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ACTIVE CITIZENSHIP FOR THE DIGITAL SOCIETY.
EXPERTISE, BEST PRACTICES AND TEACHING
IN THE DIGITAL ERA

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2. COMPETENCE PROFILES FOR THE DIGITAL SOCIETY: A COMPARATIVE APPROACH[1]

di Stefania Capogna[*] and Francesca Greco[**]

Abstract: *The essay illustrates a comparative analysis oriented to understanding the national digital strategies of countries' partners involved in the Erasmus+ Project RE-EDUCO. Digital transformation in Europe will rapidly accelerate. New technologies play a central role in this process, influencing how people live, interact, study and work. The mismatch between labour supply and demand is among the most recurring complaints that can be read in European and supranational documents that outline the digital society's developments. The essay examines this mismatch, performed through ETM, applied to the comparative analysis of the reports elaborated by the five partner countries involved in the project. The essay starts with an overview of the issue and methodology adopted to continue with the analysis and discussion data, and some summary conclusions suggested by this work.*

Key words: Digital competencies, digital society, Emotional Text Mining, comparative analysis, mismatch education-market labour.

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PROFILI DI COMPETENZA PER LA SOCIETÀ DIGITALE: UN APPROCCIO COMPARATIVO

Abstract: *Il saggio illustra un'analisi comparativa orientata alla comprensione delle strategie digitali nazionali dei Paesi partner coinvolti nel Progetto Erasmus+ RE-EDUCO. La trasformazione digitale in Europa accelera rapidamente. Le nuove tecnologie giocano un ruolo centrale in questo processo, influenzando il modo in cui le persone vivono, interagiscono, studiano e lavorano. Il mismatch tra domanda e offerta di lavoro è tra le preoccupazioni più ricorrenti che si leggono nei documenti europei e sovranazionali che delineano gli sviluppi della società digitale. Il saggio esamina questo mismatch, attraverso la metodologia ETM, applicata all'analisi comparativa dei report elaborati dai cinque paesi partner coinvolti nel progetto. Il saggio inizia con una panoramica del problema e della metodologia adottata, per proseguire con l'analisi e la discussione dei dati e alcune conclusioni di sintesi suggerite da questo lavoro.*

Key words: Competenze digitali, società digitale, Emotional Text Mining, analisi comparativa, incompatibilità tra istruzione e mercato del lavoro.

Introduction

The essay illustrates a comparative analysis oriented to understanding the national digital strategies of partner countries involved in the Erasmus+ Project RE-EDUCO[2] (*REthinking EDUcation COmpetencies. Expertise, best practices, and teaching in the Digital Era*). Between January and March 2021, the

[2] The project involved five countries (Cyprus, Greece, Finland, Italy, and Spain) in the realisation of a comparative analysis based on the elaboration of national reports based on the same research design, methodology and tools. All National and comparative reports are available on the project web site: http://re-educo.eu.

research was conducted to investigate perspectives and impacts on the future digital society to see the mismatch between labour supply and demand.

The RE-EDUCO project aimed to understand the potentialities of digital transformation in the national labour market (Capogna et. al. 2021). According to the recent work of EE.CC. (2016, 2020/b; 2020/c), digital transformation in Europe will rapidly accelerate. These innovations will deeply impact lifestyles, socioeconomic systems and learning processes. As also highlighted in the *Action Plan* (EE.CC., 2020/a), digitalisation and new technologies will play a central role in this process, influencing how people live, interact, study and work. Although several opportunities are emerging thanks to the digital transformation, the greatest risk is represented by a society that is poorly prepared to face the future. It is estimated that 90% of future jobs will require digital skills (EE. CC, 2016), and 44% of Europeans do not even manage basic skills (Carretero *et al.*, 2017).

Strengthening digital skills, using new technologies and constructing new learning methods, will represent the field in which training and educational systems will compete over the next few years. The theme of the transition from school to work, also considering the transformations mentioned and the persistence of the global economic crisis, has long ceased to be considered a simple and linear process (Capogna, 2011; Schoon and Bynner, 2019; Vermeire *et al.*, 2022). Based on these premises, an important goal of the research project was to identify the different ways to interpret and face the traditional mismatch between labour supply and demand, and changes in labour market trends, through the lens of partner country organisations (Capogna et. al., 2021). Considering the relevance of cultural perspectives (Geertz, 1973) in interpreting and

