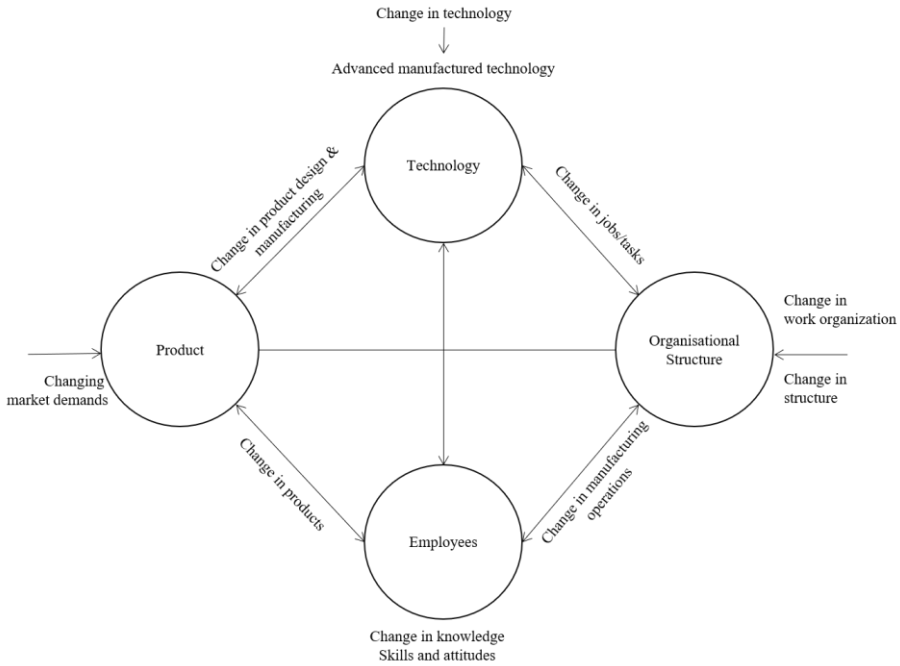
Fig. 13.1 Conceptual Framework, by Ghani and Jayabalan (2000)

Ghani and Jayabalay (2000), also state that, when there is an implementation of new technologies, total productivity at first falls because of natural response of employees resistance to accept new technology. Notwithstanding, as workers familiarize to new technology, their acceptance rate improves and their attitudes towards new technology become more positive.

Knowing there are differences between humans and robots, Jarrahi (2018) propose two ways to build a partnership between them. First, this author suggests specializing each one of the intervenient in different aspects, namely:

'AI is likely to be well positioned to tackle complexity issues (using analytical approaches). Humans can focus more on uncertainty and equivocality, using more creative and intuitive approaches.' (Jarrahi, 2018)

Secondly, Jarrahi (2018) presents that the most complex decisions are likely to involve marks of uncertainty and equivocality, which induces and requires human involvement, author add that 'therefore, humans and AI will play a combined role in almost all complex decision making'.

When facing these digital transformations, it is crucial to understand how employees' reactions can occur. Wittig (2012) refer that 'the line in employees' reactions to organizational change between resistance and acceptance is often blurred.' So, according to this, as change initiatives are not static, and factors continually occur affect employee's reactions, employees' reactions are consistently fluctuating and never stagnant.

13.3 Employers Opinion

In order to understand and take conclusions regarding the key competencies for a employee to deak with digital transformation in his workplace, a Delphi method was proceeded.

Mitroff and Turoff (2002) defined Delphi Method as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole to deal with a complex problem. This method, as a technique, allows the gather of opinion and/or judgements of experts and practitioners regarding complex matters where precise information or consensus, both of practitioners or academics, is not available.

More than a technique to achieve consensus and to understand what is really going on regarding the topic studied, Delphi Method is also able to produce and develop trends and needs in and for the atmosphere it was created for, in this specific research, the competencies need for an employee who has technologies, automation or robotic in their workplace.

The application of the Delphi method, in the scope of the research developed and presented within this thesis, went through several phases, by the application of three rounds.

Firstly, it was necessary to identify a panel of experts, determining the willingness of individuals to serve on the panel. Every possible was asked to be part of this research by email. It was gathered a panel with 6 members.

