CRITHINKEDU

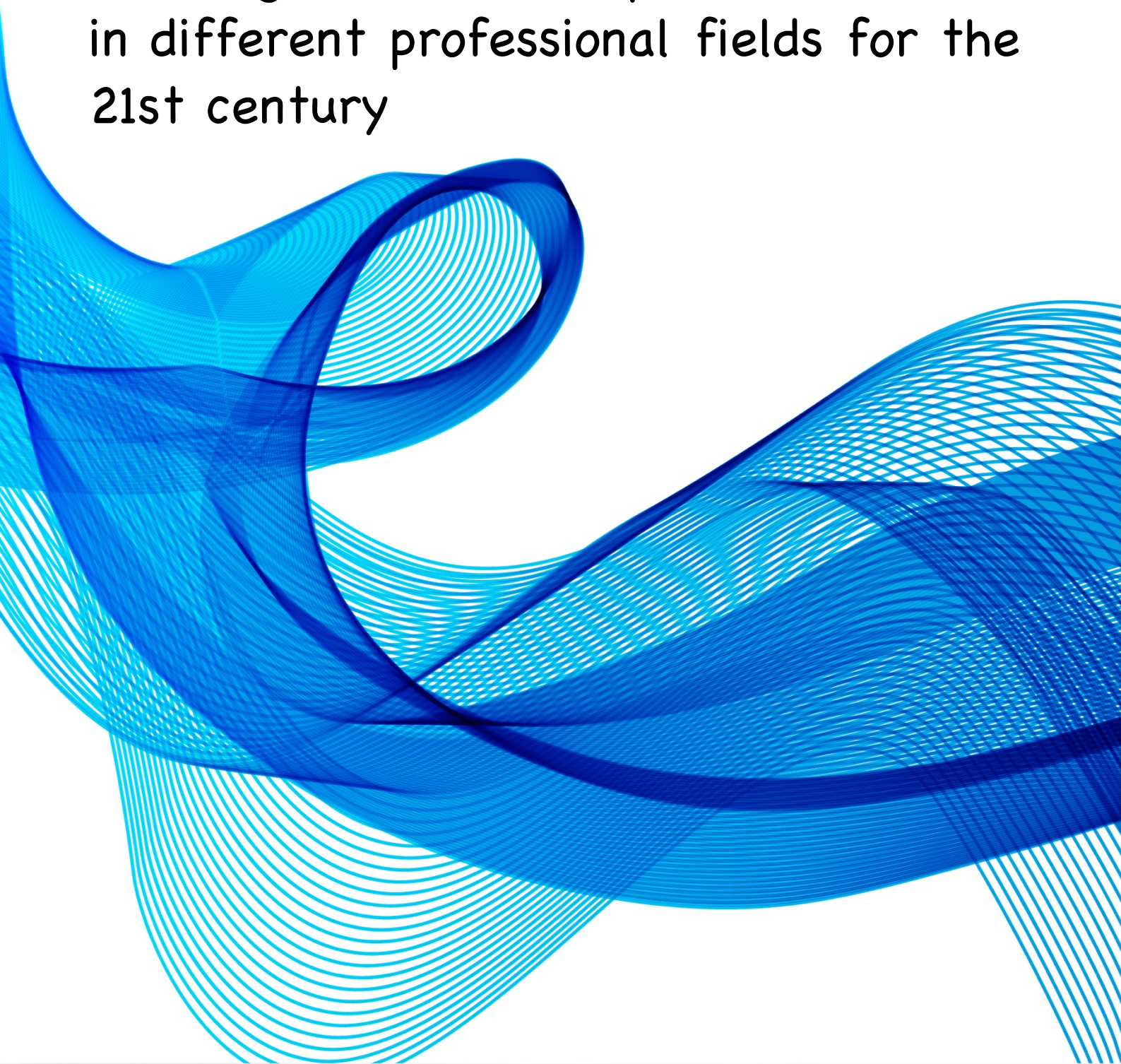Critical Thinking Across the European Higher Education Curricula

A European collection of the Critical Thinking skills and dispositions needed in different professional fields for the 21st century

A European Collection of the Critical Thinking skills and dispositions needed in different professional fields for the 21st century

TECHNICAL AND CATALOGING DATA

Cover layout
Image designed by klyaksun / Freepik

Date of publication
January 2018

Recommended cataloging
A EUROPEAN COLLECTION OF THE CRITICAL THINKING SKILLS AND DISPOSITIONS NEEDED IN DIFFERENT PROFESSIONAL FIELDS FOR THE 21ST CENTURY
A european collection of the critical thinking skills and dispositions needed in different professional fields for the 21st century / coord. CRITHINKEDU proj. Caroline Dominguez. - Vila Real: UTAD, 2018

ISBN: 978-989-704-256-0

1. Pensamento crítico--Competências--Séc. 21 / 2. Educação--Ensino superior--Pensamento crítico--Séc. 21

CDU 378.025"20"
165.19"20"

Funding
This work is part of the 'Critical Thinking Across the European Higher Education Curricula - CRITHINKEDU' project, with the reference number 2016-1-PT01-KA203-022808, funded by the European Commission/EACEA, through the ERASMUS + Programme.

Disclaimer
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

AUTHORS

Bucharest University of Economic Studies (ASE Bucuresti), Romania

DANIELA DUMITRU, PhD, Associate Professor, Department for Teacher Training

DRAGOS BIGU, PhD, Senior Lecturer, Department of Philosophy and Human Sciences

Catholic University of Leuven (KU Leuven), Belgium

JAN ELEN, PhD, Full Professor, Centre for Instructional Psychology and Educational Sciences

LAI JIANG, PhD, Postdoc, Centre for Instructional Psychology and Educational Sciences

Modern Didactics Centre (MDC), Lithuania

ASTA RAILIENĖ, PhD, Trainer and Researcher of the MDC, Associate Professor at Mykolas Romeris University, Institute of Education and Social Work

DAIVA PENKAUSKIENĖ, PhD, Director of the MDC, Lecturer at Mykolas Romeris University, Institute of Education and Social Work

Technological Educational Institute of Thessaly (TEI of Thessaly), Greece

IOANNA V. PAPATHANASIOU, PhD, Assistant Professor, Nursing Department

KONSTANTINOS TSARAS, PhD, Assistant Professor, Nursing Department

EVANGELOS C. FRADELOS, PhD, Scientific and Research Collaborator, Nursing Department

University College Dublin (UCD), Ireland

AOIFE AHERN, PhD, Associate Professor, School of Civil Engineering

CIARAN MCNALLY, PhD, Assistant Professor, School of Civil Engineering

JOHN O'SULLIVAN, PhD, Assistant Professor, School of Civil Engineering

University College Leuven-Limburg (UCLL), Belgium

AN VERBURGH, PhD, Educational Quality Assurance Officer and Educational Specialist

University of Economics, Prague (VŠE), Czech Republic

EVA JAROŠOVÁ, PhD, Associate Professor, Department of Managerial Psychology and Sociology

HANA LORENCOVÁ, PhD, Assistant Professor, Department of Managerial Psychology and Sociology

University of Roma Tre (UNIROMA3), Italy

Antonella Poce, PhD, Associate Professor, Department of Education

Francesco Agrusti, PhD, Full-time Researcher, Department of Education

Maria Rosaria Re, Research Fellow, Department of Education

University of Santiago de Compostela (USC), Spain

Blanca Puig, PhD, Assistant Professor, Faculty of Education Sciences

Paloma Blanco, PhD, Assistant Professor, Faculty of Education Sciences

Inés Mosquera, Research Fellow, Faculty of Education Sciences

Beatriz Crujeiras-Pérez, PhD, Assistant Professor, Faculty of Education Sciences

Isabel García-Rodeja Gayoso, PhD, Full Professor, Faculty of Education Sciences

University of Trás-os-Montes and Alto Douro (UTAD), Portugal

Caroline Dominguez, PhD, Assistant Professor, Engineering Department, LabCIDTFF - Centre of Didactics and Technology in Education of Trainers

Gonçalo Cruz, Research Fellow, Engineering Department

Helena Santos Silva, PhD, Associate Professor, Department of Education and Psychology, Centre for Research and Intervention in Education

Maria da Felicidade Morais, PhD, Assistant Professor, Department of Letters, Arts and Communication

Maria M. Nascimento, PhD, Assistant Professor, Mathematics Department, LabCIDTFF - Centre of Didactics and Technology in Education of Trainers

Rita Payan-Carreira, PhD, Assistant Professor, Zootechnics Department, CECAV - Animal and Veterinary Research Centre

University of Western Macedonia (UOWM), Greece

Catherine Dimitriadou, PhD, Full Professor, Department of Primary Education, Faculty of Education

Dimitris Pnevmatikos, PhD, Full Professor, Department of Primary Education, Faculty of Education

Sofia Avgitidou, PhD, Full Professor, Department of Early Childhood Education, Faculty of Education

George Palaigeorgiou, PhD, Lecturer, Department of Primary Education, Faculty of Education

Executive summary and key findings

Within the scope of the project CRITHINKEDU, this report provides an overall analysis of the **understanding of Critical Thinking (CT) by employers and establishes similarities and differences in its expression, need and practical application at the workplace**. Adopting a qualitative research methodology, **32 focus groups** were conducted enrolling 189 professionals **from 9 European countries**. The focus groups comprised graduates from **4 different professional fields**, namely **Biomedical Sciences**, **STEM (Sciences, Technology, Engineering and Mathematics)**, **Social Sciences** and the **Humanities**.

Based on the Facione' theoretical framework (Facione, 1990), **key findings** are in line with previous studies (Jones, 2009; Jones, 2010; Grace & Orrock, 2015; Sin, Jones & Wang, 2015), suggesting that CT **is widely understood and interpreted as a set of interdependent skills and dispositions that are unquestionably needed in recent graduates**. This is due to today's labour market and societal demands, although **with slight differences in their practical application which vary across professional fields**.

For professionals, **ideal Critical Thinker employees hold a well-educated way of thinking, fed by the motivation and willingness to learn and improve, anchored on a set of interdependent cognitive and propensive aspects allowing them not only to anticipate and be ready for any situation, but also to regulate and monitor their own thinking and behaviour during the process**. These findings suggest that CT seeks for strong propensity elements (e.g., dispositions and attitudes) and arises from experience, lifelong learning, effort and persistence, dealing with long-term goals and development. Additionally, CT is frequently associated with problem-solving and decision-making purposes, and its application depends not only on a stand-alone ability, but also in the convergence and interconnectedness of several other skills and dispositions out of the applied framework, such as proactivity, adaptability, creativity, emotional maturity, communication and teamwork. In **Biomedical Sciences**, for Health professionals, CT requires clinical reasoning that understands the thinking over different aspects of healthcare and wellbeing, in order to obtain a plausible decision regarding prevention, diagnosis or treatment of a specific patient, taking into account different ethical concerns. In **STEM**, for Engineering and ICT professionals, CT requires thinking about problems and different approaches to achieve the best solutions attending to the needs, goals and expectations of a specific customer. In **Social Sciences**, for Education, Administration and Tourism professionals, CT is seen as a desirable set of skills and dispositions for professional improvement and brings an added responsibility especially to teachers and educators, affecting directly the development and learning of future citizens, assuming themselves as the key agents of this modeling process. In the **Humanities**, for professionals from Arts and Culture, CT is expressed by the thinking about reality, about what is around the actor and the audience, and through this observation and thought modify that reality transforming it into an artistic object/expression.

Finally, and resulting in the main outcome and novelty of the current report, we present a proposal for a "**European Inventory of Critical Thinking skills and dispositions for the 21st century**". This inventory is constituted not only by a list of different CT skills and dispositions categorized upon the applied framework according to its overall interpretation by professionals, but also attending to their specific understanding in the different professional fields, linking them to the tendencies, differences and context-based scenarios which better illustrate their practical application and needs within the fields. Rather than guiding teachers and higher education institutions on how to teach or promote CT, this inventory aims to provide them with **a consistent basis of needed skills and dispositions in main professions that can be useful to define new learning objectives, goals and outcomes, leading to adaptations that can be incorporated into the existing European university curricula**. Additionally, we also expect to support organizations and human resources in the design of internal training programs to attend existing needs, as well as to identify future graduates for recruitment.

Some issues were encountered when conducting this study. They relate to design of the research methodology (the use of a qualitative research approach can't lead to generalized results), the research sample (e.g., background or the experience of the representatives from the diverse professional fields), or even the data analysis procedures (e.g., language barriers in the process of data translation, difficulties to assign and categorize some quotes per certain skills and/or dispositions). However, having worked across multiple disciplines in 9 countries, it was felt that these represented minor constraints. In overcoming these, the team established report objectives and obtained valid information on the labour market needs towards CT skills and dispositions in newer graduates.

Table of contents

List of tables

List of figures

1. Introduction

In the scope of the first intellectual output (O1) of the project **CRITHINKEDU 'Critical Thinking Across the European Higher Education Curricula'**[1], funded by the European Commission under the Erasmus+ Programme, reference number 2016-1-PT01-KA203-022808, the current report was accomplished by 9 partner countries: Belgium, Czech Republic, Greece, Ireland, Italy, Lithuania, Romania, Portugal and Spain. This report intends to characterize how Critical Thinking (CT) skills and dispositions are understood, expressed and requested by employers within their professional fields at the European labour market context, resulting in the proposal of the "European Inventory of Critical Thinking skills and dispositions for the 21st century".

Critical Thinking (CT) is a broad term with multiple interpretations debated over the years under different perspectives and movements (Paul, 2011; Davies & Barnett, 2015). In this study we adopted the Facione' concept of CT, who presented a wider definition based on a Delphi research study covering different study areas (Facione, 1990, p. 2):

> *"We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based (...) The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit."*

Accordingly, it can be interpreted that CT is expressed not only by cognitive elements (e.g., inference making, argumentation and reflective judgement), but also by propensive ones, like attitudes and dispositions (Halonen, 1995), thus promoting the development of the individual as a person (rather than a cognitive machine). It also contemplates CT as intellectual attitudes and habits of mind (Facione, 1995), entailing a reflective basis for decision making and judgement, as well as a set of affective states and virtues - also named as "critical spirit" (Siegel, 1988) or "spirit of inquiry" (Bailin & Battersby, 2010). It means that for an individual to think critically, he/she must not only be able to start or engage in a thoughtful task, but also be persistent and/or willing to do so (Halpern, 2014).

CT is being increasingly recognized inside and outside of the higher education context (Davies & Barnett, 2015). Employers frequently assume it as one of the main generic skills needed at the workplace (Schwab & Samans, 2016), namely for knowledge development and professional judgement processes within a wide variety of professional fields. Empirical studies attempting to characterize how CT is needed, understood and expressed within different professional fields and/or study fields remain scarce, even though some researchers analysed the employers' perspectives regarding the graduate employability in terms of the needed profiles (Andrews &

---

[1] For more information, please visit http://crithinkedu.utad.pt/en/crithinkedu/

Higson, 2008). Lessons drawn from these studies are not always clear and that could be due to different reasons: a mismatch between the discourse used by either the researchers or employers has been identified as a barrier to data collection and analysis (Sin et al., 2015); the lack of University-Business Cooperation (UBC) projects for curricula design and students' employability skills (Plewa & Quester, 2008; Baaken, Kiel & Kliewe, 2015), which mostly focus on research and development in terms of technology and knowledge transfer procedures (Cruz & Dominguez, 2016); and the premise that CT is a generic skill of similar understanding and application across domains (Andrews, 1990; Siegel, 1992) that leads to the offering of a number of generalist CT courses taught in institutions around the world.

Counterposing a 'generalist' view, other researchers argue that CT can only be taught in the context of a specific domain and agree on the important role of background and/or domain-specific knowledge as a precondition to CT development (McPeck, 1990; Willingham, 2008). They also defend that CT transfer across domains may only occur if students are provided with opportunities to practice these skills in a variety of domains and explicitly taught to transfer (Ennis, 1989). In this context, evidence suggests that academics' and employers' conceptualisation of generic attributes and professional skills, such as CT or problem-solving, is influenced by the culture of the discipline in which they are taught and/or practiced (Jones, 2009; Grace & Orrock, 2015; Sin et al., 2015). In particular, this is because what constitutes valid evidence, arguments, and standards tends to vary across domains, depending upon the epistemological context (Jones, 2010). While these skills are of central importance in different disciplines (e.g., accounting, history, law, economics, physics and medicine), the meanings attached to them are different, and the way in which this knowledge is conceptualised and constructed within each discipline shapes how CT is understood.

Thereupon, the current report aims to improve/deepen the existing body of knowledge by re-looking at the needs, understanding and expression regarding CT in different professional fields, constituting a new basis to align higher education curricula with the current European labour market context. Adopting a qualitative research methodology based on the focus group approach (Krueger & Casey, 2000; Cohen, Manion & Morrison, 2011), results drawn from data collected from 189 representatives of private, public and Non-Governmental Organizations (NGO) in different study fields (Biomedical Sciences, STEM - Science, Technology, Engineering and Mathematics - , Social Sciences and the Humanities) are in line with previous research, even though they reveal new tendencies, similarities and differences between the professional fields analysed.

Based on the Facione theoretical framework (1990), the analysis of data revealed the need for skills and dispositions other than those identified in the framework, reflecting a more holistic view of CT by today professionals. It also highlights its association with other important abilities and traits required by recent graduates. Altogether, it results in the proposal of the "**European Inventory of Critical Thinking skills and dispositions for the 21st century**". This inventory presents not only a list and

categorization of CT skills and dispositions more emphasized by different professional representatives, but also seeks to link them to illustrative scenarios which better exemplify their practical application and needs within the different fields. Rather than guiding teachers and higher education institutions on how to teach or promote CT, this report aims to provide them with a consistent basis of knowledge that can be useful to define new learning objectives, goals and outcomes, and to adapt the existing European University curricula. Furthermore, we also expect to help companies and organizations to design internal training programs to attend existing needs, as well as to identify suitable candidates for recruitment.

2. Methods

This section presents a general overview of the report objectives, design and the profile characterization of the sample involved in the study.

2.1. Report objectives

This study intends to identify and devise an inventory of the CT skills and dispositions perceived as essential by employers in today graduates at the European labour market context, embodying the following specific objectives:

- To describe the overall interpretation of CT by different professionals;
- To identify the similarities and differences in CT skills or dispositions sought in different professional fields;
- To analyse the practical application of CT at the workplace based in different professional fields.

Besides collecting evidence and analyzing to what extent CT is valued by professionals, it was also intended to bridge it with illustrative workplace-based scenarios to get a deeper understanding of its application according to the nature and context of different professional fields.

2.2. Research design and used framework

A qualitative research methodology widely used for educational purposes was adopted - the **focus group** technique. It is generally defined as a structured discussion with small groups of people, run by a facilitator or a moderating team, to generate qualitative data on a precise topic of interest, using a set of open-ended questions (Krueger & Casey, 2000; Cohen et al., 2011). Although not designed to provide statistical significance or generalization, nor to help participants reach a consensus on a given issue, it encourages people to think and develop new ideas, valuing personal stories, beliefs and experiences in specific situations, and giving them the opportunity to guide the flow and direction of questioning (Glitz, 1998).

The whole research process was arranged in four general, conceptual research steps (Patton, 2002): *Planning*, *Composition*, *Implementation* and *Data analysis*. The first step (*Planning*) involved the preparation of different documents required to organize the focus groups, such as the invitation letter, general guidelines, consent letter, thank you letter, as well as the design of the research instrument for data collection (Supplementary document 1[2]) and scheduling.

The focus group evolved around three main questions, supporting the data analysis:

- What CT skills and dispositions do you consider to be the most important today?
- What CT skills and dispositions do you consider need being improved?
- What CT skills and dispositions do you consider to be needed in the near future?

Potential participants were selected from different professional fields and sectors in partner countries (*Composition*). The selection criteria established are also detailed in Supplementary document 1. All the CRITHINKEDU partners were committed to develop 3 focus groups, representing 3 different professional fields, with each enrolling 7 to 10 participants from different sectors (e.g., Public, Private and Non-Governmental Organization (NGO)). Each partner decided what professional fields to select and how to organize the focus groups discussions (e.g., heterogeneous - with different fields' representatives -, or homogeneous - with only representatives from the same field).