activating local policies (Daniell, 2014) to run digital innovation and educational systems (Capogna *et al.*, 2023), we performed a comparative analysis, applying a qualitative methodology to interpret the data. In fact, following the *translation theory,* policy transfer is never automatic nor an unproblematic, taken-for-granted process (Lendvai and Stubbs, 2007). Translation focuses on language, and «policy is made in words, and it moves» (Freeman, 2009: 431). Policymaking is a continuous process in which ideas and purposes move between actors and locations, converting them into decisions, programs and instruments, through a continuous process of *policy translation* which is moving something in a new way and to a new place, inevitably changing what it means. In other words, translation has a geometric, semiotic, and political meaning. In this essay, we focus on the European digital policies for the reduction of the mismatch between labour supply and demand, by analysing the way in which the countries examined translate national indications locally to face the digital challenge. The need for the analysis has been performed by local *data set* for secondary data extraction, focusing on industry 4.0; new digital profile; new emerging skills for digital society, and skills gaps in the digital field. Then, each partner country performed a national research report based on a common research design to allow qualitative comparison. In line with the literature (Reinart, 1995; Carli and Paniccia, 2002; Greco, 2016a), this dimension is detectable through textual analysis since it determines the choice and association of the words used to organise the communication to represent national digital trends interpreted and explained by each partner involved. This work proposes a text-mining procedure to compare the symbolic-cultural categories that emerge from the comparative analysis of the reports. The cultural dimension can be considered a “fabric of meaning” (Geertz, 1973) that generates social actions

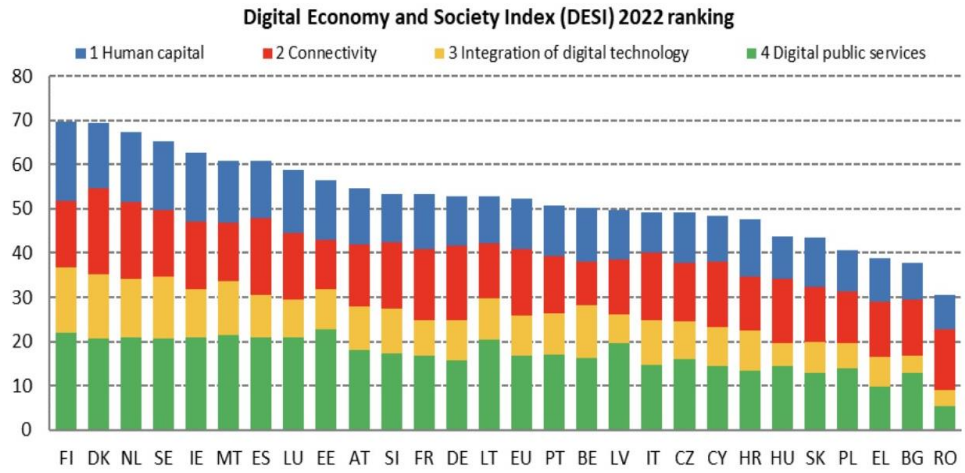
and their interpretative frameworks also in the organisation of work, as Schein (2021) expertly explained. Symbols, narratives, and language are essential building blocks of culture. So, the project's main objective was to reconstruct, through each partner narration carried out in drafting the shared research report, the idea of developing digital skills that underpin both the training processes and the evolution of the labour market and emerging professions and skills. By the text mining analysis, we investigated how digital transformation is built by discursive practices and their impact on work and education. According to a socio-constructivist perspective, these categories also affect communication, and the choice and association of words. The partner countries' national reports produced for the RE-EDUCO project originated from the common European framework, which addresses the digital European road map; analysing these reports, we can observe that they differ in lexical profiles. We hypothesise that the country's digital development and impact on the education-job market matching are also readable through report analysis to observe local interpretation. Without having prearranged questions in the background, through text mining, we tried to bring out the hidden categories that structure the worldview of the partners involved, looking for similarities, differences and specificities that could shed light on the most relevant differences between the partner countries involved. The essay illustrates the common European framework that guides national policies, the methodology, the results of the analysis conducted through text-mining, supported by excerpts of text deemed significant to explain the observed categories, and the concluding discussion.

1. *Digital transformation and the challenge for education and workforce*

The analysis does not aim to detect the cultural differences between the countries, nor the values that underlie these differences, rather it aims to explore how such different realities, in relation to the degree of digitisation of the country, faced the transformations introduced in the labour market by the digital revolution. As highlighted in the recent work of EE.CC. (2006; 2020/a; 2020/b; 2020/c), digital transformation has rapidly accelerated thanks to the development of new technologies, including artificial intelligence, robotics, cloud computing, blockchain, industry 4.0 and the new Internet era (OECD, 2021).