Considering that the outcome of a Delphi research is as valid as the opinion of the experts who made up the panel, the definition of the Delphi panel assumes great importance in which concerns to have a great output from the research process.

In what concerns to the design of the Delphi panel, and defining which experts invite to participate, it is important to avoid the "representativeness" criteria. Avella (2016) refers that "choosing a representative sample is something typically sought out in quantitative studies so the results can accurately portray the total population", therefore, for a Delphi study, representation is not a quality to fulfil imperatively, but expertise is.

During the process of experts selection, it was considered critical characteristics to the execution of the Delphi method in an accurate and adequate way, namely: anonymity, feedback and panel membership.

Anonymity is important because keeping panel members isolated from each other allows each individual freedom of expression without outside pressure or influence (Avella, 2016).

During this research, only researcher contacted each member of the panel, either to ask him or her to join the Panel, or to contact them in order to have their participation in each round.

Regarding the characteristic of feedback, knowing the process of a Delphi study, which consists in achieving consensus by a communication process, this characteristic is crucial for good results. During the time of this Delphi study, contacts between the researcher and the members of the panel were consistent and frequent, always by email.

Selecting individuals who meet expertise qualifications for panel membership is critical and cannot be overstressed. In this scope, it is important to notice that the six members of the panel have a tenure in the field of Human Resources comprehended between 14 and 28 years.

In this scope, it is important to refer the panel for this research is composed by following members:

– HR Director of an aviation group, with about 11.000 workers around the world;
– General Director of a company within the pharmaceutical industry, with about 35 workers;
– HR consultant, with an important focus in behavioural training;
– HR Director of a delivery company, inside a group of delivering experts across the Europe, with about 800 workers all over Portugal;
– Senior HR Specialist in development in a company within the automotive industry, with about 6.000 workers;
– HR Responsible in a regulatory public agency with about 400 workers.

Furthermore, according to Akins *et al.* (2005), there are certain criteria that apply to membership on all Delphi Panels, specifically interest, time and written communication.

So, in what concerns to interest as a criterion to membership on Delphi Panels, is worthy of relevance that the participants express interest in the topic and a willingness to contribute to the research inference.

In other hand, regarding time, it was careful explained to the experts, at the beginning of the research, even before they accept to participate, the needed time to be in the process, so they can be aware of this.

Lastly, language of the surveys and panel rounds was consensual within the panel members and it was "the one native language most prevalent among panel members or one based on a specific requirement for a language in which panel members shared fluency", as Avella asks to.

Having the panel defined, it was important to design and construct the instrument to the data collection, a questionnaire.

After the building of a provisional questionnaire, a pilot test was. Five individuals participated in the pilot test, resulting in a group of changes to the provisional questionnaire, with detailed feedback regarding their perception of the questionnaire.

Considering feedback provided, it was built a final questionnaire, presented in Annex A, constituted by four parts, each one with a specific objective for the research. Part I of the questionnaire, intends to gather information regarding the experts' characterization.

Second part of the questionnaire aims to know in what way experts consider important each competency, used competencies proposed by Blásquez *et al.* (2018), for an employee in a company with presence of robots or technology in its workplace.

Regarding Part III of the questionnaire, it faces experts with a situation (presented in figure 1) and two workers profiles. It is presented professional, academical and personal paths for both workers, and it is asked which competencies experts identify

in each one of the profiles presented, as well as which worker do they think will have a more positive reaction to a technological or robotic intervention or change in their workplace. Through this part of the questionnaire, it will be possible to identify which competencies experts consider more valuable for a worker in a situation of robotic presence or implementation.

In this scope, it was proposed to experts to classify who has more developed each one of the following competencies: Creativity; Informatic Knowledge; Resilience; Computer Skills; Autonomy; and Self-development.

Last part intends to explore experts' opinion, giving them the possibility to fulfil 6 spaces, ordering, by importance, six competencies considered valuable and important to workers in the presence of technology or robotic in their workplace.

Imagine a situation of a company acting in the field of the automotive components industry. There will be a change in the production line, it will be introduced in it a robot which will solve an identified problem. This robot will contribute to a higher productivity of the factory, producing more components per minute, with the same number of employees.