All the focus groups were conducted by two researchers (moderator and assistant) in the native language of each partner country (*Implementation*). All the questions included in the research instrument were introduced separately and orderly, without presenting a CT definition or concept to avoid influencing or limiting personal views (see Supplementary document 1 for more details). The discussions were moderated both in face to face and online settings, and all of them were audio recorded.

The recorded data were then *verbatim* transcribed in the original language and each participant's speech was coded accordingly to the following system: *sector_country_number-of-participant_professional-field* (*Data analysis*). Briefly, a

---

[2] For more information, please see http://bit.ly/Supplementary1

code was assigned to each represented sector [NGO (Non-Governmental Organization), PB (Public sector) and PR (Private sector)], followed by the code of the Country [e.g., PT- Portugal], and an anonymous code assigned to each participant (1 to *n*), that was followed by the identifier of the focus group (e.g., HEA - Health or TOU - Tourism). Due to time constraints and considering the extensive effort required to analyse the amount of data generated, all the *verbatim* transcriptions of each focus group were directly used in content analysis (Hsieh & Shannon, 2005). **Facione's theoretical framework** of CT skills and dispositions (Facione, 1990) was used as predetermined categories/codes for analysis (Supplementary document 2[3]).

The use of a ready-made framework was exclusively applied for data analysis purposes and did not influence the personal experiences reported by the participants. Data were coded and analysed independently by two pairs of researchers in each partner country, to identify the skills and dispositions presented in the dataset, and to code them. Any skills and dispositions not represented in the Facione´s framework were coded as "Out of the framework". Results from data analysis were presented in tables (Supplementary document 3[4]), according to the three different themes originated from the three main questions included in the research instrument. The tables used to present data consisted of three parts, namely category (skill or disposition), sub-category (sub-skill or sub-disposition) and retrieved quotes explicative of the participants' opinions. All the quotes were also counted (each time that a participant mentioned and expressed his/her opinion on a particular CT skill or disposition). National analyses were then translated into English, double-checked between the partners' researchers of each country and the partner coordinator of the report, and compiled for the overall international analysis. The total counts of participants' quotations can be found in the Supplementary document 4[5].

2.3. Research sample

Due to timetable restrictions and difficulties with the calendar availability of interviewees, a convenience sample was constituted with a cohort of 189 representatives of heads or/and senior specialists at well-established private companies, NGO and public organizations involved in internal recruitment processes (e.g., CEO, CTO, Human Resources Manager, etc.). All participants who attended the focus groups provided written informed consent for participation in the study, and for taping and/or videotaping the interviews, and for their subsequent transcription into text. A total of **32 focus groups** were conducted between November 2016 and January 2017, with an average duration of 83 minutes. Table 1 summarizes the information regarding the number of focus groups performed by country, the number of participants included in each focus group and their average duration.

---

[3] For more information, please see http://bit.ly/Supplementary2
[4] For more information, please see http://bit.ly/Supplementary3
[5] For more information, please see http://bit.ly/Supplementary4

Table 1. Summary of the focus groups performed in each country

Countries	No. of focus groups	No. of focus group participants	Average duration of focus group (in min.)
BELGIUM	6	22	110
CZECH REPUBLIC	4	32	83
GREECE	4	29	112
IRELAND	3	14	100
ITALY	3	10	60
LITHUANIA	6	21	50
PORTUGAL	5	28	84
ROMANIA	4	27	46
SPAIN	1	6	105
TOTAL	32	189	83

Participants included 93 males and 96 females from 24 to 65 years old. Table 2 summarizes the information regarding the composition of the focus groups according to sex and age of the participants.

Table 2. Characterisation of the focus groups composition according to sex and age of the participants

Countries	Sex		Age range
	Male	Female	
BELGIUM	15	7	34-57
CZECH REPUBLIC	12	20	24–62
GREECE	12	17	35-65
IRELAND	11	3	27-65
ITALY	7	3	31–62
LITHUANIA	6	15	36–56
PORTUGAL	11	17	26-60
ROMANIA	16	11	32–60
SPAIN	3	3	40-50
TOTAL	93	96	32-60

Table 3 summarizes the information on the constitution of focus groups according to different sectors represented. Among a total of 189 participants, 67 were representatives from the Public sector (35%), 66 from the Private sector (35%), and 56 from NGO (30%).

Table 3. Composition of the focus groups according to the represented sectors

Countries	Country code	Professional Sectors			Total
		Public (PB)	Private (PR)	NGO	
BELGIUM	BE	6	0	16	22
CZECH REPUBLIC	CZ	9	9	14	32
GREECE	GR	15	6	8	29
IRELAND	IE	4	10	0	14
ITALY	IT	2	6	2	10
LITHUANIA	LT	6	7	8	21
PORTUGAL	PT	6	19	3	28
ROMANIA	RO	16	7	4	27
SPAIN	SP	3	2	1	6
TOTAL		67	66	56	189

The focus groups were assigned into four larger categories representing different curricular areas, adapted from different European classifications (e.g., Erasmus Subject Areas Codes; DFG Classification of Scientific Disciplines, Research Areas, Review Boards and Subject Areas), and comprehending several Economic Activities (Eurostat, 2008), namely: **Biomedical Sciences**, **STEM – Science, Technology, Engineering and Mathematics** -, **Social Sciences**, and the **Humanities** (Table 4). This inventory was adopted for data analysis and categorization purposes, since it is similar to the main study fields taught in the different European higher education institutions, taking into account the final aim of the project CRITHINKEDU.

As stated in Table 4, the different professional fields had an uneven representation: Social Sciences had about 66% of all the representatives in the study (n=125), followed by Biomedical Sciences (n=29) and STEM (n=28), both with 15%, and only 4% from the Humanities (n=6). In the following section we present both the overall interpretation of CT by the different professionals as well as the main tendencies, similarities and differences in the need of CT between different professional fields.

Table 4. Composition of the focus groups according to the represented professional fields, economic activities and sectors (in numbers)

Focus Groups by Professional Fields	Economic Activities (Eurostat, 2008)	Field coding	Professional Sectors			Totals by	
			PB	PR	NGO	Economic activities	Professional fields
BIOMEDICINE	Health	HEA	14	4	6	**24**	**29**
	Agronomics and Animal Sciences	AAS		5		**5**	
SOCIAL SCIENCES	Education	EDU	24	9	29	**62**	**125**
	Administration	ADMIN	12	2	3	**17**	
	Tourism	TOU		9		**9**	
	Human Resources	HR		6		**6**	
	Financial Services	FS		4		**4**	
	Human Rights	HRS		1	1	**2**	
	Social Work	SOCIAL_WORK	2			**2**	
	Entertainment	ENTERTAIN	1	2		**3**	
	Law	LAW	1		3	**4**	
	Publishing	PUB		2		**2**	
	Real Estate	RE	2	2		**4**	
	Catering Services	CS		1		**1**	
	Social Aid and Charity	SOCIAL_AID_&_CHARITY			1	**1**	
	International Relations	INT_REL	3			**3**	
	Undefined	UND			5	**5**	
STEM	Engineering	ENG	4	13		**17**	**28**
	ICT	ICT	2	4	3	**9**	
	Transportation	TRANS		1		**1**	
	Environment Protection	ENVIRON_PROTECT			1	**1**	
HUMANITIES	Arts and Culture	ARTS	2	1	4	**7**	**7**

3. Findings

The current section presents and describes the main research findings, from general to specific analysis of the CT understanding, need and practical application in the workplace. Firstly, we came up with an **overall interpretation of CT by different professionals**, reflecting on how the different CT skills and dispositions are expressed by the generality of employers, taking into account their own experiences and perceptions on the topic. Secondly, we deepened the analysis towards the specific **understanding of CT within the different fields**, seeking to identify and characterize the main tendencies, similarities and differences between them.

3.1. Overall interpretation of CT by different professionals

3.1.1. CT skills and dispositions

CT was both associated with skills and dispositions by all the professionals, and this is repeatedly mentioned in a balanced and interdependent way. Although the current data should not lead to generalized inferences, this study reveals that dispositions are mentioned more often (59%) than skills (41%) (Figure 1).
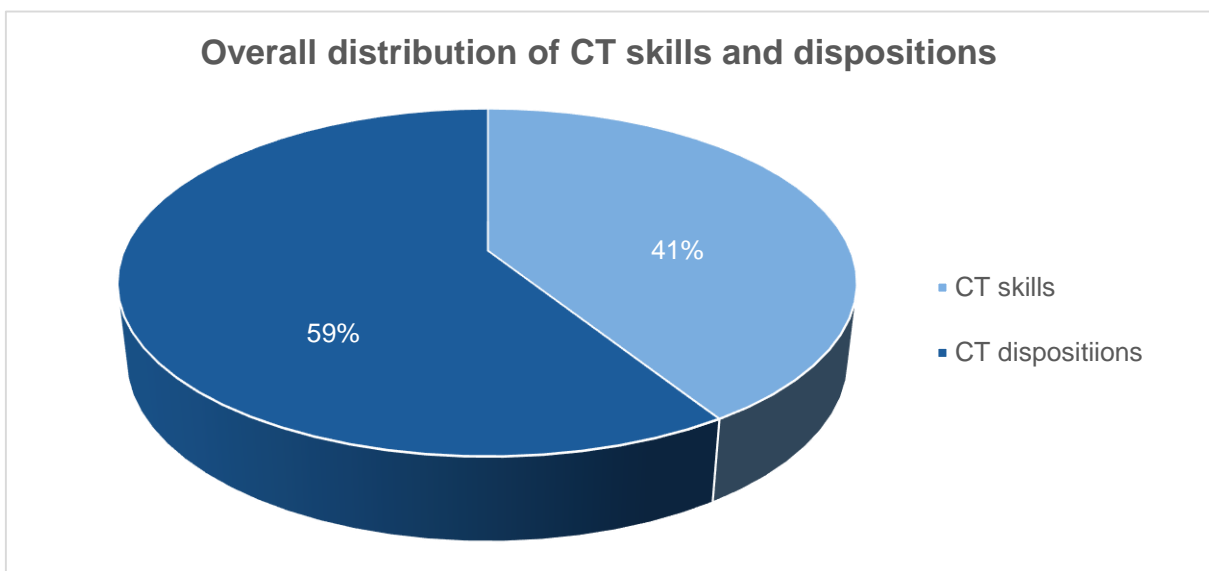

Overall distribution of CT skills and dispositions

41%

59%

- CT skills
- CT dispositiions

Figure 1. Overall distribution of CT skills and dispositions mentioned by the professionals

In fact, many times skills and dispositions are referred in the same quote. For instance, the Interpretation skill (e.g., decoding significance and clarifying meaning) seems to be somehow related with the wish to be correct and rightly interpreted/understood by others, as well as with the seeking for the right interpretation/understanding of others: "*(...) Now CT is very useful for not getting lost in information and deciding on what is truth and what is lie, interpretation. If one does not think critically, one gets in trouble to understand what is going on. S/he will take all information for granted and will be*

influenced by others (...)" (PR_LT_6_HR). It is also associated with the ability to get a holistic perspective of a context or situation: "*(...) CT is the person who takes a step back and looks at the picture or looks at the bigger picture. (...)*" (PR_IE_5_ENG) -, that in turn is linked with the propensity to be cognitively mature: "*(...) You know, you are dealing with so many areas that you never think you are going to deal with (...) you are going to have the residents up on your back and you are going to have environmental problems, you have got health and safety problems. I think it should become more pluralist, more diverse… I use the word 'pluralist' kind of a broad more than engineering because you are going to be dealing with life. There's the community, it's going to be environmental, it's going to be sociological, it could be technical*" (PR_IE_3_ENG).

Likewise, the Self-regulation skill (e.g., self-monitor and self-correct) is expressed by the seeking for the truth, the search for the right decisions and judgements. It also seems to be strongly related with our inquisitive sense, openness and availability to question ourselves in a continuous way or to listen to others for the sake of both personal and professional development/improvement: "*(...) I totally agree with self-evaluation, too. Being able to accept the opinion of a student, being able to ask: what do you want to change in the course; being able to ask: are we somewhere wrong? To do something and then give a questionnaire for the students, teachers to evaluate you. An evaluation (...)*" (PB_GR_7_EDU). Equally, the Truth-seeking disposition (e.g., eagerness to seek the best knowledge in a given context or honesty and objectivity when pursuing inquiry) is interpreted as an eagerness to improve professionally and/or personally. It is associated with the ability to interpret and analyse each situation, in order to understand when it is necessary to ask others for help in the process: "*(...) Have the humility to search for another colleague that we have by our side to helps us (...)*" (PB_PT_5_HEA). Another interesting example is the Analyticity disposition (e.g., application of reasoning and the use of evidence to resolve problems), which is understood as the ability to solve problems and to make decisions based on careful analytical work. This disposition requires analysis and evaluation skills, which in turn can make the difference in unforeseen situations, helping the professional to anticipate potential difficulties and be ready to intervene: "*(...) I was talking to Mr. John, and my colleague was seeing his hypertension, doing the things that are justified ... and suddenly, I looked at him and said: "Mr. John, what have you got?". And he said: "I'm sleepy...". And I noticed that he was red and started to get his lips a little bit different ... so I looked at the colleague, she looks at me and we saw that he was doing a CVA [cerebrovascular accident]. And it really was (...) this is a prompt decision, that is, evaluate the situation, see in that moment that we couldn't do the medication there, no... it's necessary to call 112 (emergency) to the 'green line of Cerebrovascular Accidents'. It was important to know in that moment that it was serious, that he already had symptoms and he had initiated the CVA in front of us. So, it was a practical and verified decision, based on criteria and analysis (...)*" (PB_PT_2_HEA).

3.1.1.1. CT skills

In relation to identified CT skills, all of those contained in Facione's framework were similarly mentioned by professional representatives, with **higher emphasis on Self-regulation** (Figure 2).
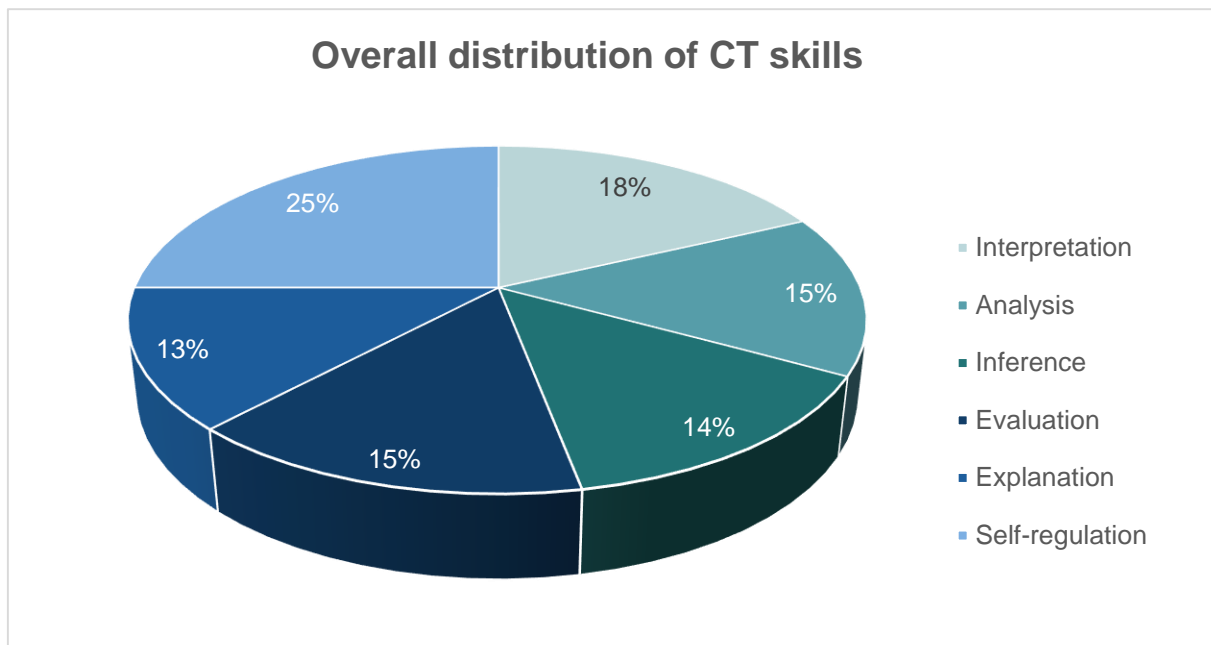

Figure 2. Overall distribution of CT skills mentioned by the professionals

In general, **Self-regulation** was the CT skill more frequently mentioned (with 25% of the mentions). It clearly shows that this is a major CT skill for new graduates and it includes the interpersonal aspect of listening and understanding the others for the sake of personal improvement: "*(...) CT in this case must be seen also in a self-reflective perspective, acquiring points of views different from one's own. Who cannot boost such qualities will play a more routine job, less identified with the institution's mission (...)*" (PB_IT_2_EDU). It also represents the ability to put oneself in some other' s position and is not understood as an innate skill, rather it should be trained and cultivated systematically: "*(...) I think we should firstly cultivate self-awareness in young people...the fact that I accept the changes in others, for myself (...) to feel empathy (...) that I can be in somebody else's shoes (...) to take part in the other's situation (...)*" (PB_GR_2_EDU). Finally, professionals seem to see it as the capacity to critically reflect about the self thinking process, but also the capacity to involve the others in it: "*(...) Critical Thinking is also this: questioning the people around us who are also thinking. That is, not only to question ourselves, but also to question others so that they, in turn, may question themselves. I would say that critical thinking is the capacity that we have to put other people to think (...)*" (PR_PT_3_ENG).

Interpretation was another frequently mentioned CT skill (with 18% of the mentions). This particular skill was associated both with understanding the others and to be understood by them in an effective way: "*(...) To know how to decode the patient's language, make sure he/she understood [the instructions] (...)*" (PB_PT_2_HEA), and "*(...) Being low experienced, the early graduate employee has a high potential, where orientation to results and clients, meant as ability to read needs and interpret them with synthesis processes and efficacy is truly essential in our organization (...)*" (PR_IT_2_ADMIN). It seems also to be strongly related with evaluation, analysis and inference skills, reflecting the ability to search and evaluate factual information as a prerequisite to achieve a meaningful outcome: "*(...) clear unbiased analysis and synthesis of available information to come to some well reasoned outcome, be it a decision or a deeper understanding (...)*" (PB_IE_4_ENG).

Analysis and **Evaluation** were evenly referred among professionals (each with 15% of the mentions), and both are strongly interconnected. On one hand, Analysis involves the examination and distinction of ideas and facts, the identification of reasons, claims and arguments in order to better understand a specific task/situation or initiate processes in a right way, towards a decision: "*(...) So it's being able to analyse the facts and figures in front of you and use that information to not necessarily come out with the right or wrong answer, it could be various different solutions and it's analysing the information to decide what is the right way to proceed or what decision you should make(...)*" (PR_IE_1_ENG). On the other hand, Evaluation is the ability which allows to effectively make a reasonable decision, based on the previous analysis. It is understood as an ongoing process for the sake of professional and organizational benefits, seeking to serve clients or patients' needs as best as possible: "*(...) We must always know, at any time, how to make analysis and synthesis simultaneously. Because, when a patient passes the door of the emergency room, we must perform an assessment at a glance, to evaluate if his condition is severe, if he needs this or that/not at all (...)*" (PB_PT_1_HEA).

The CT skills mentioned slightly less frequently were **Inference** and **Explanation** (with 14% and 13% of the mentions, respectively). Regarding Inference, this skill was often associated with both Analysis and Evaluation skills. It involves critical analysis of solutions, problems and situations to query evidence, as well as the evaluation of possible causes, reasons and consequences: "*(...) it's how you look at a proposed solution, determine how well it fits what you want and what the wider issues would be as well (...)*" (PB_IE_2_ENG). Inference deals with the conjecture of alternatives, based on the analysis and evaluation of possible strengths and weaknesses in order to draw justified conclusions and achieve the best decisions or ideas: "*We need to understand weaknesses and strengths, spotting opportunities, the capacity to build new arguments, using experience to get new ideas*" (PB_RO_5_RE). On the other hand, the Explanation skill focuses on the need to communicate with clients and present them evidence-based arguments in a clear and understandable way. It is about interpretation of information from "a foreign" to another language, from professional to individual client's language, in order to transmit the right message

effectively: "*(...) We can have 1001 people from different economic, social and cultural backgrounds in the group and we have to know how to pass the information to them in the most appropriate way (...)*" (PR_PT_5_TOU). It is also somehow related with self-confidence and the courage to present a contradicting opinion: "*(...) The ability to formulate ideas even in a broader plenary (...) the ability to say it (the idea) in a room full of people and say it quickly, in a couple of points and not to be afraid of saying something that is against the majority in that room (...)*" (PB_CZ_10_HEA).