These innovations deeply impact lifestyles, socioeconomic systems and learning processes. Digitalisation and new technologies play a central role in this process, influencing how people live, interact, study and work. Some professions disappear, others are replaced, and new ones are created; many professions and activities are transformed, and new ones will emerge. Although several opportunities are emerging thanks to the digital transformation, the greatest risk is represented by a society that is poorly prepared to face the future (Capogna *et al.*, 2021): 90% of the jobs in the future will require skills in the digital field [WEF, 2016]; and 44% of Europeans do not even manage the basic skills according to the World Economic Forum (2016). The five partner countries involved in the project differ in their level of development, ranking differently in the DESI index.

Figure 1: DESI Index



Source, European Commission, 2022[3]

The education system is expected to lead this process, accompanying people throughout their lives to help them take the opportunities and meet the challenges of a globalised, interconnected and rapidly evolving world [CEDEFOP, 2019]. This scenario impacts learning systems and models as they must enable young people and citizens to live fully in new societies characterised by innovation, equity, and resilience, according to objectives for integrated sustainable development. Lifelong Learning (LLL) requires strong partnerships and synergies between business, education, research, working and learning environments. Education, maintaining its high-quality profile, must be accompanied by extracurricular activities and a broad approach which moves in an increasingly mobile and digital

[3] European Commission, *Digital Economy, and Society Index 2022:* https://ec.europa.eu/ commission/presscorner/detail/en/IP_22_4560 (Lates consultation, 28 December 2022).

society, and explores new ways of knowing. Digital technologies play an essential role in developing more flexible learning environments, supporting the development of new skills: problem-solving, critical thinking, cooperation, creativity, computational thinking and self-employment. Strengthening digital skills, using new technologies and constructing new learning methods represents a fresh challenge for educational systems. Considering this challenge, over the last 20 years, a widespread transformative trend, known as GERM, has been observed which tends to change transnational governance models (Sellar and Lingard, 2013; Fuller and Stevenson, 2019; Colarusso and Giancola, 2019). Europe is increasingly investing in policies, strategies, practices and tools for education, training and the labour market. European investments focus on the education system, which plays a strategic and relevant role in Lifelong Learning to succeed globally in the 21st-century workforce. Education plays a particular role in providing young people and adults with knowledge, with soft and hard skills, offering an opportunity to develop them in a knowledge-based and increasing economy. The European Commission declared the intention to create a European education area.

> "Education is essential to the vitality of European society and economy. The European Education Area aims to give the education and training communities the support they need to fulfil their fundamental mission in challenging and exciting times" (President von der Leyen, 30 September 2020[4]).

[4] Communication from the Commission to the European Parliament, the Council, the European economic and social committee, and the committee of the regions on achieving the European Education Area by 2025: https://ec.europa.eu/education/sites/education/files/document-library-docs/eea-communication-sept2020_en.pdf (Last consultation 11-12-2020).

The Commission aims to promote quality, inclusive and accessible digital education in Europe. Two recent initiatives have been launched, a new *Pact for Skills* (European Commission, 2020), which considers the digital skills gap one of the most important issues for the future of Europe, and the *Digital Education Action Plan (2021-2027). Resetting education and training for the digital age*[5].

Albeit starting from profoundly different educational and regulatory models, under the impetus of European action, the five countries involved in the project started to implement the development of digitalisation, following different paths, enacting specific regulations, action plans and projects, financially supported at national and European level. It is widely understood that social and cultural factors shape human behaviour, and that the purpose of public policy is also to shape behaviour: "culture affects policy, and policy affects culture" (Coyle and Ellis, 1994). In addition, language represents a set of cultural and perceptive habits which allow the circulation and reproduction of a certain system of beliefs and shared traits, starting from the set of codified conventions and values. Language plays a fundamental part in building the national culture as well as values, institutions, history and identity (Hofstede *et al.*, 2010). For this reason, through the text mining analysis of the reports, we tried to extrapolate the most important categories of meaning that appear to guide local choices, namely, the cultural dimensions (Greco, 2016), setting the mismatch in job offer-demand in the digital era.

[5] Digital Education Action Plan (2021-2027) - Resetting education and training for the digital age: https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en (Last consultation 11-12-2020).