Consider that Employee A and Employee B are employees in this specific factory sector and will be impacted by this new robot. They will need to learn to use the robot and to solve possible problems that can occur.

Personal and professional profile of both employees are the following:

Employee A – did not finish high school; started working in automotive industry in his/her first work; never change his/her job or employer; he/she belong to a scoop troup for 7 years, having been responsible for the organization of the main events of the group; use the internet and computer to interact with his/her family and friends; he/she has 2 kids and is raising them alone because their other parent disappear; his/her children are happy and successful young people.

Employee B – frequented 3 art courses in high school; finished high school; have changed job for four times during his/her career path because he/she was unsatisfied with his/her functions; do not use his/her computer; his/her hobby is painting and baking; has no kids or pets; often attends to workshops in his/her area of interest.

Fig. 13.2 Questionnaire Part III

This questionnaire was applied through three rounds to all the initial members of the panel.

For each round of the method, following steps were conducted:

1. Gathering of the individual experts' opinions through an online questionnaire - Annex B;
2. Analysing data gathered from the panel; and
3. Compiling information and sending the questionnaire to each panel member for their review.

Through the answers to the first round of this Delphi Study, it was possible to conclude that, according to the panel of experts, the more important competencies, and the ones which reunites more consensus, for an employee with technology or robots in the workplace, were *Ability to rapidly acquire new knowledge*, *Alertness to new opportunities* and *Ability to use computers and the Internet*. In a global perspective, in the experts' opinion, the less valuable competencies for an employee, who has

technology or robots in the workplace, are *Ability to negotiate effectively*, *Knowledge of other fields or disciplines* and *Mastery of your own field or discipline*.

Concerning the situation presented in Part III of the Questionnaire, experts well-thought the following:

- Expert 01 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Resilience, Autonomy and Self-development more developed.
- Expert 02 – considered worker A the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed. This expert also proposed Flexibility and Adaptability as competencies developed by worker A.
- Expert 03 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Computer Skills and Autonomy more developed.
- Expert 04 – considered worker A the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed.
- Expert 05 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Computer Skills, Autonomy and Self-development more developed.
- Expert 06 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed.

Regarding Part IV, results found out for this first round are presented in table 9. In this scope, it is important to consider the information presented in table 2 is exactly the information provided by experts.

At this stage of the research, it was not any kind of speech revision or change in the language used. As in all following rounds, all experts receive a report with the results found out within this first round.

Table 13.2 First Round – Answers to Part IV

	Expert 01	Expert 02	Expert 03	Expert 04	Expert 05	Expert 06
1st	Innovation	Adaptability to new situations	Adaptability	Ability to continuously learn	Innovation and change ability	Proactivity
2nd	Opening for change	Critical analysis	Adaptability to change/ Creativity	Team work	Creativity	Communication
3rd	Resilience	Resilience	Resilience	Adaptability	Adaptability	Opening for change
4th	Self-examination	Adaptability	Ability to learn	Creativity	Ability to work with informatic tools	Logical thinking
5th		Decision making	Analysis capacity	Technological knowledge		Analytical capability
6th		Stress resistance	Orientation to continuous improvement	Resilience		Creativity

Second round of this Delphi study was performed with five experts, who consider as the more important competencies, with more consensus, *Alertness to new opportunities*, *Willingness to question your own and others' ideas* and *Ability to mobilise the capacities of others*. For the experts, the more valuable competencies for an employee who has technology or robots in the workplace are *Alertness to new opportunities*, *Ability to come up with new ideas and solutions*, *Willingness to question your own and others' ideas, Ability to rapidly acquire new knowledge* and *Ability to use computers and the Internet*. In other hand, experts consider as the less valuable competency for an employee who has technology or robots in the workplace the *Ability to negotiate effectively*.

When faced with the situation presented in Part III of the Questionnaire (see Figure 4), experts considered the following:

- – Expert 02 – considered worker A the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker A has Creativity, Informatic Knowledge, Resilience, Autonomy and Self-development more developed. For this round, this expert did not propose more competencies than the proposed ones.
- – Expert 03 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Resilience, Computer Skills and self-development more developed.
- – Expert 04 – considered worker A the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed.