3.1.1.2. CT dispositions

Regarding CT dispositions, all of those contained in Facione's framework were mentioned by the professionals. They were **equally mentioned in the focus group across professional fields** (Figure 3).
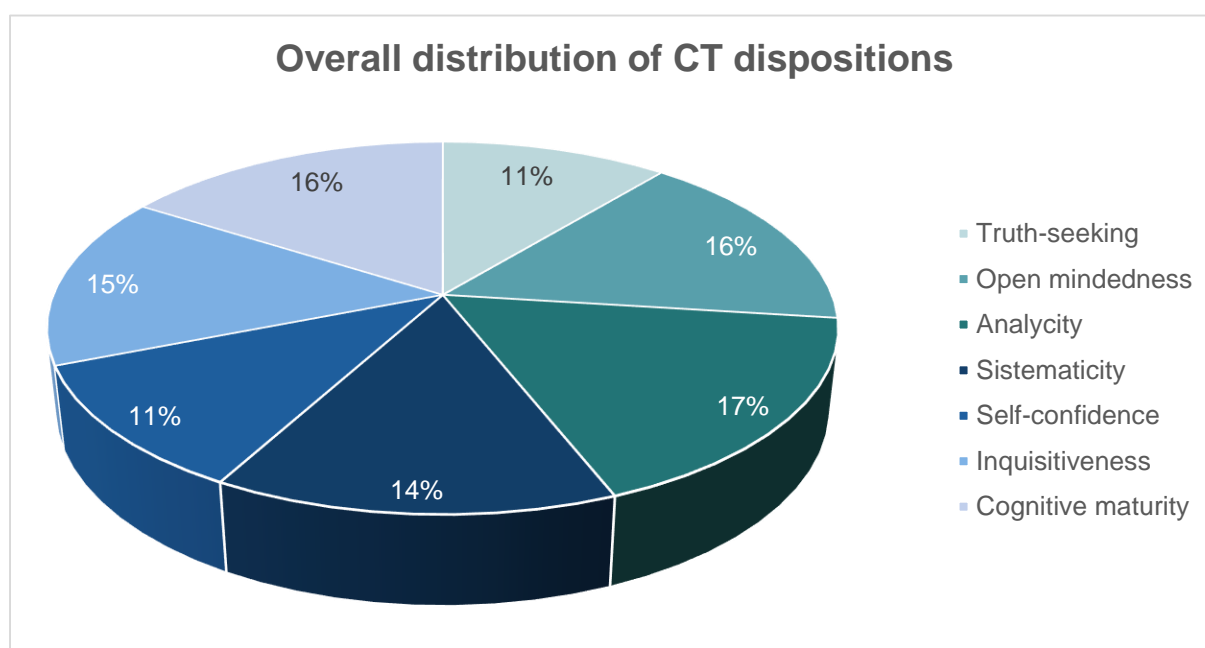

Figure 3. Overall distribution of CT dispositions mentioned by the professionals

In general, **Analyticity** was the CT disposition mentioned more often (with 17% of the mentions). It is associated with the ability to solve problems and to make decisions based on careful analytical work, but it is also connected with the readiness to act, prognosing difficulties and mental efforts to overcome particular problems or situations: "*(...) he/she starts to defend one side, because he/she gets an impression that it is truly the right way to do. And then you see, how a person reacts to your enforcement – maybe he accepts it or maybe he presents counterarguments. Then he/she tries to disprove this counterargument (...)*" (NGO_LT_3_HRS). This is somehow related to initiativeness, and is particularly reflected by the inclination to be

autonomous and proactive: "*(...) A person who has this kind of proactivity allows those who are above to gain a lot of time in their lives. When someone goes 'one step ahead', even if they do not have the ability to make a decision, at least they share it to the person who will decide and think about it. I usually tell the people that when I am assessing them, I see if they are proactive, and even if they do not have the ability to decide about the theme, the important is to think and get ahead (...)*" (PR_PT_3_ENG).

Open mindedness and **Cognitive maturity** were evenly referred by the professionals, closely behind analyticity (each with 16% of the mentions). The first is understood as a general mindset expressing the respect and tolerance to the others' point of view: "*(...) Allow for different opinions, viewpoints, that is essential for a CT teacher (...)*" (NGO_BE_7_EDU). It is strictly related to broad-mindedness, flexibility and sensitiveness towards our personal bias to satisfy clients´ needs or: "*(...) Be open to criticism. It's important for the person to know how to receive feedback. If we can identify and analyse a constructive critic, then our performance will be substantially improved. And I always say to students: 'You are producing work for others, it's not for you.' (...)*" (PB_PT_4_ARTS). Also, it is somewhat related with the ability to embrace new experiences and evolve from there: "*(...) Another critical point is that the multicultural dimension, meant as the ability to work in different environments, has a strong impact on the job itself. Our students should understand and should measure up with this aspect because present job market is moving towards an ever more widespread international dimension*" (PR_IT_3_EDU). Like Open mindedness, the Cognitive maturity is a disposition that also deals with openness and flexibility. It is frequently associated by the professionals with the ability to adapt in a constantly changing environment, by observing the wider context in which the organization is included: "*(...) to be able to understand a broader context, including the geopolitical, and think where the organization is aiming at (and also the whole "segment") (...) to change the things as one is moving ahead and is looking for new ways (...) and to try to critically assess these new possible ways (...)*" (PB_CZ_7_HRS). Cognitive maturity respects also to the valuing of different opinions, the consideration for ethical norms, and it is connected both with intellectual modesty and self-confidence. A cognitively mature person counts not only on himself/herself, but also on others: "*(...) When a doctor faces a patient he also faces himself (...) he has to develop the CT in this sense: neither put himself in the situation of incapable, nor put himself in the situation of fully capable. To deal with a situation, to call a colleague to see, whatever the moment in life we are in. It only benefits those who do it, and obviously those who receive it*" (PB_PT_1_HEA).

Inquisitiveness and **Systematicity** were similarly mentioned among the professionals, but less frequently than the previously identified dispositions (with 15% and 14% of the mentions, respectively). Inquisitiveness, represents the intellectual curiosity or the desire to learn, which is associated with the need to update professional knowledge in order to meet new organizational demands. It is well expressed by a constant process of questioning oneself and the others, leading to new knowledge for professional and personal improvement purposes: "*(...) We need to*

learn what is new. We meet new challenges – we have to reorganize our activities because of new computer systems. They are constantly renewed. We also have many new specific things in nursery, laboratories, day surgeries and etc. And also – medical equipment, new working methods. Employees have no other way, just constantly learn (...)" (PB_LT_6_HEA). It can also be associated to a kind of "professional scepticism": "*Finally, I would say a certain degree of nonconformism. Because in order to have critical thinking, you have to be a little "nonconformist" (if you can say it so). We need to be always curious, and not to think that the first thing they tell us is right (...)*" (PR_PT_1_ENG). On the other hand, Systematicity was often associated with the consistency of expressed thoughts and actions, serving as a model for others: "*(...) And we should assume this role model, too. That is, I am consistent. That means, you need to be consistent in your work, be consistent in your words, in your promises. In order to make a good relationship with your family, tomorrow, with your partner, with your children, with your colleagues. If we ourselves teach inconsistency, children will reproduce it (...)*" (PB_GR_8_EDU). It was also valued as an organized approach to perform tasks in time restriction settings, to come up with clear and generalized ideas and expects employees to be focused, attentive and critical in making professional decisions: "*(...) The time management, the organization of the work, the prioritization. Thus, this is very important, because people may know a lot, but they can be lost in front of a patient and, instead of having the given 20 minutes (30 in private sector), they lose themselves in time and the other patients will be waiting. Thus, in a given situation, time management, make priorities, and the organization of the work, are essential (...)*" (PB_PT_2_HEA). This is particularly important today, when "*(...) we work in an environment with high dynamics (...)*" (PB_RO_4_EDU), and "*(...) speed is a very important factor (...)*" (PR_GR_2_ICT).

The CT dispositions less frequently identified were both the **Self-confidence** and **Truth-seeking** (both with 11% of the mentions). Self-confidence is related to the ability to evaluate and make personal decisions regardless of the professional and position held. Thus, it includes aspects of honest behaviour, mutual trust and intellectual integrity: "*(...) Moreover, I think the issue of attitude is extremely important, it is important to develop intellectual integrity, because we often think one thing, but we do another – by influence of others, or any other reasons – sometimes we think correctly but our actions lead us elsewhere (...)*" (PR_PT_9_TOU). Also, being self-confident means to trust our own opinion, which is associated with independent thinking and decision making, reflecting the ability to resist to mainstream thinking and have the courage to express non-standard opinions: "*(...) A CT teacher never simply copies something; she will adapt in order to make it more suited for her particular setting. She does not simply follow mainstream thinking (...)*" (NGO_BE_7_EDU). Leadership is an integral part of self-confidence. In some cases, it can be called "veiled leadership", when employees silently, on their own, take the initiative to move on, go forward: "*(...) He was in a paradigm where he had a person hierarchically above him who said no, it should be done this way, but then he had his own conviction that it should be done differently. OK, so he grabbed it, decided to show the pros and cons of both ways and*

it worked, because the answer that he got from the person who evaluated him was in accordance with what he thought from the beginning. I think this is a clear example of a person who did not limit himself to programme and develop the code (computer code) that they asked for, but rather thought critically in order to defend his idea until the end, without hurting anyone (he did what the supervisor wanted and also did the way he thought the best)" (PR_PT_3_ENG); and in some cases it can be called "visible leadership", when employees are eager to model leading complex situations. Finally, the Truth-seeking CT disposition is understood as eagerness to improve either professionally and personally: "*(...) definitely updated knowledge, because in the dietary field, things develop fast, in conjunction with the holistic approach of various specialties; therefore, it is very important to introduce a spirit (an idea) which all of us will be eager to acquire (...)*" (PB_GR_4_HEA). It is in some cases related to the inquisitiveness and open mindedness dispositions, since it reflects the desire to look deeper and learn with others, the courage to raise questions and to make mistakes: "*(...) I'll receive, too, I will not only give. That is, you should have the willingness to receive from the students and to search with them. Several times I told them I do not know that, you will give me time to look it up and I will let you know (...)*" (PB_GR_7_EDU).

3.1.2. Skills and dispositions outside of the framework

The analysis identified other relevant skills and dispositions not fitting into Facione's theoretical framework, which were coded under the "out of the framework" tag. They were considered essential to describe the overall interpretation of CT by the different representatives of focus groups. All these data can be understood as a core of complementary, interdependent and interconnected skills and dispositions that shape CT in a complex and wider perspective, according to a variety of different meanings, contexts and settings.

Many research participants linked CT to interpersonal skills such as **Communication**, **Cooperation** and **Teamwork**. Accordingly, CT goes beyond the individual and is reflected by the sense of belonging to a team, organization or system, in which the communication, empathy and relation with the others (e.g., colleagues, patients, clients) have a major role to achieve desirable goals, better results or make critical decisions: "*(...) Medicine and Nursing are mainly relational [practices]. We need to deal with activities, shall we say, interdependent, dependent, we have to contact with a variety of colleagues, peers, with doctors; in fact, that kind of demand exists (...)*" (PB_PT_3_HEA), and "*(...) As well as another competence (…) there is a value that our company acknowledges: we are stronger if we are together: It is an interpersonal relationship competence. Why this? Because we believe that this ability to work as a team, not being isolated, will also allow us to grow, which does not mean that we do not have the capacity to be alone, introspectively, to think, but to know that we are part of a team (...)*" (PR_PT_3_ENG). This also goes along with strategic thinking and the

sense of shared responsibility: "*(...) Those involved in the process have the (their share of) responsibility (...)*" (PB_GR_8_EDU), and "*(...) strategic thinking, developing sense of responsibility towards organization (...)*" (NGO_LT_4_SOCIAL_AID_&_CHARITY).

Another characteristic strongly emphasized by a large part of the professionals was **Emotional Maturity**. This implies the ability to manage different feelings and emotions, and is particularly reflected in unforeseen or controversial situations: "*(...) we are always under a constant pressure, from the audience, the director, etc. An actor does not sleep before his/her debut, does not eat, etc. The emotional factor, and for me I would like to cross critical thinking with this question of emotional intelligence. The actor, as a theater actor, as mediator, works with a receiver who is equal to him, who cries and laughs. And above all, with regard to critical thinking, the actor does not have time for reflection due to all this stress and pressure (...)*" (NGO_PT_5_ARTS). In addition, it is somehow related with the tolerance and resistance to stress, requiring in some cases a psychological balance that relies on perseverance - "*(...) Our occupation is stressful, soul-destroying and you need psychology…you should have stamina, to endure (...)*" (PR_GR_1_ICT), and happiness - "*(...) The ability to enjoy the little things and really live in the presence (...) the ability to be mindful and present (...)*" (PR_CZ_1_HR).

Finally, another "out of the framework" skill mentioned by the overall participants was **Creativity**. It seems to be associated with inference, in the extent that it involves the ability to search for authentic, original and non-standard solutions/alternatives within a problem solving approach, that in many cases derives from an entrepreneur and innovative behaviour: "*(...) Creativity is another behavioural skill that we value. The development of new approaches, of original solutions, so that we differentiate ourselves in the market (...)*" (PR_PT_2_ENG), or "*(...) I would like to see creativity, courage to let thought go; that all decisions were not uniformed, not standard. I would like to see a person out of box thinking, looking from a new perspective (...)*" (NGO_LT_5_HRS).

3.1.3. Interpretation of the results

From the presented data, there are **fewer mentions of CT skills in comparison to dispositions**. Even considering this a drift, it suggests that for professionals, CT resembles not only a set of different cognitive abilities, but mainly personality traits which involve a sense of willingness. Thus, it cannot be developed in few situations, rather it is something that emerges from experience, life long learning, effort and persistence (Halpern, 2014). Both CT skills and dispositions empower people to think and act critically. This perspective is in line with the Facione's theoretical framework (Facione, 1997) and the opinion of several other researchers (Siegel, 1988; Bailin & Battersby, 2010), who defined the relationship between the two entities in two ways. On one hand, it is necessary for an individual to possess trained cognitive skills, but it is not enough to effectively apply them; that person must be minded to do it. On the

other hand, if we look at it from the development perspective of CT, how can someone train and develop their cognitive skills involved in a critical process, if they are not first motivated to it?

All the CT skills included in the Facione's theoretical framework were identified by professionals, who frequently have emphasized their interconnectedness. Even though CT is understood, by employers, as an ability of problem solving and decision making, its application does not depend on a standalone skill, but in the convergence of different abilities. It means that to achieve a better solution, decision or outcome, you cannot simply query evidence, conjecture alternatives or draw logically valid conclusions (e.g., Inference), without being able to decode the significance or clarify the meaning within the context (e.g., Interpretation), to analyse ideas, identify arguments and claims (e.g., Analysis), or to assess the credibility and quality of them towards an inductive or deductive reasoning (e.g., Evaluation). All of them are complementary and manifested side by side during the cognitive process. Additionally, even being able to reach the solutions for a problem, the employee needs to be capable to express them to the other colleagues from the organization, through the statement of results, justification of procedures and presentation of arguments (e.g., Explanation). This complex flow of cognition does not end here, but remains over the practical application of the most emphasized CT skill by employers, that is Self-regulation. This is somehow related to metacognition, self-reflection and self-criticism, being essential to regulate and monitor not only our own thinking and behaviour, but also useful to help other colleagues engaging with it. This ability congregates the different CT skills previously presented, in the sense that it requires interpretation, analysis, inference and evaluation of our actions and decisions adopted within a situation, and seems to be at the "heart" of CT in the workplace, constituting the basis for improvement and progress of all professionals. Thus, CT is not only understood as a result and outcome (what), but also as a process (how) of leading to a specific outcome.

Professionals mentioned all CT dispositions of the Facione's theoretical framework, although with an uneven distribution. The most repeatedly favoured disposition was Analyticity. This disposition is particularly associated with the readiness to intervene and anticipate potential problems, determined by the personal initiative, autonomy and responsibility of employees. Strongly related with the analysis and evaluation skills, the Analyticity disposition involves the prognosis of difficulties and mental efforts to overcome them. However, this is only valuable for employers if merged with a complementary and integrated perspective on how CT is understood as a personal trait - which includes all of the other dispositions. For instance, this means that an employee can be always ready to intervene, but it is essential to do it within an organized approach, presenting consistency of expressed thoughts and actions, coming up with clear and generalized ideas (e.g., Systematicity): "(...) but it is not only to have energy and be entrepreneur, it's about having it in a structured way (PR_PT_7_TOU)". Moreover, an individual will be proactive or autonomous if and only if he/she trusts in his/her own opinion (e.g., Self-confidence), or is courageous to

express it, to raise questions (e.g., Inquisitiveness), to fail and to respect the other colleagues' opinion (e.g., Open mindedness), or to be eager to learn and improve (e.g., Truth-seeking). This clearly shows how the different dispositions are interrelated with each other. Similarly, and also dealing with this kind of openness and flexibility, CT is shaped by the capability to adapt in an increasingly changing workplace, considering the wider context that is composed by different ethical norms, technological advances and patterns in which the organization is included (e.g., Cognitive maturity).

Additionally, data analysis showed that **opinions on how CT is understood by the different professionals go beyond the Facione's theoretical framework**. This reflects a wider and holistic interpretation of CT, which is essential either because of professional benefits, or the personal improvement and overall good. Thus, the outcomes of a professional activity are directed not only by profit, but also to meet people's needs, to overcome societal challenges, and contribute in this way to a better future and quality of life. Within this context, CT is not only related solely with personal cognitive/psychological traits, it also implies a collective responsibility, in which other skills and traits of an interpersonal nature have a major role, such as communication, cooperation, teamwork and emotional maturity. The current demands of the labour market increasingly calls for a multidisciplinary professional, not only able to communicate, cooperate and work in a team with different profiles and backgrounds, but also with stakeholders (e.g., customers, patients, students, etc.). On the other hand, the ability to be emotionally balanced, empathetic and tolerant are key characteristics of a critical employee, especially in situations of uncertainty in which the stress and conflict of interests can become a barrier to the process. Finally, another skill mentioned by the professionals was creativity. Although its relationship with CT is not well-expressed among the overall employers, creativity is commonly associated with innovation and entrepreneurship, and seems to represent a kind of divergent and non-standardized thinking, that requires the ability to search for authentic and original solutions within a problem solving approach.