2. *Methodology*

To operate the comparative textual analysis between all the European Project intellectual outputs of each partner country (Cyprus, Finland, Greece, Italy, Spain), the researchers operated as follows. A detailed research design (Capogna *et al.*, 2021), focused on *The European Perspective,* was chosen and shared among all the project partners to define the common framework to operate and process data; elaborate the national needs analysis; analyse both the evolution of new competences and profiles and the perspectives and impacts determined by the digital society. This design included:

a) the theoretical framework for Digital Pattern innovation, illustrating the European vision related to the digital challenge for the future of the labour market; the digital transformation, explained by the development of new digital culture, pointing out new opportunities for competitiveness, labour (emerging profiles and digital skills) education, cultural sectors and society;
b) the international comparison of labour market trends and schools elaborated on the basis of databases and data sets of a secondary nature to represent the following two issues: the skilling and reskilling between innovation and transformation, and digital skills for High Schools;
c) the Annexes, to clarify the theoretical-methodological guidelines and indicate to all partners how to process the research/analysis at the national level, to the type and selection of sources; the glossary; the structure and main contents to elaborate a national report, and index for writing a national report, ensuring the comparison of data.

Based on these common theoretical-methodological visions, all partner countries wrote their national reports. The

objective of the national research - *IO1.A1.3 National Needs analysis Competence profiles to update perspective and impacts for the future digital society*[6] - was to explore the effects of the digital revolution on the local labour market, to favour: the innovation in organisational and educational processes to reduce the mismatch in job offer demand in the digital era; the promotion of excellence in teaching and skills development; the dissemination of a broader digital culture suitable for managing digital technologies responsibly. Thanks to the preliminary sharing of work, all the documents had the same structure. They were subjected to a qualitative comparative analysis to identify the similarities and differences that characterise the partner country organisations to intercept different ways to interpret and implement the digital transition in education and the labour market. The reports produced by the five partners were compared utilising a natural language processing procedure, to understand whether there are specificities in the symbolic-cultural categories used to communicate the scientific results of the projects. To this aim, the documents were collected in a corpus, and we used an explanatory variable to identify the differences between countries. We chose to use Emotional Text Mining (ETM) (Greco, 2016a; Greco and Polli, 2020) to investigate similarities and differences in the symbolic-cultural categories used to communicate the European Project intellectual output since it performs cultural-social profiling. ETM is based on a socio-constructivist approach that identifies the cultural-symbolic categories and the representations setting communication. ETM employs a natural language processing approach on unstructured data based on a context-sensitive, bottom-up logic that does not need previously classified features (e.g. dictionary). It identifies both the semiotic and semantic levels

[6] The report is available at this link: http://re-educo.eu/wp-content/uploads/2021/08/IO1.A1_The-European-perspective_def.pdf (Last consultation 22.12.2022).

of communication. ETM was used in different domains, including document comparison (e.g., Greco, 2016b; Capogna *et al.*, 2022). We collected all the reports in a corpus and calculated lexical indexes (Tab. 1) to assess whether it was possible to statistically process data (Giuliano and La Rocca, 2010). All the corpus documents were subdivided into Chunks of Text (CT) and lemmatised using the T-Lab segmentation algorithm and dictionary (Lancia, 2018).

Table 1: Corpus lexical characteristics

Index	**n/%**
Document	5
Type	4,448
Token	33,112
Type Token Ratio	0.13
Hapax %	46.0%
chunk of text	862
chunk of text classified	98.0%

Source: RE-EDUCO. Comparative Report, 2021

We removed the stop words and selected the terms of the medium and low-frequency rank up to a threshold of five occurrences. The lower threshold is defined by the number of documents in the analysis (Greco, 2016a). Then, we performed a cluster analysis with a bisecting *k-means* algorithm based on cosine similarity (Steinbach *et al.*, 2000) on the *term-chunk* of text matrix, limited to twenty partitions, excluding all the *chunks* of text that did not have at least two terms co-occurrence. We calculated the intraclass correlation coefficient and evaluated the dendrogram to detect the first two optimal partitions, the first to identify the main topics and the second to pick out their sub-topics. The

chunks of text classified in each cluster were ordered according to their relevance (*score*) (Lancia, 2018). We performed a correspondence analysis on the term-main topic clusters matrix (Lebart and Salem, 1994). Finally, we performed a *chi-square test* on the first partition clusters-country contingency table to assess the reports' topics specificity, using the standardised residuals to identify relevant differences (Sharpe, 2015). To facilitate the interpretation of the correspondence analysis results, we assigned each term exclusively to the factor with the highest total contribution, filtering out this term from the other factors. In this way, each factor is characterised by specific terms that are different from the other factors. Four judges interpreted the correspondence, and the cluster analysis results separately to identify the available axes of communication and the topics according to clusters' location in the factorial space and their terms co-occurrence. Reading the most representative chunks of text of each cluster lead to define the judges' interpretations. Results were compared among judges, and a final agreement was found.

3. Presentation of results

The 845 terms selected classify 98.0% of the *chunks of text*. The first two optimal partitions were four clusters (main topics) and nine clusters (sub-topics) (table 2).