- Expert 05 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Computer Skills, Autonomy and Self-development more developed.
- Expert 06 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed.

Results found out In Part IV of the questionnaire, for this second round, are presented in table 2. At the end of the data analysis, experts received a report with the outcomes from this round, accessible in Annex C.

Table 13.3 Answers to Part IV – Second Round

	Expert 02	Expert 03	Expert 04	Expert 05	Expert 06
1st	Change management	Adaptability	Opening for change	Innovation and change ability	Proactivity
2nd	Resilience	Adaptability to change	Ability to continuously learn	Creativity	Communication
3rd	Stress resistance	Self-learning	Analytical thinking	Adaptability	Opening for change
4th	Organization of the work	Orientation to continuous improvement	Team work	Ability to work with informatic tools	Logical thinking
5th	Time management		Resilience		Analytical capability
6th	Creativity		Positiveness		Creativity

In the third round of this Delphi study, four experts have participated. Through their answers, it is possible to observe three competencies reach a consensus regarding the level of importance for an employee with digital transformations in workplace: *Knowledge of other fields or disciplines*; *Ability to perform well under pressure*; *Ability to coordinate activities*. Each one of these competencies was considered by all the experts as Very Important to an employee who deal with technology in the workplace.

Additionally, it is possible to conclude that, according to the panel of experts, the more important competencies for an employee with technology or robots in the workplace, the ones which were listed only as Very Important or Extremely Important, apart the ones considered only as Extremely Important, were: *Ability to come up with new ideas and solutions*, *Willingness to question your own and others' ideas*, *Analytical thinking, Ability to rapidly acquire new knowledge, Mastery of your own field or discipline, Ability to use computers and the Internet, Ability to write and speak in a foreign language, Ability to make your meaning clear to others* and *Ability to assert your authority*.

In a global perspective, according to the experts' opinion, the more valuable competency, it means the competency listed by more experts (three in a total of four experts) as Extremely Important, is *Mastery of your own field or discipline*.

In the experts' opinion, the less valuable competencies, within the ones presented to the experts, are *Ability to negotiate effectively* and *Ability to write reports, memos, or documents*.

For the situation presented in Part III of the Questionnaire, experts stated the following:

- − Expert 02 – considered worker A the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker A has Creativity, Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed. For this round, this expert proposed also that worker A has developed the ability to work under pressure and also the ability to work in a team.
- − Expert 03 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Computer Skills and Self-Development more developed.
- − Expert 05 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Computer Skills, Autonomy and Self-development more developed.
- − Expert 06 – considered worker B the one with a more positive reaction to a technological change and robot implementation. Simultaneously, considered that worker B has Creativity, Informatic Knowledge, Resilience, Computer Skills, Autonomy and Self-development more developed.

When questioned regarding the competencies not mentioned that could be important for a positive reaction to the technological implementation described, experts also proposed adaptability to change (expert 02), problem solving (expert 02 and expert 03), decision making capability (expert 02), technical knowledge for the software/equipment (expert 03), process management (expert 03), orientation to continuous improvement (expert 03), quality focus (expert 03), adaptability (expert 05), continuous learning (expert 05), constructive feedback (expert 05) and strategic behaviour (expert 05).

Regarding Part IV of the questionnaire, results found out for this third round are presented in table 13. In this scope, it is important to consider that the information presented in table 3 is exactly the information provided by experts, no changes were made in the speech used by them.

At the end of these three rounds, experts were presented with a report stating the results found out, presented in Annex D.

Table 13.4 Answers to Part IV – Third Round

	Expert 02	Expert 03	Expert 05	Expert 06
1st	Adaptability to new situations	Adaptability to change	Innovation and change ability	Proactivity
2nd	Adaptability	Adaptability	Creativity	Communication
3rd	Resilience	Self-learning	Adaptability	Opening for change
4th	Capability to work under pression	Problem solving	Ability to work with informatic tools	Logical thinking
5th	Self-esteem			Analytical capability
6th	New challenges appetite			Creativity

13.4 Findings and Conclusions

The results gathered through the Delphi Study performed, allows to understand which competencies are valuable for an employee who deal with robots, technology or digital transformations in his workplace, from a perspective of the employers.