3.2. Tendencies, similarities and differences in the need for CT between different professional fields

3.2.1. CT skills and dispositions

Although the current data could not lead to generalized inferences, **the need for CT dispositions was more frequently mentioned than the need for CT skills in 3 of the 4 professional fields investigated in the study** (Figure 4), namely in Biomedical Sciences (65% vs 35%, respectively), Social Sciences (61% vs 39%, respectively) and the Humanities (74% vs 26%, respectively). Only in STEM professional fields was the need for CT skills more mentioned than the need for CT dispositions (56% vs 44%, respectively).
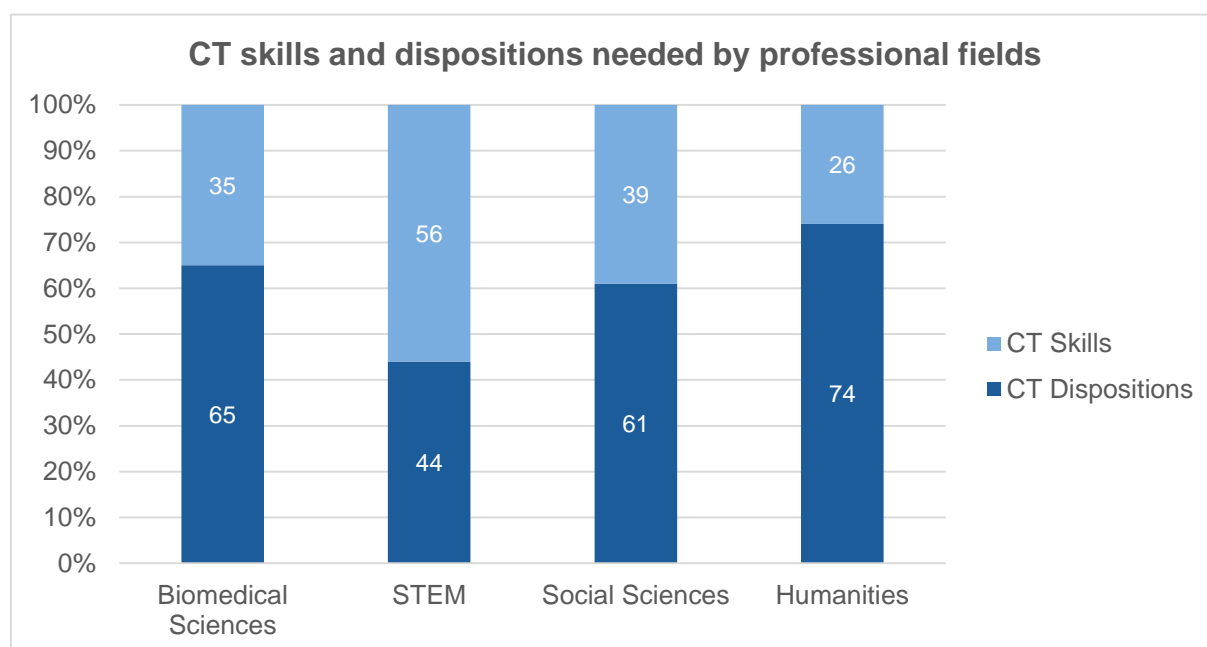
Figure 4. CT skills and dispositions needed by professional fields

These results reinforce the opinion that the motivational element of the human being and his/her propensity are most important for CT development. For Biomedical Sciences, Social Sciences and Humanities professionals, this perception was consensual and could be confirmed through several testimonies: "*(...) I think that critical thinking is a combination of many things (...) Or also the employees' willingness certainly to develop critical thinking*" (PB_GR_TEI_6_HEA); "*(...) the most important thing is motivation (...) the rest can be learned, but when one has a long-term goal it makes a difference*" (PB_CZ_EDU_10); and "*there is more motivation in some students than in others, and this is a process which relates to what each one wants to learn (...)*" (PB_PT_4_ARTS).

3.2.1.1. CT skills

In relation to the identified needs for CT skills among the different professional fields, **slight nuances and similarities were found, based on the interpretation and practical application of CT in each field**. Some attempts to illustrate this were made through the identification of workplace scenarios mentioned by the different employers. Figure 5 presents the distribution of the CT skills needed in each professional field.
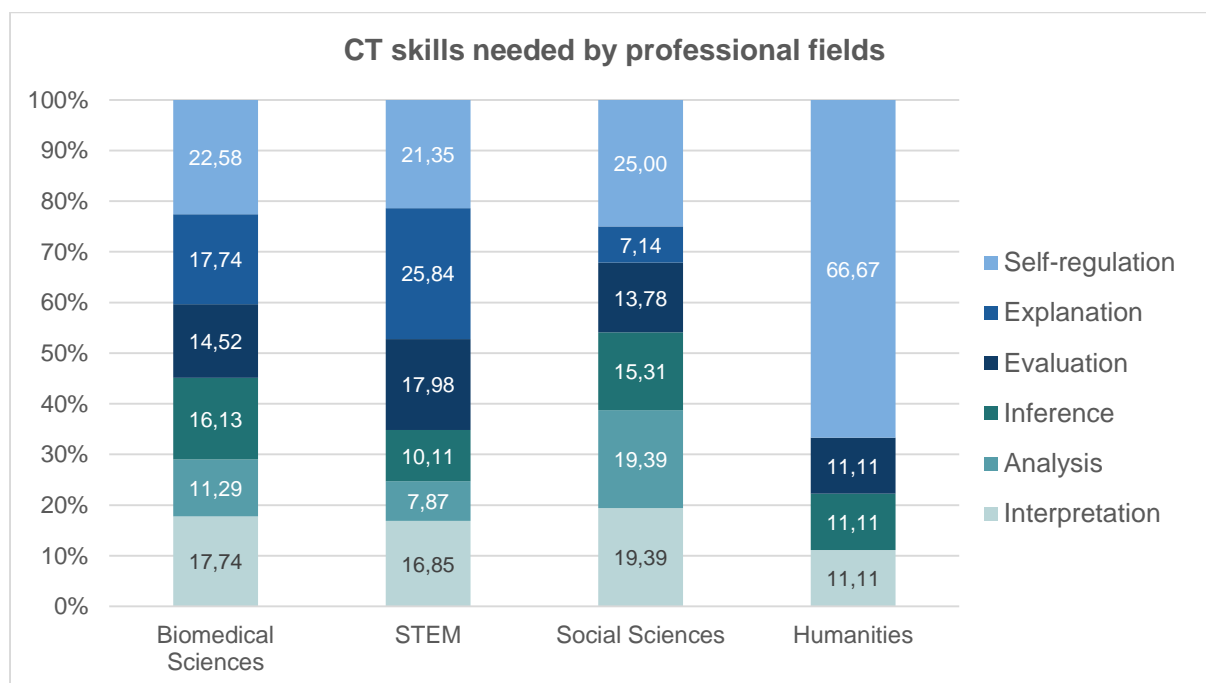
Figure 5. CT skills needed by professional fields

Accordingly, **Self-regulation** is expressed as one of the main CT skills needed in each professional field, particularly by the Humanities employers from Arts and Culture, in which the mentions are quite numerous (representing 67% of the field), followed by Social Sciences (representing 25% of the field), Biomedicine (representing 23% of the field) and STEM (representing 21% of the field). In **Arts**, the need for Self-regulation is somehow related with the search for self-professional improvement and the constant spirit of self-criticism, lying on the fact that an actor lives under pressure, never fully satisfied with existing results: "*(...) to reflect on results is quite common, and in theater, the pressure... an actor lives constantly in self-criticism, he is never happy, even after the premiere (...)*" (NGO_PT_5_ARTS). For these professionals, self-regulation also requires a certain kind of intellectual openness and humility: "*(...) It's that question of self-criticism. We cannot think that we are always right and that we are the best. It is very hard to deal with this type of people.*" (NGO_PT_1_ARTS). Also, and with similar interpretation, the need of Self-regulation is frequently mentioned within the other fields as one of the most needed CT skill. For instance, in **Social Sciences**, educators have a major role in the promotion of this skill in their learners, being one of the most important concern in this profession: "*(...) I think students must be taught this: you can not have results in your work, and as a human being, see improvement in what you study and what you will do tomorrow, without dedicating time and without constantly wondering if you have done well to continue or if you have done wrong to stop (...)*" (PB_GR_8_EDU). Moreover, "*(...) A critical thinking teacher can control his own judgement (...)*" (NGO_BE_4_EDU), and promotes/shares this kind of CT skill in/with the others (e.g., students and colleagues): "*(...) Is able to pause, to allow everybody to think (...)*" (NGO_BE_7_EDU), and "*(...) Being able to self-assess one's own*

competencies and share the result with colleagues is a very important element (...)"
(PR_IT_3_EDU). In **Biomedical Sciences**, professionals from Health stressed the
role of clinical practice auditing in the promotion of this specific CT skill: "*(...) The
critical thinking imposes auditing. Without the audits, the critical spirit/thinking remains
the one we were able to produce and the things we consider to be right. The audit I
am talking about it the audit to the process (...) we discuss clinical cases, all of us, we
discuss topics, etc. But I perform clinical verifications, that is I transform clinical records
into management processes. And a major part of the critical spirit I develop regarding
our procedures arises from that (...)*" (PB_PT_1_HEA). Finally, in **STEM**, professionals
from Engineering and ICT associate this skill with the sense of openness and self-
criticism even when the solutions for a problem are attained: "*(...) the ability to remain
open and to kind of self-criticise the solutions as you arrive at them (...)*"
(PS_IE_3_ENG). They refer that it's all about the ability to monitor our own thinking,
"*(...) thinking about thinking, thinking about what are you doing and why (...)*"
(PB_RO_12_ICT), and "*(...) questioning what we could have as predefined, and
evolve from that (...)*" (PR_PT_2_ENG).

In relation to **Explanation**, this was the CT skill most emphasized in the STEM field
(representing 26% of the field), followed by Biomedicine (representing 18% of the field)
and Social Sciences (less mentioned in the last one, representing only 7% of the field).
There were no references about the need of this CT skill by Humanities professionals.
Conversely, in **STEM**, professionals from Engineering and ICT associated the need
for Explanation not in the sense that employees should be able to present or
communicate the solutions for a problem, but to support them argumentatively: "*(...)
We need to improve the ability of finding alternatives or multiple solutions and support
them with arguments (...)*" (PB_RO_12_ICT). And this not only occurs after achieving
a solution, but also during the process of its own discussion and elaboration: "*(...) Once
a problem is analysed, it must be elaborated and discussed giving one's reasons and
raising all addressed gaps to find a solution (...)*" (PR_IT_3_ICT). For engineers in
consultancy services, a main outcome resulting from the need of this CT skill is the
ability to persuade and influence their own customers: "*(...) The ability to define and
convey objectives, guidelines, check the evolution trends, or also the influence, the
persuasion - how can a person influence and persuade his/her customers? (...)*"
(PR_PT_2_ENG). Moreover, the need for Explanation is shaped by the ability to
communicate in different forms, and attending to the audience that you are trying to
communicate to: "*(...) Having the knowledge is one thing but then being able to
communicate it in various ways and that people sometimes very simply sum it up as
´oh that's communication`, but it's not because communication only ever works if you
can identify the audience that you are trying to communicate with but it requires some
serious critical thinking (...)*" (PR_IE_4_ENG). In **Biomedicine**, this skill is particularly
needed in Health professions, not only to justify the procedures to a patient - "*(...) If a
patient comes in with a very high blood pressure, or anxious because he has a
surgery/goes to the surgery block, I worry about lowering the blood pressure, but what
that patient probably needs is for me to explain the surgery, to tell him that nothing will*

go wrong… (...)" (PB_PT_3_HEA) -, but also to his/her family that should be maintained informed of the current situation: "*(...) The patient relation with his/her doctor is a contractual relationship, based on an oral agreement. The institution may serve as cover, but when something goes wrong the doctor is the one with the prejudice. However, if the situation goes bad/wrong, the family must not be caught/taken by surprise. The patient's family should be maintained informed of the current situation, be aware of the possible evolution, what doctors can do, etc… They can even have/ ask for a second or a third opinion on the situation, but he/she should be made co-responsible with the situation (...)*" (PB_PT_1_HEA). Also, the need of the Explanation skill is presented when the doctor has to state his/her action plan to treat and follow-up the patient: "*(...) P refers to Plan, the action plan (referring to the framework used in Portuguese Hospital Centers to proceed for hospital admissions, SOAP). What are the doctor's proposed actions? The decision he makes at a moment*", *that could be short- medium- or long-term decision. And that is reformulated from an appointment to another, surely/evidently (...)*" (PB_PT_2_HEA). In contrast, the need for this skill was less mentioned in **Social Sciences**. For Education professionals, it is somehow related with the ability to contrast and debate opinions/knowledge properly, not only in an independent basis but also collectively: "*(...) Is able to build sound lines of argument together with pupils in a class, not only that she is able to do it herself but able to do it together with learners (...)*" (NGO_BE_9_EDU). In Tourism, Explanation is a CT skill needed to transmit the information to use the most suitable level of language to convey information to different customers/audience, during a tour: "*(...) We can have 1001 people from different economic, social and cultural backgrounds in the group and we have to know how to pass the information to them in the most appropriate way (...)*" (PR_PT_5_TOU).

The need for **Evaluation** is referred in a balanced way by all the professional fields, more often by STEM professionals (representing 18% of the field), followed by Biomedicine (representing 15% of the field), Social Sciences (representing 14% of the field) and Humanities (representing 11% of the field). For Engineers and ICT consultants, in the **STEM** field, the need for this skill relates to the fact that "*(...) students have access to massive amount of information (...)*" (PB_IE_2_ENG), which requires not only the capacity to assess the quality of arguments in a given information for decision making or problem-solving purposes - "*(...) So as you build you'd evaluate the information in front of you so you are constantly evaluating and analysing and trying to make a decision based on (...)*" (PR_IE_3_ENG) -, but also the ability to examine your team within a project: "*(...) You have to be able to critically analyse everybody else on the project (...)*" (PR_IE_2_ENG). Thereby, "*(...) the ability to peer review is a really useful life skill both inside and outside of academia (...)*" (PB_IE_4_ENG). Likewise, the Evaluation skill is needed for STEM professionals to "*(...) prioritize the tasks they have to do giving priority to the important ones (...)*" (PR_GR_1_ICT), and to "*(...) understand connections and solve systematically the problems (...)*" (PB_RO_12_ICT). In the **Biomedical** field, especially for the Health professionals, the need for Evaluation is essential to manage situations of uncertainty

(e.g., emergency), in order to prioritize the following actions and decisions: "*(...) Because, when a patient passes the door of the emergency room, we must perform an assessment at a glance, to evaluate if his condition is severe, if he needs this or that/not at all (...)*" (PB_PT_1_HEA). This skill is also the basis to make a clinical diagnosis, and results from a subsequent process of interpretation and analysis (all are interdependent): "*(...) A - for assessment, where we codify the diagnosis (referring to the framework used in Portuguese Hospital Centers to proceed for hospital admissions, SOAP). For sure it is needed that everyone knows what should be done regarding "S" (Understand what the patient told us), make an objective assessment (O), so we may codify correctly "A". If he [the medical resident] starts wrongly then he would never be able to codify "A" (...)*" (PB_PT_2_HEA). Likewise, the Evaluation skill is even more needed today due to the fact that the patients and families have a huge amount of data available but lack for information literacy skills: "*(...) [Health] professionals must be prepared to know that the patients often arrive misinformed". When someone comes with the patient, it is usually a family member that already googled for information. That is an entirely different area in critical spirit that we need to develop with the patient. The issue with nosocomial infections [hospital-acquired infections], that occur worldwide and people do not know how to deal with them. The concern with antimicrobials is that most people think they are the cure for the smallest condition/health problem (...)*" (PB_PT_1_HEA). In the **Social Sciences** field, the need for Evaluation skills falls on the ability to assess the credibility of different sources of information by professionals from Administration: "*(...) Judgement abilities on the credibility of information sources (quantitatively out of control and often organized and managed in an inappropriate way also within the organization) are important (...)*" (NGO_IT_1_ADMIN). This is also needed for Education professionals, in order to separate the reality from subjective opinions - "*(...) We need to develop capacity to distinguish between reality and subjective opinions (...)*" (PB_RO_2_EDU) -, but also to judge and value evidence after a careful analysis - "*(...) analyse and to evaluate based on evidence, that's a competence of a critical thinking teacher. He evaluates and judges but only after the situation has been analysed (...)*" (NGO_BE_4_EDU) -, and considering the opinions of different learners or stakeholders - "*(...) consider different alternative views, e.g., from learners in a classroom. Can consider the perspectives from different stakeholders (...)*" (NGO_BE_4_EDU). For Tourism professionals, this need recalls for an ability to evaluate the context in which the employees work, based on a previous interpretation and analysis: "*(...) Obviously this is always based on cognitive skills, I think the question of analytical ability, the ability to evaluate the context in which they are inserted, interpret the signals that emerge from the context, I think these competencies are very important (...)*" (PR_PT_9_TOU). In contrast, in the Humanities field, no significant interpretation and application of the need for Evaluation was retrieved from testimonials in Arts and Culture focus group.

The need for **Inference** was expressed from representatives in all the fields, a major emphasis being found among the professionals from Biomedicine (representing 16% of the field), followed by Social Sciences (representing 15% of the field), Humanities

(representing 11% of the field) and STEM (representing 10% of the field). In **Biomedicine**, especially in Health professions, Inference is needed for diagnosis and query for evidence purposes, which professionals use during physical exams and when retrieving the clinical history of a patient - "*(...) O - for objective, which includes the physical exam and also the previous [clinical] history… (referring to the framework used in Portuguese Hospital Centres –SOAP (...)*" (PB_PT_2_HEA), and also when grading the severity of the clinical condition - "*in that moment, in my head, all the information we acquired [during the consultation] has already passed, and that allows recognizing if the situation is severe and, at the same time, take the action of referring him for other service (...)*" (PB_PT_1_HEA). In **Social Sciences**, the need for Inference skills is shaped according to different settings. For instance, Tourism professionals during the elaboration of recreation programs need to conjecture different alternatives attending to customers' preferences: "*(...) Here I also speak about the creation of some programs, as it was also said here, they have to be able to elaborate these programs knowing that people also want to have time to rest, want to have moments for shopping, want to have moments to be surprised, and the program has to contemplate all these tools, all those moments (...)*" (PR_PT_7_TOU). For Administration professionals, this need is strongly related with the ability to draw justified conclusions - "*(...) capacity to see which issue is not conforming to the regulations (laws) and how good is the solution an employee is offering. These are our objects of activity (...)*" (PB_RO_7_ADMIN) -, and this seems to be related to a specific assumption that is "*(...) to recognize that whatever we see around us is the product of certain correlations, comes from a person with a specific ideology (...)*" (PR_GR_1_PUB). In turn, for Education professionals, the need of Inference is found during the supposition of alternatives, regarding their feasibility - "*(...) Projecting feasible scenarios (...)*" (NGO_RO_1_EDU) -, and considering the existing limitations - "*(...) Taking actions regarding existing limitations (...)*" (PB_RO_3_EDU). Thus, it requires a strong ability to apply theory in practice, "*(...) to re-contextualise the knowledge acquired in the university within new frameworks (...)*" (PR_GR_1_PUB), to query evidence and "*(...) think about ideas, causes, problems (...)*" (PB_CZ_3_EDU). It can be achieved by listening - "*(...) For a critical thinking teacher, listening is probably the basis. A very important source of information and the start to engage in interaction, in a discussion (...)*" (NGO_BE_5_EDU) -, and by constructive questioning and consideration of different points of view: "*(...) we should have an educational meeting to talk about the students, what problems we have, what we want to change in the children, in us, how to do it (...)*" (PB_GR_8_EDU). As with Evaluation, no significant interpretation and application for Inference was found among professionals in the Humanities field. Finally, in **STEM** field, the need for Inference is also related with the conjecture of alternatives, to give possible directions, solutions and recommendations to customers. This requires a strong ability to formulate good questions - "*(...) has to do with the formulation of questions that can give us clues to realize the reasons and the causes of situations (...)*" (PR_PT_2_ENG) -, and to draw conclusions from ideas that may not be apparent and to look in a different way to the specific situation or solution: "*(...) we have to look with different views and lenses that*

are completely independent of the situation, in order to characterize the roots of the problems and then point out clues and recommendations so that our clients can overcome the problems (...)" (PR_PT_1_ENG).

Analysis was emphasized in Social Sciences field (representing 19% of the field), Biomedicine (representing 11% of the field) and STEM (representing 8% of the field). There were no mentions on the need for this CT skill by the Humanities professionals. For instance, in **Social Sciences**, the mentions for Analysis were quite numerous and in strongly relation to the need of argumentation. For Educators, it is perceived as the first step for a systemic thinking which can be developed with the ability to question (being inquisitive), to argue or to look for answers: "*Developing the analytical capacity toward a systemic thinking, the ability to put questions, and to argue, to look for answers, involvement and developing a logical thinking (...)*" (PB_RO_9_EDU). In this context, the ability to analyse and ask questions are promoted by the teacher, but developed together with students: "*(...) Being able to see and recognize different points of view and to analyse them with learners (...)*" (NGO_BE_9_EDU), and "*(...) to ask inquisitive questions to learners in view of encouraging them to develop a line of argument*" (NGO_BE_8_EDU). Analysis is also related to perceive a new literacy for teachers, resulting from the use of web and ICT in education: "*(...) One of the ability categories on which no much attention is paid (contemporary version of traditional literacy ability) is web literacy or information literacy. I refer to the ability of identifying, selecting information through different tools which could give access to digital resources (...)*" (PR_IT_1_EDU). The need to identify arguments, reasons and claims is consistently reinforced, not only by Education professionals - "*(...) The ability to differentiate what an issue and what an opinion is, within the huge amount of information, we receive everyday, is for sure a fundamental aspect (...)*" (PR_IT_3_EDU) -, but also by employers from Administration - "*(...) Analysis, steady focus facing events and ability to select effectively keypoints are essential qualities we seek constantly (...)*" (NGO_IT_1_ADMIN). For the Health professionals, in **Biomedicine**, the ability to analyse is needed within a wider perspective, examining ideas and attending to the social responsibility and consciousness that a doctor must have: "*(...) he/she should have new ideas, to be able to think innovative things, something radical, something new; all these want critical thinking, i.e. to be able to filter some things, things about the society, about the section, i.e. what it needs and what not, to have the ability to assess and suggest something that will be beneficial for the body and for the society as well (...)*" (NGO_GR_5_HEA). Also, analysis is crucial to identify reasons and claims, because populations are somehow submissive to their preconceived ideas: "*(...) good judgement, i.e. to be able to see and judge what is true because with these populations there is also some submissiveness which does not always allow you to say what is true and what is not true (...)*" (NGO_GR_5_HEA). In **STEM**, the need for Analysis seems to be strongly related to some of the services provided by engineers, such as consulting. This is essential in a first step for their work: "*(...) A first component is related with the analysis and identification of the situation. For this, it is necessary a set of specific competencies, to analyse a certain*

situation, to understand it. (...)" (PR_PT_1_ENG). For some professionals, this requires a deep engagement and a more inquisitive behaviour: "*(...) I think we should learn to be a little more analytical and to question the reliability of the data we process, because we very easily take for granted the very first thing we see before us without analyzing it and looking deep into it (...)*" (NGO_GR_7_ICT).

The need for **Interpretation** was referred in all the focus groups in a balanced way, with more mentions in Social Sciences (representing 19% of the field), followed by Biomedicine (representing 18% of the field), STEM (representing 17% of the field) and Humanities (representing 11% of the field). In **Social Sciences**, educators envisage Interpretation as the ability to clarify meaning and empathy, in order to understand concepts or different perspectives from learners: "*(...) to learn what empathy means, what means to put yourself in the other person's position, what active learning means (...)*" (PB_GR_7_EDU). This wider interpretation was frequently emphasized in other mentions, such as "*(...) A critical thinking teacher is able to take perspective, to look at a situation from the perspective of somebody else. Is empathic (...)*" (NGO_BE_7_EDU), and "*(...) Is able to link up with topicality and society, opens up viewpoints for himself and learners (...)*" (NGO_BE_9_EDU). Also, educators mention the need for decoding significance and categorizing as essential to "*understand and correctly define different types of problems*" (NGO_RO_2_EDU), to "*recognize quality of information and information resources*" (PB_CZ_3_EDU), and to "*evaluate which information is good and which is not, and if at that moment one really needs so much information*" (PB_CZ_12_EDU). This was considered a priority in the field of communication, because we live "*in the era of information (...)*" (PR_GR_1_PUB), in the field of Administration where "*guidance to results and clients is meant as an ability to read needs and interpret them with synthesis processes (...)*" (PR_IT_2_ADMIN), or even in the Tourism field, during a cultural tour where the professionals in front of a group of people "*(...) have to figure out what they want in the first few minutes, otherwise they will have problems, they will not be able to pass the message (...)*" (PR_PT_4_TOU). In **Biomedicine**, Interpretation, as the ability to decode significance, is of utmost importance for clarification of meaning, categorization of information or thinking with evidence. In this field, communication also plays a major role to understand the patients and to be understood by them: "*(...) Communication is very important. We must ascertain if the patient understood all we said and taught (ex., during familiar treatment at home). Prescription is a crucial instrument for the treatment (so to know about the doses, the schedule, etc). Communication, both written and oral, is very important. To know how to decode the patient language, make sure he/she understood [the instructions] (...)*" (PB_PT_2_HEA). For example, in an emergency, it is only after the doctor categorized information or the clinical case, that s/he will be able to prescribe physical exams and evaluate the situation towards a reasoned diagnosis: "*(...) S – for subjective, where the doctor writes what is the complaint of the patient*" (referring to the framework used in Portuguese Hospital Centers to proceed for hospital admissions, SOAP) […] *Of course, it is necessary for the person to know what s/he did in the S (to understand what the patient told us), in order to do the*

objective exam (O), and then to code the A (Assessment) correctly. If it starts wrong, you will not be able to code the A (...)" (PB_PT_2_HEA). This calls for an organized approach: "*(...) Organizational skills because you're dealing with a thousand cases and you should classify them and each has its own needs and specificity... over there organization is necessary (...)*" (NGO_GR_TEI_5_HEALTH). However, the current education in this field seems not to be aligned with the current demands: "*(...) In the medical field we still have an education that relies largely on the ability to memorize, without data, often fairly/not even organized […] We delay in a large measure the ability to make fully informed decisions […]. If the necessity for data acquisition exists, we should be aware/know which data we are collecting (...)*" (PB_PT_1_HEA). In **STEM**, the need for Interpretation is expressed by the ability to decode significance, which requires "*(...) to raise data, raise facts that allow me to understand the situation, without any previous beliefs about it. Perceive the reasons and the causes of things (...)*" (PR_PT_1_ENG), because there are "*(...) differences between knowing something and understanding something (...)*" (PR_IE_4_ENG), and "*(...) Engineers are not good at actually formulating questions which is precisely one of the elements of critical thinking that you have to be able to do (...)*" (PR_IE_4_ENG). Also, an essential need for engineers is the ability to take a holistic view: "*(...) how to understand the role of engineering in society and how it evolves... People are much more informed now. They know much more about their rights and entitlements so you have to be able to deal with all that as well as just dealing with the day to day (...)*" (PR_IE_1_ENG). This was mentioned in a systematic way: "*(...) in the future I think engineers will have to have more knowledge of the world around them particularly the wider world and an awareness of it.*" (PR_IE_4_ENG), and "*(...) You know, you are dealing with so many areas that you never think you are going to deal with. [...] you are going to have the residents up on your back and you are going to have environmental problems, you have got health and safety problems. I think it should become more pluralist, more diverse… I use the word 'pluralist' kind of a broad more than engineering because you are going to be dealing with life. There's the community, it's going to be environmental, it's going to be sociological, it could be technical.*" (PR_IE_3_ENG). One reason underlying the emphasis for the necessity of a wider and holistic interpretation is that "*(...) we [engineers] are trained in the detailed skills and the technical abilities … the weaker side is big picture thinking sometimes*" (PB_IE_4_ENG), and also because "*A problem with some of engineering thinking is that it is fixed*" (PR_IE_2_ENG). Few mentions existed on the need for Interpretation in the Humanities field; the existing ones seemed to relate with the need for a strategic thinking and alignment between the individual and the organization: "*(...) I think that all the recent graduates have to understand when they go to the workplace […] the context of the organization. Try to align their work with the goals and strategy of the institution (…)*" (NGO_PT_1_ARTS).

3.2.1.2. CT dispositions

As before, the data on **the need for CT dispositions among the different professional fields showed slight nuances and similarities, based on the interpretation and practical application of CT in each field**. Some attempts to illustrate those findings were made through the identification of workplace scenarios mentioned by different employers. Figure 6 presents the distribution of the CT dispositions needed by professional fields.
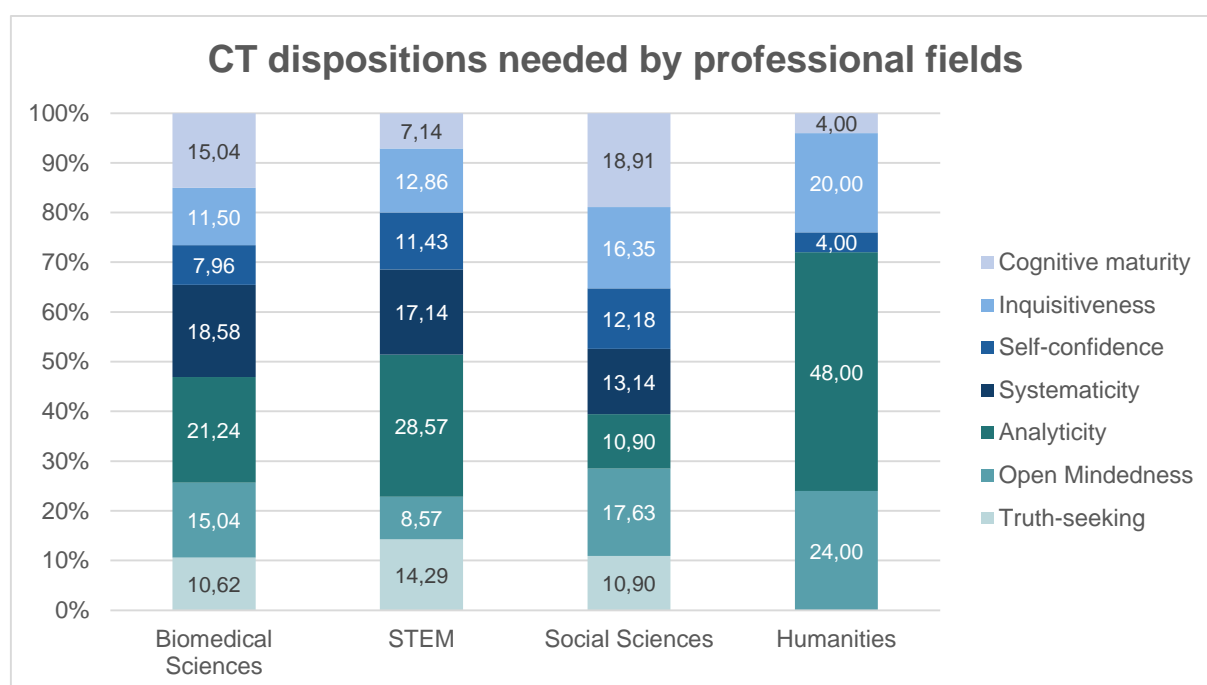

Figure 6. CT dispositions needed by professional fields

Accordingly, even though **Cognitive maturity** was expressed as a CT disposition needed in different professional fields, it was mentioned with differing frequency. It was most mentioned in the Social Sciences (representing 19% of the field), followed by Biomedicine (representing 15% of the field), STEM and Humanities (these last two fields with much fewer mentions compared to the first ones, representing only 7% and 4% of each field, respectively). In **Social Sciences**, professionals related the need for this disposition with the context in which the organization is included, considering it as a "*(...) system of values and shared objectives based on rational methodologies, constantly in progress and continuously monitored (...)*" (NGO_IT_1_ADMIN), which requires a "*(...) constant eye on the global scenario, where working action is taking place (...)*" (PR_IT_4_EDU), and "*(...) understanding of the world in causal link (...)*" (PB_CZ_3_EDU). This is exemplified by different scenarios, in which we need to shape our behaviour according to the context, such as in Education - "*(...) the Teacher observes the learner but waits with his assessment till more information is available on what the learner actually can do.*" (NGO_BE_3_EDU) -, and in Tourism - "*It is one*

group in one day and another next day, and they (recent graduates) have no discernment to be able to shape their presence, their way of communicating from one day to the other. This may be a lack of maturity." (PR_PT_2_TOU). Another relevant aspect emphasized by professionals is related to the demand for multi- and interdisciplinary thinking in an increasingly international market: "*(...) Another critical point is the multicultural dimension meant as the ability to realize that working in different environments has a strong impact on the job itself. Our students could start understanding and facing this aspect because present job market is moving toward an ever more widespread international dimension*" (PR_IT_3_EDU). Also, some professionals related this disposition with the propensity to "*(...) Being able to work with [...] a very different person*" (PB_GR_8_EDU), and "*to see the things from different angles, different perspectives, so it inspires others to generate more ideas and make associations (...)*" (PB_CZ_13_EDU). In **Biomedicine**, there existed several mentions for this disposition, which were conversely more related with the need for ethics: "*(...) We need, above all, ethics (...)*" (PB_RO_6_HEA). This is clearly related with different values in the health context, such as intellectual modesty/honesty (be aware of the limitations of own knowledge) and respect for patients, and can be understood with the following practical scenario: "*(...) When he faces a patient he also faces with himself... he has to develop the critical thinking in this sense: neither put himself in the situation of incapable, nor put himself in the situation of fully capable. To deal with a situation, to call a colleague to see, whatever the moment in life we are in… it only benefits those who do it, and obviously those who receive it*" (PB_PT_1_HEA). Few mentions were found in STEM and Humanities. In **STEM** the need for Cognitive maturity was related with the ability to adapt in unforeseen and highly dynamic situations - "*(...) Analysis, executive adaptation ability, practical situation and procedure dynamics insight are essential abilities, because if situation changes on the go you must adapt immediately either you know or not what to do (...)*" (NGO_IT_1_ICT) -, and also with the propensity to behave according to those who are working with you - "*(...) In most cases the job involves third parties. Being able to understand who is in front of you and understand how to behave is fundamental (...)*" (PR_IT_3_ICT). Finally, in **Humanities**, Cognitive maturity is somehow related with the need to be honest and responsible for our actions, especially when we work in a team: "*(...) We as a group can do everything, when there is an obstacle we can solve it all together, but if the person has taken responsibility and not communicated an obstacle it will be impossible to solve it. So responsibility also comes with taking over if you can not do something and ask for help.*" (PB_PT_3_ARTS).

The need for **Inquisitiveness** is more emphasized in the fields of Humanities and Social Sciences (representing 20% and 16% of each field, respectively) than in STEM or Biomedicine (representing 13% and 12% of each field, respectively). In **Humanities**, the professionals from Arts and Culture strongly relate Inquisitiveness with intellectual curiosity, desire to learn and open mindedness, seen in every moment as an opportunity to acquire professional and personal experience: "*(...) They have passed through the university life of theater, of amateur groups, of associations, of*

volunteer work [...] and I am citing interviews that our actors and students analyse to reflect on the apprenticeship modes of a professional that should be in a theater company." (NGO_PT_5_ARTS). In **Social Sciences**, the Tourism professionals perceive being inquisitive similarly to professionals in the Humanities field, which could be due to the fact that both deal with cultural aspects: "*(...) They also lack the experience of other cultures and the notion of what is culture about.*" (PR_PT_2_TOU). On the other hand, for educators, this need relies on the fact that a critical teacher should be open and eager to seek new knowledge, wanting "*to know more before judging.*" (NGO_BE_2_EDU), and questioning: "*(...) the school in all its aspects on how it supports learning [...] not only his/her own classroom but also the context in which it happens*" (NGO_BE_11_EDU). For the majority of teachers, this is understood as a need for an "*internal motivation, inner interest in the field, desire to be even better in it [...] such a lifelong process*" (PB_CZ_6_EDU), and it can be found within simple tasks like "*(...) to find the right resources*" (PB_CZ_6_EDU), or to operate with "*(...) new technologies*" (PB_GR_7_EDU). In **STEM**, for engineers and ICT professionals, the need for Inquisitiveness is related to self-development and this is no longer seen as a responsibility of the organization, but an individual concern of every professional: "*(...) The paradigm has changed, contrary to what is used to happen, nowadays we tell people that they are responsible for their own evolution, they are responsible for their career*" (PR_PT_3_ENG). It's also related with the intellectual curiosity that when satisfied can bring an added value to the organization, improving and challenging the existing body of knowledge: "*(...) that curiosity that there's more to than what I know, there's more than what my boss knows*" (PR_IE_2_ENG). In **Biomedicine**, this need is also strongly related to self-development and updated knowledge: "*(...) regarding medicine and nursing science, things run and they run fast, so I consider again updated knowledge as one of the main components and qualifications for nurses, to be able to have effectiveness (...)*" (PB_GR_1_HEA). It's expressed by our own desire to learn and seek improvement - "*(...) I remember to say, when I was in my second year of the university: 'But I cannot go to the Peripheral Medical Service knowing what I don't know'. So, I started to do emergency services in my second year because it was in the emergency that we learned (and not in classes). I notice that today the youth do not want to do that. They have a schedule and need to fulfill it. There is what they need to do, and will not do anything more. [...] they think that we need to give them everything, because they were raised thinking 'someone has to do it for me, people must give me the things'*" (PB_PT_2_HEA). This is already being evaluated in some European countries involved in the study, during the nurses´ internships: "*This SIADP3 (referring to the evaluation framework used in the Portuguese Hospital Centers) evaluates the nurses, also recent graduates, in two aspects, two knowledge essences extremely interesting: one of them is the 'Individual Objectives' parameter. This evaluates the quality, the investment that he/she does in his/her own training activity, his/her auto-organizational efficiency*" (PB_PT_3_HEA).

Regarding **Self-confidence**, few mentions were found among the different focus groups. It was reported more often in the Social Sciences and STEM (representing

12% and 11% of each field, respectively) than in Biomedicine and Humanities (representing 8% and 4% of each field, respectively). In **Social Sciences**, for educators, Self-confidence is expressed by the need to trust in one's reasoned judgements, particularly when students ask questions: "*(...) Not become angry when learners ask critical questions*" (NGO_BE_2_EDU). It is somewhat related with the courage to go against the standards or mainstream thinking - "*(...) A critical thinking teacher never simply copies something; she will adapt in order to make it more suited for her particular setting. She does not simply follow mainstream thinking*" (NGO_BE_7_EDU) -, and also "*(...) to be able to say negative things*" (PB_EDU_CZ_1), or "*(...) to resist the pressure (of the authority, media, etc.)*" (PR_EDU_CZ_11). This kind of self-trust can be obtained by "*(...) Evaluation (…) help me to become better (…) the way that will show me what else I can do (...)*" (PB_GR_7_EDU), and may drive professionals to be proactive and adaptable, in the sense that it allows them to "*(...) move on different levels, from organizational to the curriculum one*" (PR_IT_3_EDU). It seems also to be related with the need to develop a kind of intellectual integrity in order not to be influenced by others: "*(...) Moreover, I think the issue of attitude is extremely important, it is important to develop intellectual integrity, because we often think one thing, but we do another - or by influence of others, or by other reasons – sometimes we think correctly but our actions lead us elsewhere*" (PR_PT_9_TOU). In **STEM**, this need seems also related to the courage to take a position or to apply a solution, and not be afraid of the judgements from the others: "*(...) When we are younger we are not afraid of the value judgements that the others will make of us (…) It is on this path we should go*" (PR_PT_1_ENG). There were mentions to leadership in the engineering' focus groups as being an integral part of self-confidence. In some cases, it can be called "veiled leadership", when employees silently, on their own, take the initiative to move on, go forward: "*(...) He was in a paradigm where he had a person hierarchically above him who said no, it should be done this way, but then he had his own conviction that it should be done differently. OK, so he grabbed it, decided to show the pros and cons of both ways and it worked, because the answer that he got from the person who evaluated him was in accordance with what he thought from the beginning. I think this is a clear example of a person who did not limit himself to programme and develop the code (computer code) that they asked for, but rather think critically in order to defend his idea until the end, without hurting anyone (he did what the supervisor wanted and also did the way he thought the best)*" (PR_PT_3_ENG). In **Biomedicine**, for Health professionals this disposition is related to the need of trust in our own performance, but in turn also being aware of our own limitations: "*(...) The first important thing is that the professional feels able to exercise the profession. That creates solidity, in his performance, with that critical spirit to know the limits of what he knows and what he needs to do when he/she doesn't know. This is the first level of critical spirit that should remain along the whole career*" (PB_PT_1_HEA). Finally, in **Humanities**, there was only one mention to this disposition and seems to be related with the sense of trust in the others and co-responsibility, especially during unforeseen situations in which the employers cannot

be present: "*(...) And it is also necessary to trust people who can deal with the unforeseen, to a situation where I can not be present*" (PB_PT_4_ARTS).