It is important to notice the questionnaire was passed throughout experts in their mother language, Portuguese, so they can feel more comfortable reading and writing. All proposed competencies were written in Portuguese by the experts, with no guidelines or support. So, it seems to be natural that the results show different competencies, notwithstanding the possibility different competencies, presented by different experts and their perceptions, have the same meaning at the end of the research.

In order to adequate this speech differences, all competencies were reviewed and aligned in a group of major, and more standardized, competencies, as it will be showed.

For the first round it was proposed a total of 32 competencies by 6 experts, in the second round were proposed a total of 26, by 5 experts, and, within the last round, the third one, it was proposed a total of 20 competencies by 4 experts.

After the revision of the competencies proposed, only in a perspective of language and differences of speech, it is possible to conclude that it was proposed a total of 82 different competencies. So, according to a deep revision of each one of these competencies, reviewing and standardizing the way they were exposed and written by experts, it results in a group of 29 different competencies, presented in table 13.5.

Table 13.5 Answers to Part IV – Third Round

Competency	Number of times referred through the Delphi Study
Adaptability	10
Creativity	9
Resilience	7
Innovation Ability	5
Opening for Change	5
Analytical Capability	4
Ability to work with informatic tools	4
Learning capability	3
Proactivity	3
Communication	3
Logical Thinking	3
Adaptability to change	3
Stress Resistance	2
Team Work	2
Self-learning	2
Self-examination	1
Decision maker	1
Orientation to continuous improvement	1
Change Management	1
Organization of the work	1
Time management	1
Analytical thinking	1
Positiveness	1
Capability to work under pressure	1
Self esteem	1
New challenges appetite	1
Problem Solving	1

In a more detailed revision of the gathered data, it seems relevant to analyse the predominance of some competencies, which will be important to taking conclusions from the research developed.

Within this scope, it will be analyzed the reference, through the three rounds, to Resilience, Adaptability, Informatic Competencies, Learning Skills and Creativity. These competencies were chosen to a deepest analysis based on, not only the number of times it was referred by experts, but also on the existing literature and the researcher understanding of the subject.

Additionally, for an easier analysis, it was considered Informatic Competencies as the *Ability to work with informatic tools* proposed 4 times within the Delphi Study.

Table 13.6 Percentage of reference by experts through the Delphi Study

	1st Round	2nd Round	3rd Round	Weighted Average Percentage of Reference
	6 experts	5 experts	4 experts	
Resilience	66.7%	40.0%	25.0%	**46.7%**
Adaptability	66.7%	60.0%	75.0%	**66.7%**
Informatic Competencies	33.3%	20.0%	25.0%	**26.7%**
Learning Skills	33.3%	40.0%	25.0%	**33.3%**
Creativity	66.7%	60.0%	50.0%	**60.0%**

According to the information gathered and displayed in the table 13.6, it is possible to understand the percentage of experts who refer each competency, as well as the weighted average of reference by the experts for listed competencies. Weighted average is computed as follows:

$$\bar{x} = \frac{sum\ of\ number\ of\ competency\ references\ in\ each\ round}{total\ of\ experts\ participating\ in\ all\ rounds}$$

In this scope, in average, the most referenced competencies were *Adaptability* and *Creativity* with 66.7% and 60.0%, respectively. The less referred was *Informatic Competencies* with 26.7% of references.

The intend of this research is to find out which competencies are considered more valuable for a positive reaction of employees when dealing with digital transformations in their workplace, by the employers' perspective and perception of the topic.

From the Delphi Study performed results that the reaction of an employee to digital transformations in his workplace is impacted by two big groups of competencies: Informatic Skills (which are constructed based on two different topics – informatics knowledge and computer skills) and Personal Competencies (based on the competencies proposed by experts, namely *Adaptability*, *Resilience*, *Creativity* and *Learning Skills*).

In a consensual way, at the end of the research process, respondents consider that, for a more positive reaction to digital transformations in workplaces, employees

should have, or be able to develop, competencies like *Adaptability* and *Creativity*. Employers expect that a worker use competencies, mostly transversal to other fields, in order to better know how to manage and handle with technological or robotic tools.