Regarding the need for **Systematicity**, it was only expressed in the Biomedicine Sciences field (representing 19% of the field), followed by STEM (representing 17% of the field) and Social Sciences (representing 13% of the field). This disposition was not mentioned among the professionals in Humanities focus group. In **Biomedicine**, the need for Systematicity calls for organizational and time management abilities: "*(...) And that's where we see how they organize themselves. How they manage time, how they react under pressure. All we are talking about makes the difference. It is precisely the day-to-day, the routine, information coming in all the time, tasks coming in minute by minute, the skills for time management, the ability to react, the ability to even try to organize in a certain way, that is what makes the difference in professional life and everywhere (...)*" (PR_PT_1_AAS). This is expressed constantly by the Health professionals, regarding the time constraints during an examination - "*(...) the time management, the organization of the work, the prioritization. Thus, this is very important, because people may know a lot, but they can be lost in front of a patient and, instead of having the 20 minutes (30 in private sector), they spend more time and other patients have to wait. Thus, the time management, the prioritization, in a situation distinguish what is priority, and the organization of the work (...)*" (PB_PT_2_HEA) -, expecting to be effective and achieve "*the best possible result at the lowest cost*" (PB_GR_2_HEA), according to "*hospital treatment protocols*" (PB_GR_5_HEA). In **STEM**, for engineers this is an essential need in order to solve problems, being "*one of the basic things that makes an engineer (…) how to get to a solution, you systematically go through all of the options*" (PB_IE_2_ENG). It's all about the need to be focused, orderly and consistently in problem-solving - "*(...) a failure of critical thinking or an act of carelessness. If I think about the analysis and the interrogation of data it's like the old adage: measure twice, cut once (...)*" (PR_IE_1_ENG) -, and not if the obtained solution is right or wrong, but how you get there (what was your plan/method?) - "*(...) we look at how the candidates discuss the situation and present solutions, and we draw our own conclusions (…) it's not about to come up with a right or a wrong result, but it's more about the way they build the solution. Therefore, all the thinking process that they have until the proposal of solutions (...)*" (PR_PT_1_ENG). In **Social Sciences**, for administrators, this need is strongly related with "*coordination, planning (...)*" (NGO_GR_3_ADMIN), with "*prioritization of tasks (...) which is more important at that time*" (PB_RO_9_ADMIN), and "*strong listening and organizational abilities*" (NGO_IT_1_ADMIN). On the other hand, for educators, Systematicity is similarly expressed, however with different words, such as "*(...) be rigorously and plurally documented, handle volume of information*" (PB_SP_3_EDU), and "*(...) carefully paying attention*" (NGO_BE_8_EDU). Other professionals related this not only with "*(...) having it in a structured way*" (PR_PT_7_TOU), but also with some kind of persistency related to "*(...) the ability of profound work (…) do not skip from one thing to another (...)*" (PR_CZ_6_HR), that young people seem to lack: "*(...) They want constant challenges [...] they want to see news about anything, they go and see and*

quickly forget and go to another" (PR_PT_3_TOU). However, it is for educators that the need of this disposition is crucial, lying on the fact that the consistency of their expressed thoughts and actions can serve as a model for learners and future citizens: "*(...) And we should be this role model, too. That is, I am consistent. That means, you need to be consistent in your work, be consistent in your words, in your promises. In order to make a good relationship with your family, tomorrow, with your partner, with your children, with your colleagues. If we ourselves teach inconsistency, children will reproduce it. And since many of these children have not been taught the context in which to move around within a social group, whether they are in the family or at school, or at work, (...) anywhere, this is their last chance. They are at the last minute (...)*" (PB_GR_8_EDU).

Analyticity was the most mentioned in Humanities (representing 48% of the field), followed by STEM (representing 29% of the field) and Biomedical Sciences (representing 21% of the field). In Social Sciences, the need for this disposition was lower (representing 11% of the field). In **Humanities**, this disposition was strongly emphasized by the Arts' professionals, in the sense that any artist needs to be able to anticipate potential problems or even to improvise in unforeseen situations: "*(...) For example, at our TV we have a teleprompter, but I do not let them use it. Because if the student leaves the university prepared to look at the camera and read the whole text, he/she easily gets to the labour market and reads a teleprompter. The contrary is no longer true. Therefore, this part of preparing ourselves for the unforeseen is also important.*" (PB_PT_4_ARTS). However, that is not possible without a previous and careful analytical work: "*(...) Can improvise, or risk, but based on knowledge [...] what defines an artist can be this capacity of thinking about reality, about what is ahead of him/her, ahead of all, and through this observation and thought modify that reality transforming it an artistic object or in another thing*" (PB_PT_3_ARTS). In **STEM**, engineers expressed the need for analytical thinking with the application of reasoning and use of evidence to resolve problems. Thus, it's "*(...) the idea of being able to take all that education that you have and put into practice*" (PB_IE_2_ENG), and for that you need the ability to "*(...) define the problem, break the problem and then how assess options*" (PR_IE_1_ENG), and to "*(...) ask questions, gather data, gather information, base my analysis on real, concrete and informed questions, without preconceived perceptions, beliefs and stereotypes*" (PR_PT_1_ENG). Moreover, it's also related with the need to be proactive and anticipate potential difficulties: "*(...) What constitutes a competence for us is proactivity. That is, the student's ability to interpret, to know how to analyse, to know how to deduce things, and to know how to calculate risks, to mitigate them and to advance*" (PR_PT_2_ENG). In **Biomedicine**, for Health professionals, Analyticity is strongly emphasized in scenarios of uncertainty such as an emergency, in which professionals should always be ready to intervene and there is no great margin for error: "*(...) I don't know if this can serve as an example, this is a prompt decision, that is, to evaluate the situation, see in that moment that we couldn't do the previewed medication, no... it's necessary to call 112 (emergency number) [...] All the structure worked. This is a real situation. It was important to know in that*

moment that it was serious, that he already had symptoms and he had initiated the *cerebrovascular accident in front of us. It could have not happened, it could have happened before, when he was in the waiting room, or when he was parking the car ... isn't it? So, it was a practical and verified decision, based on criteria and analysis*" (PB_PT_2_HEA). Furthermore, professionals also related it to the need to "*(...) have patience, to be involved, to have active listening and be organized*" (PB_RO_6_HEA) before taking any decision. As with the engineering context in the STEM field, Analyticity is related with "*(...) the practical application of all you have studied, so far [...] and how you see the people with whom the object of your work relates (...)*" (NGO_GR_5_HEA). This was constantly mentioned by doctors and nurses, in the sense that the reality at the workplace is very different from that in the university, and the need to anticipate practical difficulties and use evidence to resolve problems is essential in this field: "*(...) what should we do with the knowledge in terms of communication and holistic treatment to the patient that we learn at the universities and faculties, when actually at the workplace we cannot put into practice (...)*" (PB_GR_1_HEA). In **Social Sciences**, educators and administrators emphasized the need for Analyticity in order to obtain "*(...) informed decisions*" (PB_GR_2_ADMIN), "*(...) to argue*" (PB_SP_4_EDU), or to "*(...) question refutations or phenomena*" (NGO_SP_1_EDU). Thus, this "*(...) analytic spirit opens the process into component parts, analyse situations in order to change for the better*" (PB_RO_2_RE), and is strongly related with "*(...) scientific scepticism*" (PB_CZ_8_EDU). As in Biomedical Sciences or STEM, in Social Sciences Analyticity aims to "*(...) look for the social application of what is done in the university*" (PB_SP_4_EDU). For the professionals from Tourism, the need for Analyticity is highlighted in specific uncertain situations, in order to be ready to intervene and overcome potential problems: "*(...) it is unthinkable for a pilot in a plane, if something happens, any challenge, he simply cannot stop, so he must be able to solve the problem quickly*" (PR_PT_9_TOU). More than training individual who have a static knowledge, "*(...) it is important to prepare them for more complex tasks, prepare them for more complex environments, for uncertain contexts, prepare them for problem solving, search for innovative solutions. All these are critical thinking skills, but I think it is ... not only to have the knowledge, nor to have the ability, it is to have this attitude that I think should be more developed*" (PR_PT_9_TOU).

The need for **Open-mindedness** is valued mainly by professionals in Humanities (representing 24% of the field), Social Sciences (representing 18% of the field), Biomedicine (representing 15% of the field), and STEM (representing only 9% of the field). In **Humanities**, professionals from Arts and Culture, associate this disposition with the need to be open and tolerant to criticism, regarding that you are performing or creating something for a specific target/audience: "*(...) Be open to criticism. It's important for the person to know how to receive a feedback. If we can identify and analyse a constructive critic, then our performance will be substantially better. And I always say to students: 'You are producing work for others, it's not for you.' In the area of information, we know how easy it is to manipulate the information [...] If the person has that spirit open to critics, he /she will improve for sure*" (PB_PT_4_ARTS). It

requires to only to be humble - "*(...) it is necessary to have that humility, to get into the labour market and to realize effectively that you do not know everything, and you need to have a learning process*" (PB_PT_4_ARTS) -, but also flexible and adaptable to the organization's needs that emerge against the increasingly lack of funding in this field - "*(...) And then of course the flexibility. But this comes from the weaknesses of the market and the capacity (smaller and smaller) to hire people, in the company that I represent. Of course people have to be flexible, a sound technician has to help the light technicians, or the video technicians, or eventually the production, or management tasks, etc. Therefore, the team, which was once bigger, always had that spirit of flexibility*" (PB_PT_4_ARTS). In **Social Sciences**, for professionals from Education and Administration, to be an open-minded employee you mean to be "*(...) open to alternative solutions to the model (and cultural stimuli) adopted in the job is essential*" (NGO_IT_1_ADMIN), allowing "*(...) different opinions and viewpoints*" (NGO_BE_7_EDU), and not be afraid or frustrated to "*(...) change opinion and say: I think I was wrong before*" (PB_CZ_1_ EDU). Furthermore, an open-minded teacher is someone who can "*(...) offer an environment which is both culturally and cognitively differentiated*" (PB_GR_1_EDU), avoid "*(...) prejudice when trying to understand why some things are happening*" (PB_CZ_3_ EDU), and is empathetic in the sense that is "*(...) able to take perspective, to look at a situation from the perspective of somebody else*" (NGO_BE_7_EDU). All the educators' opinions from this field reflect a common need for a "*multidisciplinary vision*" (PB_SP_4_EDU), and "*plurality*" (PB_SP_3_EDU), calling for a sensitive person that is able to attend the different cultures of learners, avoiding any kind of stereotypes. In **Biomedicine**, as in Humanities, professionals from Health also emphasized the need for open-mindedness with the need for humility: "*(...) We value also the humility. Sometimes they come and think that they are the only ones that know. Therefore, an openness to learning […] to know how to listen to the patient and get into his/her level […] being intellectually open to learn*" (PB_PT_5_HEA). This appears to be an essential disposition that seems to be lacking in new professionals, and impairs possible cooperations in some situations between experienced and recently-graduated doctors: "*(...) Sometimes, the doctors prefer to work with whom they already worked in the past, because in many cases there is a lack of humility from the new/young professionals in the desire to be taught to take the best decisions*" (PR_PT_4_HEA). Also, the expectation "*to treat the patient holistically*" (PB_GR_1_HEA), and the ability to adapt to new situations were valued by these professionals (e.g., with the adoption of a new management software): "*(...) We want people who get there, look at it [new software] and say 'I will try to adapt to it'*" (PR_PT_1_AAS). In **STEM**, few mentions relating to the need for open-mindedness were found. Yet, engineers and professionals from ICT emphasized the relation of Open-mindedness with the need for relational abilities, in the sense of being tolerant and to know how to behave when "*(...) most cases the job involves third parties*" (PR_IT_3_ICT), or even in some cases when there is more than one good solution to a problem and professionals need to make an agreement and move forward due time constraints: "*(...) So let's implement the fastest way, we'll definitely fall into one of the two different opinions from these 'Seniors', and then we will integrate the other*

person's suggestions in the implementation phase. So I got them to reach an agreement based on the time factor" (PR_PT_2_ENG).

Ultimately, the need for **Truth-seeking** was more relevant in the STEM field (representing 14% of the field), followed by Social Sciences (representing 11% of the field), and Biomedicine Sciences (representing only 11% of the field). Although no quotes have been found in Humanities, very close ideas were expressed in other categories (e.g., open-mindedness and inquisitiveness). In **STEM**, engineers related the need for this dispositions with the need to be eager to "*(...) apply existing knowledge to new unseen problems [...] going beyond the existing knowledge*" (PB_IE_2_ENG). That is being open to seek for new solutions and to "think outside of the box": "*(...) it does not have to be that solution or that idea that has always been applied in that specific context / problem / industry, it has to be a solution to a new situation. Basically, it's having this openness and willingness to think 'out of the box'. What is this? It is not look at that solution, for that problem, with the "lenses" of another context*" (PR_PT_1_ENG). This also not only requires "*(...) courage to make mistakes, looking deeply and carefully*" (PR_RO_3_ICT), but also to be patient and orderly in "*(...) the ability to ask questions*" (PR_IE_4_ENG): "*(...) People are not able to produce that level of asking questions as you tend to be thinking the answer as soon as you hear the question from your client*" (PR_IE_4_ENG). In **Social Sciences**, and similarly to engineers, the professionals from this field highlighted the need "*(...) to combine the new with the old knowledge*" (PR_GR_1_PUBLISH), the "*(...) attitude and the desire to make it happen*" (PR_PT_9_TOU), approaching "*the ideal decision-making*" (PB_CZ_1_ EDU), by asking "*a lot of questions, seeking information*" (NGO_BE_1_EDU), and not succumb to "*group thinking, established conventions, simplicity and speed*" (PB_CZ_6_EDU), or even be influenced by "*logical fallacies*" (PB_CZ_2_EDU). In education, Truth-seeking seems to be related to innovation, discovery and experiential learning: "*(...) I also want my students to understand that I am looking for and discover things. I consider this ability very important (…) to be able to innovate, as much as I can, as it is allowed with one thing at a time. So as not to make a step into the void and fall. To take small steps in order to change something. Because innovation means that I bring a change, especially a change in the culture of a class, a change in the culture of a school, rather than set new computers or do my lesson with an interactive whiteboard*" (PB_GR_7_EDU). It demands a teacher who is honest and objective in his/her inquiry: "*(...) I'll receive, too, I will not only give. That is, you should have the willingness to receive from the students and to search with them. Several times I told them I do not know that, you will give me time to look it up and I will let you know (...)*" (PB_GR_7_EDU). Finally, in **Biomedical Sciences**, Truth-seeking is related with the need for training and updating knowledge, in relation to specific areas (e.g., dietary) that develop fast in conjunction with other specialities: "*(...) definitely updated knowledge, because in the dietary field, things develop fast in conjunction with the holistic approach of various specialties, therefore it is very important to introduce a spirit (an idea) which all of us will be eager to acquire*" (PB_GR_4_HEA). Also, this disposition seems to be essential in the very initial stage

of a clinical situation, in medical screening, when doctors and nurses need to ask questions to the patient in order to obtain the best initial diagnosis of the situation: "*(...) I saw, from the screening phase, the way they exposed the situation to the patient, the knowledge of technical parts, and the way they filled the initial admissions. We start to know the interest that they have in doing what they are doing and their basic knowledge. The knowledge that others can also have, but don't have the interest in getting. They aren't worried, because they have their position secure*" (PB_PT_2_HEA). Or even when they need to call for help and search for another colleague: "*(...) Have the humility to search for another colleague that we have by our side to help us*" (PB_PT_5_HEA).

3.2.2. Skills and dispositions outside of the framework

Within the "out of the framework" data collected from the focus groups transcripts, **similar needs in terms of skills and dispositions were found between the four professional fields, although in few cases with slight differences regarding their application, depending of the context and nature of each field**. The main needs identified by the professionals are both at a personal and interpersonal level, e.g., proactiveness, adaptability, creativity, emotional maturity, communication and teamwork. Other testimonies were analysed regarding different topics, e.g., background knowledge/experience and nurture of CT, however with fewer mentions and in some cases lacking contextualization within the fields.

Several references have been found on the need for a more **proactive employee**, considering it as an essential behaviour based upon different traits of each one of us, as **motivation**, **initiative**, **commitment**, **courage to fail**, **confidence** and **autonomy**. As we saw above, this is somewhat related with the Inquisitiveness, Analyticity, Truth seeking and Self-confidence dispositions. In this sense, "*(...) a proactive person is always available and will always progress/go forward, has the critical spirit to find solutions (...)*" (PR_PT_1_AAS), has "*(...) the desire to make it happen*" (PR_PT_9_TOU), the "*(...) willingness to do supplementary work*" (PB_RO_13_ADMIN), the "*(...) courage to make mistakes and to experiment*" (PB_RO_2_RE), and the "*(...) ability to perform his functions autonomously, taking some risks, and overcoming some constraints*" (PR_PT_2_ENG). This is particular important taking into account the lack of time and the need for prompt and quick responses: "*(...) they need to act very quickly when dealing with a certain task (...)*" (PR_GR_2_ICT). Similarly, the need for **Adaptability** was mentioned in many cases, being associated with flexibility and open mindedness, attending to the current demands of the labour market that is increasingly multidisciplinary, global and highly dynamic. Thus, this need is strongly connected with the "*(...) easiness to adapt to different situations and with different people, both in managing intellectual and relation activities (…) help integration in the company*" (PR_IT_2_ADMIN). Considering that "*(...) in the following years many mechanical job will disappear*" (PR_RO_5_HEA),

there is a major need to "*(...) adjust for changes in their jobs in future (…) it will be terribly important for them to be flexible and accept changes and re-motivate themselves to do something else*" (PB_CZ_2_EDU). This is also valued in unforeseen situations, for example when "*(...) a player has an accident, others must do his/her job*" (PB_RO_15_ADMIN), or even due to the lack of funding and human resources: "*(...) flexibility is very important. I think that today we can't have workers who do and limit themselves to only a single thing. And therefore, they must be open to learn more and have a certain malleability in their jobs, because if not, with the constraint of making things and the problem of not having enough funding and enough people... we really have to be multifaceted*" (NGO_PT_1_ARTS). Finally, **Creativity** was also mentioned as a skill needed in all the fields, although more emphasis was given in STEM, Social Sciences and Humanities. There was however no specific application and it was usually associated with innovation, the formulation of new ideas and solutions, and a kind of differentiated thinking: "*(...) Creativity is another behavioural skill that we value. The development of new approaches, of original solutions, so that we differentiate ourselves in the market (...)*" (PR_PT_2_ENG). There seems to be no consensus on the relationship between CT and creativity. If on one hand "*(...) critical thinking helps creativity*" (PB_RO_2_RE), on the other hand "*(...) creativity is a major critical thinking skill*" (PB_GR_2_EDU). We can consider Proactiveness, Adaptability and Creativity as cross-field skills and dispositions, due to the lack of any great differences in terms of their need and application, and only general remarks were shared by the different professionals.

Another topic highlighted by the professionals is **Emotional Maturity**. It both deals with personal and interpersonal levels of the human being, and is particularly stressed by the professionals from Biomedicine Sciences, Social Sciences and Humanities. On one hand, emotional maturity has a personal dimension involving the ability to manage our own emotions, to be resilient under unfavorable situations, being of utmost importance in scenarios of pressure and stress. For instance, in Biomedicine Sciences, doctors and nurses "*(...) are dealing with people and the disabled. It takes a lot of strength, both physical and mental (…) to withstand all this pressure (...)*" (NGO_GR_4_HEA), however you need "*(...) to discern, to judge and not let this emotional element affect your judgement (...)*" (NGO_GR_5_HEA), because the important thing is "*(...) How fast one will act on a patient's life*" (PB_GR_6_HEA). In Social Sciences, professionals relate this to Resilience: the "*(...) ability to persevere (…) when something fails or goes wrong and there is no positive feedback (...)*" (PB_CZ_6_EDU), to "*(...) resist the pressure (of authority, media, etc.)*" (PB_CZ_11_EDU), and "*(...) not to succumb to emotions effects in argumentation*" (PB_CZ_2_EDU). Also, in Humanities this topic gains a particular relevance based on the fact that "*(...) the actor does not have time for reflection due to all this stress and pressure. In a counter-scene, in a theater, there is an absolute partnership, and if one makes an error, the other has to fill this error, so that piece goes well*" (NGO_PT_5_ARTS). On the other hand, the interpersonal dimension of emotional maturity is related with the need for being empathic in order to manage different

relationships with the others and maintain a mutual understanding. In Biomedicine Sciences, this is required transversally to all the organization, e.g., "*(...) who is talking to a patient, who is on the phone - these people need to have some training, even because we are talking about patients, people that are suffering, who will receive bad or good news*" (PR_PT_4_HEA), and especially because "*(...) these people [patients and families] usually have strong, i.e. emotional Intelligence Quotient (IQ) (…) they communicate mostly through feelings and emotional IQ and less through the well known IQ*" (NGO_GR_4_HEA). Some professionals even claim that "*(...) the success of a doctor does not come from what he knows, it comes from the way he deals with the patient and his family.*" (PB_PT_1_HEA). In Social Sciences, educators relate this need with the way that we learn and operate, "*(...) based on knowledge, but also based on emotion. Because people do not operate only with reason. We operate with the feeling. And if we wish to change perceptions, attitudes towards foreigners, for example, we should be aiming at the emotion (…) And this can only be done with discovery learning and experiential learning*" (PB_GR_7_EDU). Empathy here plays a significant role within the relationship between teacher and student, being crucial to promote a shared interest: "*(...) Our students do not care at all about how well and scientifically we know things, how good we are. And if we have qualifications. Until they understand if we care for them. Once they understand that we care for them, then they will start to care for us and for the lesson*" (PB_GR_7_EDU).

At the interpersonal level, no great differences regarding its necessity were found, and the majority of the skills and dispositions emphasized by the employers had a broad and similar application among the four professional fields. **Communication** and **Teamwork** received a great emphasis by the overall professional representatives of the different fields. In Biomedical Sciences, professionals considered these abilities critical to current society and educational system: "*(...) Today's society (and I think that it is much related to education) values individualism in disregard of the collective value (...)*" (PR_PT_1_AAS). On one hand, recent graduates need "*(...) very good communication with the patients and their companions (...)*" (PB_GR_3_HEA), and also "*(...) counselling skills (...)*" (PB_GR_4_HEA), taking into account a shared ethical and normative conduct, as "*(...) truly respect, not humiliate human life (...)*" (PB_GR_3_HEA), or "*(...) elimination of racism and many others (...)*" (PB_GR_1_HEA). On the other hand, they also need to "*(...) cooperate with the colleagues*" (NGO_GR_1_HEA), assuming that "*(...) Medicine and Nursing are mainly relational [practices], interdependent, dependent (...)*" (PB_PT_3_HEA), and "*(...) in the medical field, it is very important for one to be aware of the limits of his knowledge*" (PB_GR_3_HEA)" – thus, it is crucial to "*(...) ask for help and cooperation*" (PB_GR_3_HEA). In STEM, also communication and teamwork skills were valued similarly - "*(...) a competence that has to do with relationships, whether it's about team relations (because we work as a team within our company), or also about the relationships with customers*" (PR_PT_1_ENG) -, but - "*(...) a lot of these skills that I've spoken here in technology students are less obvious - in particular the issue of communication, the ease of exposing their ideas to others in a clear and succinct way*

that everyone understands, and also the issue of group working relationships. Often, and also because of the very nature of the field, technology students may prefer to work individually rather than in a group" (PR_PT_1_ENG). For engineers, CT seems to influence communication which in turn influences teamwork: "*(...) if a person on my team makes an unreasonable comment, I can not turn around and say" You are bad! "- probably I'm not having this critical thinking and playing the best role, attending to the cohesion and the team spirit needed in order to develop a project*" (PR_PT_3_ENG). For professionals from Social Sciences, both oral and written communication skills are required: "*(...) moving on to key or fundamental skills, we enter in the area of communication skills (…) Writing skills, we reply to budgets, sometimes in a written way, and other times orally when we deal with the customer face-to-face or by phone*" (PR_PT_6_TOU). This requires us to "*(...) evaluate how to communicate and with whom, what to tell to whom and when (...)*" (PB_CZ_5_EDU), to have "*good grammar*" (PB_RO_1_PUB), and sometimes the ability "*to communicate with a larger group of people, with different subjects*" (PB_CZ_2_EDU). In the case of the educational professionals, these interpersonal skills are essential, needed not only because a teacher needs to communicate with "*(...) parents, students and the colleagues at school, with the people in charge and the subordinates (...)*" (PB_GR_1_EDU), but mainly due to the teacher's influence as a role model for students: "*(...) learning is built on cooperation and contact. If students experience that, they will reproduce it, I believe. Beyond the scientific background, which are always understood to be taken for granted, as well as the advances in those areas, we want the human element (…) to make the difference. If the student learns to cooperate and notices results in his work with the teacher, s/he will continue as a teacher him/herself and will imitate his own teacher. And he/she will become a good teacher (...)*" (PB_GR_8_EDU)". Finally, in Humanities, good teamwork and interpersonal relation skills are of utmost importance too, and in some cases can be the reason for a dismissal: "*(...) And in the theater, more important than competences can be the human relations. There was an actress I did not hire because she 'spoiled' the whole team. She was a good professional, but she did not manage to become part of the group and destabilized. Partnership, dynamics and teamwork are core*" (NGO_PT_5_ARTS). Moreover, professionals consider that "*(...) Teamwork fosters critical thinking, organizational culture and continuous improvement (...)*" (NGO_PT_6_ARTS), and highlighted the role of transparency in communication: "*(...) transparency for me is fundamental. Transparency is also a broad term, but if in an institution or in a company someone is dissatisfied, or not aligned, and does not convey that feeling, it is difficult for us to solve anything. Sometimes a certain explanation of what is happening solves everything*" (NGO_PT_1_ARTS).

Other topics were analysed from the professionals' discourse, however with few references and sometimes with lack of contextual understanding and application within the different fields, e.g., **background knowledge/experience** and **nurturing of CT**. In relation to background knowledge and experience, those elements seem to be taken as favorable conditions to a better reasoning and their importance was

highlighted within all the fields: "*(...) in order for someone to be effective, s/he should also have experience (...)*" (PB_GR_1_HEA); "*(...) Experience is not measurable. Reasoning is what comes out (...)*" (PR_IT_3_ICT); "*(...) it is often linked with experience, why? - It's because I've been through this in the past and I already know how to solve it.*" (PR_PT_6_TOU); and "*(...) Effectively, the best are those who have some critical thinking, basically, who make decisions, give opinions to improve, after seeking for knowledge (...)*" (PR_PT_2_ARTS). Finally, some mentions related with the nurturing of CT were found in the Social Sciences field, by the professionals from Education. A common shared vision is that "*(...) children and teenagers are losing CT. Students have to learn to think and they come to the university and we don't make them think either*" (PB_SP_4_EDU), and this is also present within the teachers' training context, in which professionals seem to face some challenges to nurture CT in the future professionals: "*(...) We help them become potential critical thinking teachers but we cannot guarantee they will actually engage in CT (…)*" (NGO_BE_6_EDU; NGO_BE_8_EDU; NGO_BE_12_EDU). Moreover, the current educational culture seems to inhibit CT: "*(...) Not in all schools, student teachers are allowed to show their thinking critically (…) for some school leaders it is easier to have teachers who do not engage in CT*" (NGO_BE_10_EDU). In this sense, some strategies characteristic of a critical teacher, related with time, can be applied to overcome these challenges - "*(...) What is especially important is that a teacher makes time for learners to think critically*" (NGO_BE_14_EDU) -, encouragement - "*(...) Able to encourage learners to think for themselves based on a good analysis of well-selected information*" (NGO_BE_10_EDU) -, and with the environment - "*(...) A critical thinking teacher not only thinks critically but allows and enables learners to think critically. She creates an environment in which pupils feel safe to express their opinions and to engage in a debate*" (NGO_BE_6_EDU).

3.2.3. Interpretation of the results

Analysis of the data coming from the different fields confirmed that **CT is understood as a set of different cognitive and propensive elements that are interrelated and connected with other social traits and abilities** (e.g., proactivity, adaptability, creativity, emotional maturity, communication, teamwork), converging in a wider and holistic interpretation of CT, which involves both a personal and an interpersonal dimension of a professional. Although most of the CT skills and dispositions seem to have identical interpretation between the fields, some tendencies and slight differences on their need and application were observed, and here, the nature, object and context of each professional field play major roles. Thus, we will address the key skills and dispositions of the fields studied in the project CRITHINKEDU.

In **Biomedical Sciences**, for Health professionals (e.g., physicians and nurses), CT requires clinical reasoning which is understood as thinking over different aspects of healthcare and wellbeing, in order to obtain a plausible decision regarding prevention,

diagnosis or treatment of a specific patient. Thus, within this specific field, professionals emphasized the need for Self-regulation skills, namely a critical reflexive analysis of their own clinical practice, which should be trained permanently in order to minimize the risks of failure during their careers. This can be promoted, for example, by the audit of processes. Also, Interpretation and Inference skills were assumed as essential, mainly during the initial phase of the clinical practice during the first contact with the patient. On one hand, it's crucial to a doctor or a nurse to know how to decode the patient's language, through his/her complaints and symptoms. On the other hand, and after that stage, professionals need to propose alternatives based on all the information collected from the patient, the clinical history and the initial physical exams, prioritizing their subsequent actions that may involve referring the patient to another service or giving him a medical prescription (among many others). Afterwards, it's necessary to have good Explanation skills, in order not only to justify his/her decision to the patient, presenting the action plan for treatment and follow-up, but alto to inform the family of the patient, that should be kept abreast of the situation. Complementarily, the Health professionals need the Analyticity disposition, which allows them to be always ready to intervene, especially in unforeseen situations such as in emergency cases, in which there is no great margin for error and it is crucial to assess, at glance, the patient health condition, and quickly prioritize the subsequent actions in order to save his/her life. As with Analyticity, and intrinsically related, is the need for Systematicity, in the sense that these professionals need to take organized approaches to decision making, based on different protocols existing in health organizations, properly structured and predefined, which require time management and organizational abilities to make an examination or run a consultation. Other dispositions identified were Open Mindedness and Cognitive Maturity. These are related to the propensity to be open and aware of the limitations of their own knowledge, and if needed to be humble and cognitively mature enough to ask for help or call a colleague, taking into account the different ethical norms of the context (e.g., respect, transparency, etc.). These also will be required for lifelong learning, particularly important in a field presenting a steady and rapid evolution in matters of complementary diagnosis and treatments. Finally, it is fundamental for doctors and nurses to have the ability to manage their own emotions, be empathetic and have good communication skills, not only to create and maintain trustful relationships with the patient and his/her family, but also to strengthen the team spirit and confidence of their colleagues and peers.

In **STEM**, for Engineering and ICT professionals (e.g., engineers and consultants), CT is required for problem-solving, which is understood as thinking about problems and different approaches to achieve the best solutions attending to the needs, goals and expectations of a specific customer. Thus, it is essential to be creative in the search for new approaches and original solutions to differentiate the company from others in the market. Moreover, an engineer needs to have good Explanation skills, in order to communicate (in both oral and written ways) and persuade clients, presenting them evidence-based arguments to solve their problem in a clear and easily understandable

way. The search for the best solution requires the Self-regulation skill, and promotes constantly the self-reflection and questioning of the decision making path during the development of a desired solution or outcome. This is not only needed in an individual basis, but also collectively, asking colleagues to question themselves and reflect on their own decisions and approaches. Here, the Evaluation skill is emphasized, not only to assess a given information for problem-solving purposes, but also to be examined by the team within a project, which can be expressed as a peer review process. Similarly to Biomedicine, STEM' professionals need to hold good Interpretation skills to better read the client's needs and expectations, being of utmost importance the ability to ask questions, raise facts and take a wider/holistic approach within the context - engineering is present in all the dimensions of the society. Moreover, professionals need to be aware of different concerns, such as ethical, environmental, safety, technological, etc. Also, and attending that engineering is a highly dynamic field with constant changes, the Analyticity disposition is a must for any engineer, which should be one step ahead, and show proactivity in order to anticipate barriers and gain time in problem-solving processes. Following this idea, the need for Systematicity is required, in order to be orderly and consistent when testing different solutions for a problem - and here it is not about the solution being write or wrong, but about the way they build the solutions and all the systematic thinking and testing process they have until the outcome. Another CT disposition often referred by engineers was Truth-seeking. This is somehow related to abstract thinking or to "think outside of the box", in the sense that it requires to combine the new with old knowledge, to think in new solutions for new problems and situations, with new approaches of other contexts. Finally, and especially in ICT and/or technology-based organizations, the need for Inquisitiveness was also emphasized by engineers. This is strongly related to professional scepticism, which is understood as a kind of nonconformism that should guide them in the search for self-development and improvement, bringing an added value to the organization and challenging the existing body of knowledge that exists within it.

In **Social Sciences**, for professionals in Education, Administration and Tourism, CT is seen as a desirable set of skills and dispositions towards both personal and professional improvement. In particular, for teachers and educators, CT is a major concern because it affects directly the development and learning of future citizens. Those professionals are key actors and civic agents of these modelling processes. They can adopt different strategies to nurture CT, e.g., promote a safe environment to debate and questioning, pause and encourage questioning, respect cultural and cognitive differences, etc. Thus, it's desirable for teachers to pursue Self-regulation skills, not only to be able to control their own judgement, accepting evaluations/opinions from students, but also to promote/transfer this skill to students - helping them regulate their own work and acquire this lifelong learning habit. Also, teachers should have the ability to understand and clarify different concepts and perspectives to their students. Here, the need to be empathetic and put themselves in the others' positions/roles is of utmost importance - actually, learning is significant only

52

when it causes emotion, and the ability to manage this is crucial to teachers, in order to motivate students to engage in the CT development process. Moreover, interpretative skills are also important to recognize the quality of information for the development of good teaching resources, as well as to link them with other topics in society and learners' experiences. In Administration and Tourism, the need for this skill is identical to STEM, in order to know how to read the client' needs and guide them to the expected results and/or outcomes. The need for the Analysis skill in Social Sciences is linked to good argumentation and logical thinking, with the ability to analyse information and ask questions, not only to but by students. This is particularly a concern in the current digital era, in which a new kind of analytical skill is needed, namely digital literacy - the ability to identify, select and assess credible information through different online tools and/or web-based resources. For administrators, this is equally needed, due the huge amount of data that they receive everyday, calling for the ability to distinguish and effectively select the key points of specific information. Regarding CT dispositions, Cognitive maturity is assumed as the most required in this field. It is expressed by the propensity to always seek for a wider perspective, keeping an eye on the global scenario - this is truly important in an increasingly international market, demanding for multi- and interdisciplinary thinking, allowing professionals to understand the world as a causal link (e.g., terrorism and MiddleEast war have a strong influence in the tourism global market). Other important disposition is Open Mindedness, that in turn is related with the openness to admit that knowledge is constantly been scientifically updated and that a teacher does not know everything, allowing different opinions, and not being afraid or frustrated when he/she is wrong. Also, an open-minded teacher has a plural and multidisciplinary vision, offering a learning environment both culturally and cognitively differentiated, encouraging all the students to debate and question, avoiding any kind of stereotypes. In line with the need for Open Mindedness, Inquisitiveness is also highly required, not only for the tourism professionals (e.g., willingness to experience other cultures), but also to educators (e.g., wanting to collect more data about a student performance before judging; finding the most adequate resources to a certain class or even to use the new technologies to support different learning activities, etc.). Finally, and as with Biomedical Sciences and STEM, the need for Systematicity is present and linked to coordination, prioritization and organizational abilities, being orderly focused in decision-making or problem-solving approaches. For educators, this is a main concern, lying on the fact that the consistency of their expressed thoughts and actions will serve as a model for learners and future citizens (e.g., if a teacher will not be consistent in his/her work, words and promises, students might reproduce that state of mind, having thus a negative impact in their lives).

In **Humanities**, for professionals from Arts and Culture, what defines an artist can be this ability to think about reality, about what is ahead of him/her, ahead of all, and through this observation and thought modify that reality, transforming it into an artistic object/expression. In this sense, CT skills such as Self-regulation are of utmost importance for self-professional improvement, attending that an actor lives constantly

under pressure and within a spirit of self-criticism, being never satisfied with the existing results. Here, the ability to communicate, transmit and manage their own emotions is central, because the actor, as a theater actor, as mediator, works with a receiver/spectator who is equal to him, who cries and laughs. Likewise, the Analyticity disposition is crucial, in order to prepare the artists to be able to deal with unforeseen situations, anticipating potential problems based on previous analytical work or/and being able to improvise during a show if needed (e.g., if the colleague makes an error or if he/she forgot the text of the dialogue). Due to the lack of funding and human resources (that is an increasing reality in the field of Arts), the need for flexible and adaptable professionals, capable of realizing different kind of works or assume several roles, is a current demand. This is somehow related to Open Mindedness and to the propensity to be open to criticism, especially in a field which demands the production of an object/expression to a particular audience - we need to be always open to a negative reaction of those who buy the ticket to our show. Finally, and also necessary, is Inquisitiveness, the willingness to live new experiences and gain cultural background that will certainly be an added value to the career of an actor (e.g., amateur groups of theatre, association's, volunteer work, etc.).

4. Conclusions and implications for practice

This report aimed to characterize how CT skills and dispositions are understood, needed and expressed by 189 European employers from four different professional fields, namely Biomedicine Sciences, STEM, Social Sciences and Humanities. It provided a deeper insight on the existing body of knowledge and contributed to: 1) describe the overall interpretation of CT by different professionals; 2) identify tendencies, similarities and differences on CT needs in the different professional fields; and 3) analyse the practical application of CT at the workplace within the different professional fields. **The key findings of our work are in line with several other studies** (Jones, 2009; Jones, 2010; Grace & Orrock, 2015; Sin et al., 2015), **suggesting that CT is widely interpreted as a set of interdependent skills and dispositions that are unquestionably needed in recent graduates due to today's labour market and societal demands, with slight differences in their practical application which tend to vary across professional fields, depending on the context, nature and purpose in which they are required**.

Taking into account the overall interpretation of CT by different professionals, **ideal CT professionals possess a well-educated way of thinking, fed by the motivation and willingness to learn and improve. CT is anchored in a set of interdependent cognitive and propensive aspects that allow professionals not only to anticipate and be ready for any situation, but also to regulate and monitor their own thinking and behaviour in such process.** This suggests that CT is something that seeks for strong propensity elements (e.g., dispositions and attitudes) and arises from experience, lifelong learning, effort and persistence (Halpern, 2014), dealing with long-term goals and development. Additionally, CT is frequently associated to problem-

solving and decision-making purposes, and its application does not depend only on a standalone skill or disposition, but in the convergence and interconnectedness of several of them. In this regard, professionals go beyond the Facione's theoretical framework used for the data analysis (Facione, 1990), considering that CT must be understood in a wider and holistic perspective, revealing itself as essential both for professional and organizational efficacy, but also for personal improvement and common good. Thus, **CT has a major role not only in directing professional to the desired outcome, but also in attending to people's needs and expectations, to overcome different societal challenges, considering different ethical, environmental and technological concerns, contributing this way to a better future and quality of life**. Here, **CT is associated both with an individual and collective responsibility/consciousness, made up of the professionals' personal and interpersonal dimensions, claiming for other skills and traits such as proactivity, adaptability, creativity, emotional maturity, communication and teamwork**.

Although most of CT skills and dispositions seem to have identical interpretation by the overall professionals, **some tendencies and differences on their need and application** were observed **between the different fields**. For instance, in **Biomedicine Sciences**, for Health professionals, CT requires clinical reasoning that understands the thinking over different aspects of healthcare and wellbeing, in order to obtain a plausible decision regarding prevention, diagnosis or treatment of a specific patient, taking into account different ethical concerns. In **STEM**, for Engineering and ICT professionals, CT requires thinking about problems and different approaches to achieve the best solutions attending to the needs, goals and expectations of a specific customer. In **Social Sciences**, for Education, Administration and Tourism professionals, CT is seen as a desirable set of skills and dispositions for professional improvement and brings an added responsibility especially to teachers and educators, affecting directly the development and learning of future citizens, assuming themselves as the key agents of this modeling process. In **Humanities**, for professionals from Arts and Culture, CT is expressed by the thinking about reality, about what is around the actor and the audience, and through this observation and thought modify that reality transforming it into an artistic object/expression.

Even with few mentions, it is notable that **some professionals associated CT need with the ability of managing digital information**. That triggers new issues and expectations. However, this aspect was briefly debated and requires a deeper reflection. How the characteristics of digital environments (e.g., immediacy, big data, privacy, etc.) will challenge CT development, knowing that we live in an era of uncertainty in which time to reflect is scarcer?

Finally, in order to better understand how CT is needed and expressed in the different professional fields, and resulting in the main outcome and novelty of the current report, we present a proposal for a "**European Inventory of Critical Thinking skills and dispositions for the 21st century**" (Table 5 and Table 6).

This inventory presents not only a list of different CT skills and dispositions categorized upon the Facione theoretical framework (Facione, 1990), according to the professionals' general interpretation, but also attending to their specific understanding in the different professional fields, linking them to the tendencies, differences and context-based scenarios which better illustrate their practical application and needs within fields. Rather than guiding teachers and higher education institutions on how to teach or promote CT, **this inventory aims to provide them with a consistent basis of needed skills and dispositions at the current labour market that can be useful to define new learning objectives, goals and outcomes, promoting their adoption into the existing European University curricula**. Additionally, we also expect to support organizations and human resources in the design of internal training programs to attend existing needs, as well as in the identification of future graduates for recruitment.