13.5 Limitations and Future Work

The initially stated overarching aim of this research was to identify competencies employers consider important for a worker to deal with digital transformations in the scope of his workplace. While recognizing limitations, it is possible to identify how critical is to identify a panel of experts to represent companies who employ workers to constantly deal with technology or robotic. Even so, the gathered panel for the Delphi Study pursued was highly satisfactory in terms of quality. However, it can be identified as difficulty, the constantly feedback needed to the experts in order to maintain the number of participants in each round. Although there was a constant feedback and contact with experts, two of them eventually did not fulfil all rounds of the study. Regarding this limitation, it is worth to refer also the need of time to have consistent participations from the experts: this consists in a limitation for the experts and, consequently, for the research.

Recommendations for future research goes also through the importance to define consistent strategies to develop the more needed competencies within the job market, in order to cope challenges promoted by the presence of technology, robots and digital in the current workplaces.

References

Akins, R., Tolson, H., Cole, B. (2005). Stability of response characteristics of a Delphi panel: Application of bootstrap data expansion. *BMC Medical Research Methodology*, 5(37). doi.org/10.1186/1471-2288-5-37.

Avella, J. R. (2016). Delphi Panels: Research Design, Procedures, Advantages, and Challenges. *International Journal of Doctoral Studies*, 11(11), 305–321.

Baxter, M. B., Young, J. L. (1982). What Do Employers Expect From High School Graduates? *NASSP Bulletin*, 93–98.

Blázquez, M., Herrarte, A., Llorente-Heras, R. (2018). Competencies, occupational status, and earnings among European university graduates. *Economics of Education Review*, 62, 16–34. doi.org/10.1016/j.econedurev.2017.10.006.

Boyatzis, R. E. (1982).*The Competent Manager: A Model for Effective Performance*. NY: John Wiley & Sons.

Boyatzis, R. E. (2008). Competencies in the 21st century. *Journal of Management Development*, 27(1), 5–12. doi.org/10.1108/02621710810840730.

Chouhan, V. S., Srivastava, S. (2014). Understanding Competencies and Competency Modeling - A Literature Survey. *IOSR Journal of Business and Management*, 16(1), 14–22. doi.org/10.9790/487X-16111422.

Dubois, D. D. (1998). *The Competency Casebook: Twelve Studies in Competency-Based Performance Improvement*. Amherst, A: HRD Press.

Ghani, K. A., Jayabalan, V. (2000). Advanced manufacturing technology and planned organizational change. *The Journal of High Technology Management Research*, 11 (1), 1–18.

Jarrahi, M. H. (2018). Artificial intelligence and the future of work : Human-AI symbiosis in organizational decision making. *Business Horizons*, 61(4), 577–586. doi.org/10.1016/j.bushor.2018.03.007.

Le Deist, F. D. and Winterton, J. (2005). What is competence?. *Human Resource Development International*, 8(1) 27–46. doi.org/10.1080/1367886042000338227.

Mitroff, I., Turoff, M. (2002). Philosophical and Methodological Foundations of Delphi in Linstone and Turoff eds (2002). *The Delphi Method: Techniques and applications*. 17-34. NY: Addison Wesley Publications.

McClelland, D. C. (1973). Testing for competence rather than for 'intelligence'. *The American Psychologist* 28(1), 1-14. doi.org/10.1037/h0034092.

Rothwell, W. J., Lindholm, J. E. (1999). Competency identification, modelling and assessment in the USA. *International Journal of Training and Development*, 3(2), 90–105. doi.org/10.1111/1468-2419.00069.

Teijeiro, M., Rungo, P., Freire, M. J. (2013). Graduate competencies and employability: The impact of matching firms needs and personal attainments. *Economics of Education Review*, 34, 286–295. doi.org/10.1016/j.econedurev.2013.01.003.

Teodorescu, T. (2006). Competence versus competency: What is the difference? *Performance Improvement,* 45 (10), 27-30. doi.org/10.1002/pfi.4930451027.

Wittig, C. (2012). Employees' Reactions to Organizational Change. *OD Practitioner*, 44(2), 23–29.