5. Limitations and future work

Different research limitations can be identified in the current study, which might have a potential impact on the quality of the findings and the effectiveness in achieving the established report objectives. These are related to methodological constraints found throughout the process, namely the research design, the research sample and the data analysis procedures. Each of these were considered and discussed in order to be overcome during future research.

In relation to the research design, we need to take into account that this was a qualitative research study aimed to evaluate the personal perceptions, beliefs and experiences of professionals regarding their CT understanding, expression and need at the workplace. Thus, it cannot lead us to generalized conclusions or to reach a consensus on the topic transferable to other contexts. For that purpose, quantitative studies need to be carried out in the future, such as survey research - which will allow us to identify and explain trends of larger groups of professionals on the need for CT at the labour market.

Regarding the research sample, we assume that the background and experience of the different professionals on the topic of CT can influence their own perceptions and beliefs, leading to different data and results. Also, the uneven representation of the sample needs to be considered: Social Sciences had about 66% of all the representatives in the study (n=125), followed by Biomedical Sciences (n=29) and STEM (n=28), both with 15% of the representation, and only 4% from Humanities (n=7). Such inequalities have a major impact on the final conclusions about CT understanding and expression in the different professional fields. And even within the fields, there are different economic activities more represented than others (e.g., Health and Education).

Table 5. A proposal for a "European Inventory of Critical Thinking skills for the 21st century"

SKILLS	OVERALL INTERPRETATION	BIOMEDICAL SCIENCES (illustrative applications)	STEM (illustrative applications)	SOCIAL SCIENCES (illustrative applications)	HUMANITIES (illustrative applications)
Interpretation	• Understand the other's points of view and be understood by them in an effective way (to be clear, not to be mistaken and not to mistake the others); • An ability to filter and categorize data; • Take a holistic perspective of situations according to the context; • Understand needs, expectations and outcome-based requirement.	• Decode significance, clarify meaning, categorize information and thought with evidence towards a reasoned diagnosis; • Understand the patient through expressed complaints and symptoms.	• Decode significance on clients' needs and expectations, by raising data, facts and formulating questions; • Take a holistic view of the world and understand the role of engineering in the society, attending to different ethical, environmental, safety and technological concerns.	• Clarify meaning to understand concepts or different perspectives from students; • Decode significance and categorize different types of resources, information, and problems; • Read client's needs and guide them to the expected results.	• Understand the organizational context to align individual needs with organizational goals and strategy.
	A strong emphasis on interpersonal relations and mutual understanding. It calls for empathetic professionals.				
Analysis	• Examine and distinguish ideas from facts; • Identify reasons, claims, and arguments, moving towards a better understanding of the situation; • Make argument-based judgements; • Sort and analyse information from different sources.	• Examine ideas from a broader perspective and attending to the social responsibility and conscience that health professionals must possess; • Identify reasons and claims attending to preconceived ideas of patients and populations; • Identify and select relevant information using different medical tools and resources.	• Question the reliability of data, look for a deeper understanding and engage in an inquisitive behaviour.	• Raise questions, look for answers and arguments; • Identify and select relevant information using different web-based tools and other resources; • Identify reasoned-based arguments.	• No significant interpretation and application of this skill were found.
	Also expressed by analytical thinking, it is needed not only at the personal level, but also for communicating to and with others. In many cases, it is tightly connected with interpretation and evaluation of information.				
Inference	• Query evidence by analysing different causes and reasons for a problem and/or situation; • Evaluate possible scenarios, solutions, and consequences; • Develop alternatives and draw justified conclusions, based on the analysis and evaluation of possible strengths and weaknesses towards achieving a better decision, solution or idea.	• Query evidence during the diagnosis of a patient, looking at his/her physical exams or clinical history; • Look for different treatment alternatives and guide the patient to the best one.	• Propose alternatives, giving possible directions, solutions, and recommendations to the clients' needs; • Formulate good questions and draw conclusions from ideas that may not be apparent, or look from a different perspective to the specific scenario.	• Propose different alternatives within the elaboration of a recreational/course program, attending to customers'/learners' preferences; • Draw justified conclusions, based on the assessment of different solutions; • Project feasible scenarios regarding existing limitations.	• No significant interpretation and application of this skill were found.
	Strongly related to analysis and evaluation skills. It is not solely a personal action; in many cases, it is done when working with others.				
Evaluation	• Make reasonable decisions based on a previous analysis; • Assess different suggestions, points of view and possible scenarios; • Evaluate wider contexts, inside and outside of the organization; • Sort objective from subjective information; • Assess credibility of claims and arguments.	• Prioritize actions to better manage situations of uncertainty and emergency; • Take evidence-based decisions within an initial diagnosis, based on the previous interpretation and analysis of the clinical case; • Assess the quality of information sources, taking into account that patients and families have a huge amount of available data but lack information literacy skills.	• Assess quality of arguments in the information needed for decision making or problem-solving purposes; • Examine the performance of peers within a project; • Prioritize tasks and make associations between different data.	• Assess the credibility of different sources of information; • Distinguish objective from subjective opinions, by judging and valuing evidence after a careful analysis; • Consider different opinions of students and/or stakeholders; • Evaluate the surrounding context where professionals are immersed.	• No significant interpretation and application of this skill were found.
	This skill is closely linked with interpretation, analysis and inference making.				
Explanation	• Communicate and present evidence-based arguments in a clear and understandable way; • Interpret information from the professional to the individual's language; • Express the right message effectively, attending to different audience;	• Justify procedures to a patient, inform and maintain his/her family current of the situation/clinical case; • State the action plan to treat and follow-up the patient.	• Communicate the solutions to a problem and support them argumentatively, not only after achieving them but also during the process of their discussion and elaboration; • Persuade and influence customers; • Communicate in different forms to a variety of audiences.	• Contrast and debate properly justified opinions, on an independent and/or collective basis; • Use the most suitable level of language to convey information to different customers/audiences.	• No significant interpretation and application of this skill were found.
	Requires strong communication skills (both oral and written) and is somewhat related to interpretation, courage and the self-confidence to present a contradicting opinion.				
Self-regulation	• Be aware and critical of one's performance, by listening and understanding the opinion of others; • Monitor and correct one's personal thinking and behaviour, by seeking for the truth and/or the right decision; • Assist others in regulating their own thinking and behaviour.	• Question, verify and critically analyse personal actions and decisions during the clinical practice; • Seek right decisions and judgements, in an attempt to minimize error.	• Critically analyse the personal thoughts, ideas, and approaches during a problem-solving process; • Supervise others in their self-monitoring and regulation process.	• Control own's judgement; • Question and analyse personal thoughts, decisions and actions; • Assist learners in regulating their own thinking and behaviour; • Self-assess one's abilities and limitations.	• Be critical and aware of the outcomes of an artistic performance; • Be open and humble to accept criticism from others to promote personal/professional improvement.
	Represents an ongoing attempt to personal and professional improvement, being somewhat related to meta-cognition, truth-seeking and open-mindedness.				

Table 6. A proposal for a "European Inventory of Critical Thinking dispositions for the 21st century"

DISPOSITIONS	OVERALL INTERPRETATION	BIOMEDICAL SCIENCES (illustrative applications)	STEM (illustrative applications)	SOCIAL SCIENCES (illustrative applications)	HUMANITIES (illustrative applications)
Open-mindedness	• Be respectful and tolerant of other points of view; • Be flexible, open to criticism and sensitive about personal bias; • Be open to adapt or to embrace new experiences.	• To be humble and recognize personal bias; • Be able to respect the patient' needs and treat him/her holistically; • Be adaptable to new situations.	• Be tolerant and know-how to behave and relate to third parties or other stakeholders; • Be open to accepting other alternatives/solutions for a problem.	• Be open to alternative solutions and different opinions, not being afraid or frustrated to change and accept one's mistakes; • Inclination to serve as best as possible the learners' needs; • Try to understand the reasons behind the facts, being empathetic and looking to situations from the perspective of somebody else; • Have a multidisciplinary and plural vision.	• Be open and tolerant to criticism attending to audience' opinions; • Be multifaceted, flexible and adaptable to the organizational needs, considering external factors (e.g., lack of funding/human resources).
	Strongly related to broad-mindedness, openness, flexibility, and sensitivity to personal bias and others' perspectives. It calls for empathetic professionals.				
Inquisitiveness	• Be curious and have a lifelong desire to learn; • Be open to widening personal horizons and updating professional knowledge to meet new requirements and needs; • Be sceptical and non-conformist, in a constant process of questioning to seek and apply knowledge in practice.	• Be responsible for the individual professional development, seeking to update to the existing body of knowledge; • The desire to embrace new experiences and perspectives.	• Be responsible for own professional development; • Be curious and bring an added value to the organization, improving and challenging the existing body of knowledge.	• Have the desire to be even better, to seek for new knowledge and questioning the organizational response to the challenges of the broader context.	• Be curious, open and always have the desire to learn, seeing every moment as an opportunity to acquire professional and personal experience.
	Represents an ongoing intellectual curiosity, desire to learn and seek to update the existing professional knowledge (lifelong learning).				
Cognitive maturity	• Adapt to the constantly changing environment, by observing the wider context and interpreting global tendencies; • Respect and value others' opinions, being able to learn with and from them; • Possess intuition, insight, and flexibility.	• Take into account different ethical norms and concerns in the clinical practice; • Be intellectually modest and honest to the limitations of one's knowledge.	• Adapt to unforeseen and complex situations; • Act according to the stakeholder's preferences, expectations, and needs.	• Consider the context in which the organization is included as a system of values and shared objectives; • Keep a constant eye on the global scenario and understand the world as a causal link; • Hold a multi- and interdisciplinary thinking within an increasingly international market; • Be able to work with different individuals and to see things in a different perspective.	• Be honest and responsible for personal actions, especially when working in a team.
	Strongly related to interpretation, flexibility, and intellectual modesty (without limiting self-confidence).				
Systematicity	• Be consistent with your expressed thoughts and actions, serving as model for others; • Take an organized approach to perform tasks, and work with constraints such as limited time / large amounts of data; • Come up with clear and generalized ideas, be focused, attentive and critical in making professional decisions.	• Have organizational and time management abilities, attending to different medical protocols and restrictions.	• Be focused, orderly and consistent in the problem-solving process; • Be able to prioritize tasks, ready to identify gaps and contradictions, and to systematize or generalize ideas; • Nurture different structured approaches to problem-solving.	• An ability to coordinate, plan, prioritize, listen and organize; • Approach situations in a structured way and be persistent; • Be consistent with your thoughts and actions, serving as a role model for others.	• No significant interpretation and application of this disposition were found.
	Requires strong organizational and time management abilities.				
Analyticity	• Solve problems and make decisions based on careful analysis; • Be ready to act, predicting difficulties and mental efforts to overcome particular problems or situations; • Have a propensity to be autonomous and proactive.	• Be ready to intervene in uncertainty scenarios such as emergencies; • Anticipate practical difficulties and use evidence to make decisions.	• Apply reasoning and use evidence to solve problems; • Avoid preconceived perceptions, beliefs, and stereotypes when asking questions, gathering data and base personal analysis on real, concrete and informed evidence; • Be proactive and anticipate potential difficulties.	• Be ready to intervene and overcome potential problems in complex situations.	• Be able to anticipate problems or to improvise in unforeseen situations.
	Closely related to proactivity, autonomy, and initiative. It requires the ability to apply individual background knowledge in practice.				
Truth-seeking	• Be eager to improve professionally and personally; • Have the desire to look deeper and learn with others, valuing doubt and showing courage to ask questions and make mistakes.	• Be eager to update knowledge and get involved in new training, especially in specific areas that develop fast in conjunction with other specialties; • Be inclined to collect the best data possible within the initial diagnosis of a clinical case; • Be humble to call for help and search for another colleague that can have the best information in a given context.	• Be eager to seek for new solutions that may derive from other contexts (tightly connected with abstract thinking); • Be courageous to make mistakes, be patient and orderly in asking questions.	• Combine new with old knowledge and have an attitude to seek for the best information; • Overcome established conventions, group thinking or logical fallacies; • Be open to discover and experiment.	• No significant interpretation and application of this disposition were found.
	It is tightly connected with inquisitiveness and open-mindedness.				
Self-confidence	• Evaluate and make personal decisions, regardless of the profession and position held; • Trust in one's opinions, decisions and actions; • Nurture independent thinking, resisting to the mainstream with the courage to express non-standard opinions.	• Trust in the personal performance and be aware of own knowledge limitations.	• Have the courage to take a position or apply a solution, not being afraid of judgements from others; • Take the initiative to move on and go forward towards the development of a solution, leading others in the process.	• Trust in your reasoned judgement, mainly when others ask the questions; • Have the courage to go against standards or mainstream thinking; • Develop own intellectual integrity to not be influenced by the others.	• Trust in others during unforeseen situations in which we cannot be present (be confident when delegating).
	It includes aspects of honest behaviour, courage, non-standard thinking, mutual trust, and intellectual integrity. Leadership is an integral part of self-confidence.				

The last remark is related to the data analysis, attending that the current research is the result of a partnership between several researchers of 9 European countries, which led to possible limitations in terms of interpretation of the results. These could arise due to: language barriers, that directly impacts the process of data translation; difficulties to assign and categorize some quotes per certain skills and/or disposition using the applied theoretical framework - in some cases, professionals were making references to different skills and dispositions simultaneously.

In the scope of the project CRITHINKEDU, **future work** will be carried-out within its second intellectual output, namely the "**A European review on Critical Thinking educational practices in Higher Education Institutions**" **report**. This report will aim to understand how CT is being currently addressed by the European Higher Education Institutions, seeking to identify the **gaps between the CT needs expressed by professionals presented here and the educational practices promoted by academics**. Thus, it will be possible to get a deeper understanding and compare how CT is understood and expressed between these two different worlds, which sometimes remain separated. Are European Higher Education Institutions promoting CT in an intentional and consistent basis, attending to its current importance and specific nature? What are the CT skills and dispositions that faculty teachers are promoting through their educational practices? Are they the same as expressed by professionals? Are there any differences between the scientific fields?

Another considerable issue related to social and labour market demands is the impact of an increasing technology-based society, in which the emergence of robots and artificial intelligence (e.g., Machine Learning) will become a reality in the near future, putting many jobs at risk - even those who call for high levels of judgement and appraisal (Frey & Osborne, 2017). Thus, it is imperative to critically debate, in future agenda, what is the role of CT in the construction of a more sustainable socio-economic and cultural scenario. What kind(s) of CT will society need in the future? How will time (or the lack of it) be compatible with CT development? The responses surely require an ethical ground - what kind of society do we want? Will there be place for individuals to take part in a critical, truthful and open society that grants authenticity for ideas and in which universities uphold argument, free speech and critical dialogue? Or will it be a much more closed society with decisions or information increasingly taken/filtered by imposed algorithms?

These and other relevant questions will be addressed within the project CRITHINKEDU, that aims to look at labour market and societal needs in terms of CT, linking them with higher education practices, in order to establish and propose a set of different preliminary guidelines to CT education around Europe, rethinking the university curricula.

6. List of references

Andrews, J. N. (1990). General thinking skills: are there such things?. *Journal of Philosophy of Education, 24*(1), 71-79

Andrews, J., & Higson, H. (2008). Graduate employability, 'soft skills' versus 'hard' business knowledge: A European study. *Higher education in Europe, 33*(4), 411-422.

Bailin, S., & Battersby, M. (2010). *Reason in the Balance: An Inquiry Approach to Critical Thinking*. Whitby, ON: McGraw-Hill Ryerson.

Baaken, T., Kiel, B., & Kliewe, T. (2015). Real World Projects with Companies Supporting Competence Development in Higher Education. *International Journal of Higher Education, 4*(3), 129-139.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education, 7th edition*. New York: Routledge.

Cruz, G. & Dominguez, C. (2016). How can we prepare future engineers to the labour market? A University-Business Cooperation project using Context and Problem-Based Learning approaches. In R. M. Lima et al. (Eds.), *Proceedings of the PAEE/ALE'2016, 8th International Symposium on Project Approaches in Engineering Education (PAEE) and 14th Active Learning in Engineering Education Workshop (ALE)*, Guimarães (639-644). Guimarães: Universidade do Minho.

Davies, M., & Barnett, R. (2015). *The Palgrave Handbook of Critical Thinking in Higher Education*. New York: Palgrave Macmillan

Ennis, R. H. (1992). The degree to which critical thinking is subject specific: Clarification and needed research. In P. Norris (ed.), *The Generalizability of Critical Thinking: Multiple Perspectives on an Educational Ideal*. New York: Teachers College Press, 21-37.

Eurostat (2008). *NACE Rev. 2: Statistical Classification of Economic Activities in the European Community*. Luxembourg: Office for Official Publications of the European Communities.

Facione, P. A. (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment & Instruction: The Delphi Report*. California: California Academic Press.

Facione, P., Sanchez, C. A., Facione, N. C., & Gainen, J. (1995). The Disposition toward Critical Thinking. *Journal of General Education, 44*(1): 1-25

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation?. *Technological Forecasting and Social Change, 114*, 254-280.

Grace, S., & Orrock, P. J. (2015). Criticality in Osteopathic Medicine: Exploring the Relationship between Critical Thinking and Clinical Reasoning. In M. Davies & R. Barnett (Eds.), *The Palgrave Handbook of Critical Thinking in Higher Education*. New York: Palgrave Macmillan, 475-490.

Glitz, B. (1998). *Focus Groups for Libraries and Librarians*. New York, NY: Forbes Custom Publishing.

Halonen, J. (1995). Demystifying Critical Thinking. *Teaching of Psychology, 22*(1): 75-81

Halpern, D. (2014). *Thought & Knowledge: An Introduction to Critical Thinking. 5th Edition*. New York: Psychology Press

Hsieh, H-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research, 15*(9), 1277-1288

Jones, A. (2009). Redisciplining generic attributes: The disciplinary context in focus. *Studies in Higher Education, 34*(1), 85-100.

Jones, A. (2010). Generic attributes in accounting: the significance of the disciplinary context. *Accounting Education: an international journal, 19*(1-2), 5-21.

Krueger, R., & Casey, M. (2000). *Focus Groups: A Practical Guide for Applied Research*. Newbury Park, CA: Sage.

McPeck, J. E. (1990). Critical thinking and subject specificity: a reply to Ennis. *Educational Researcher, 19*(4), 10-12.

Patton, M. Q. (2002). *Qualitative Evaluation and Research Methods*. Thousand Oaks, CA: Sage

Paul, R. (2011). *Critical thinking movement: 3 waves*. Retrieved from http://www.criticalthinking.org/pages/critical-thinking-movement-3-waves/856

Plewa, C., & Quester, P. (2008). A dyadic study of "champions" in university-industry relationships. *Asia Pacific Journal of Marketing and Logistics, 20*(2), 211-226.

Schwab K., & Samans, R. (2016). *The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution*. World Economic Forum. Retrieved from http://reports.weforum.org/future-of-jobs-2016/

Siegel, H. (1988). *Educating Reason: Rationality, Critical Thinking, and Education*. New York: Routledge.

Siegel, H. (1992). The generalizability of critical thinking skills, dispositions, and epistemology. In P. Norris (ed.), *The Generalizability of Critical Thinking: Multiple Perspectives on an Educational Ideal*. New York: Teachers College Press, 97-108.

Sin, S., Jones, A., & Wang, Z. (2015). Critical Thinking in Professional Accounting Practice: Conceptions of Employers and Practitioners. In M. Davies & R. Barnett (Eds.), *The Palgrave Handbook of Critical Thinking in Higher Education*. New York: Palgrave Macmillan, 431-456.

Willingham, D. T. (2008). Critical thinking: why is so hard to teach?. *Arts Education Policy Review, 109*, 21-32.

7. Funding and acknowledgments

8. Supplementary documents

Supplementary document 1. Available at http://bit.ly/Supplementary1

Supplementary document 2. Available at http://bit.ly/Supplementary2

Supplementary document 3. Available at http://bit.ly/Supplementary3

Supplementary document 4. Available at http://bit.ly/Supplementary4