Table 2: Cluster partition

N. of clusters	P	$\Delta(P_i-P_{i-1})$	SEL	Parent	Child
2	0,0104	0,0000		1	2
3	0,0232	0,0128		2	3
4	0,0383	0,0151	**Main Topics**	1	4
5	0,0526	0,0143		2	5
6	0,0673	0,0147		3	6
7	0,0853	0,0180		1	7
8	0,1092	0,0239		4	8
9	0,1343	0,0250	**Sub-topics**	5	9
10	0,1534	0,0192		6	10
11	0,1791	0,0257		7	11
12	0,2009	0,0218		2	12
13	0,2269	0,0260		4	13
14	0,2493	0,0225		10	14
15	0,2732	0,0239		8	15
16	0,2972	0,0240		1	16
17	0,3002	0,0030		5	17
18	0,3207	0,0205		12	18
19	0,3441	0,0234		9	19

Source: RE-EDUCO. Comparative Report, 2021

The correspondence analysis was performed on the term-main topic contingency table, detecting three factors (Tab. 3), of which the first two explain 76.2% of inertia (Fig. 2, Tab. 3). The correspondence analysis results interpretation distinguishes three principal axes of communication set by the cultural symbolic categories:

1) the *matching* between the *job market demand* and *education system*,

2) the *training model for digital education* at both *micro* and *macro* level,
3) and the *national digital innovation* in its tension between *development* and *assessment*.

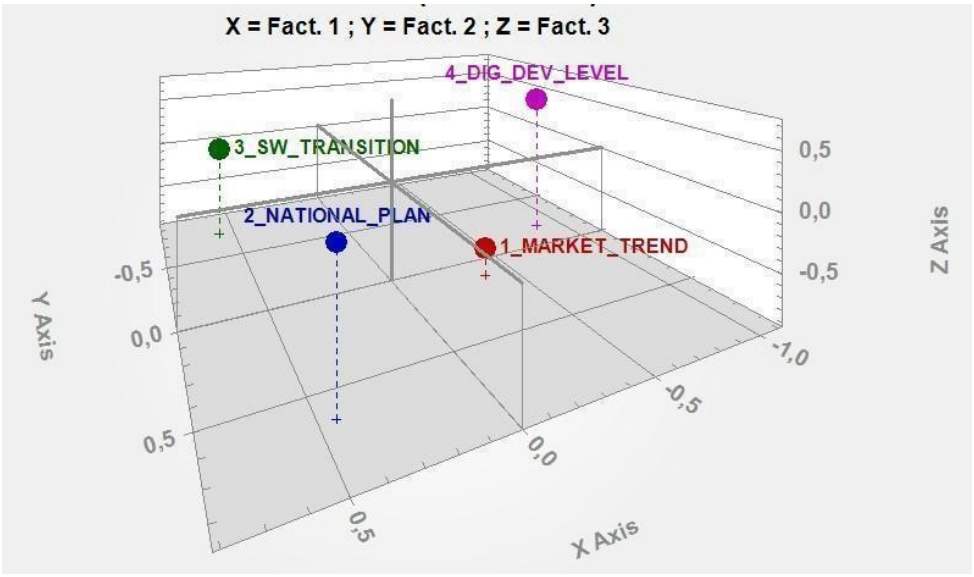
This first output is in line with the focus of the reports, which aimed to reconstruct both the European digital policies, considered as a unitary reference framework of all the partner countries and the mismatch between labour supply-demand and the development trends of national labour markets in terms of the digital transition.

Table 3: Correspondence analysis results

n.	Factors	Negative Pole	Positive pole	Eigenvalues	Percentage	Cumul. %
1	*Matching job demand-supply*	Job market demand	Education system	0.330	42.6	42.6
2	Training model for digital development	Micro school	Macro Institution	0.260	33.6	76.2
3	National digital innovation trend	Development Trend	Assessment	0.185	23.8	100.0

Source: RE-EDUCO. Comparative Report, 2021

Figure 2: Factorial space



Source: RE-EDUCO. Comparative Report, 2021

Examining the co-occurrence of the words (Tab. 4), we can interpret the three factors as follows.

Factor 1: Matching job demand-supply

Observing the collection of words occurring in the *negative pole*, we detect the demand for ICT-oriented professionals with a high level of education to satisfy the job market's demand for highly specialised positions. The co-occurrence of this group of lemmas, which summarises the first factor's *negative pole,* has been identified as the *Job Market demand*. From this analysis, it is evident that the job market expresses a demand for high professionalism. However, in the discourse analysis, there is no sensitivity to the place and how this professionalism is built. When the attention is shifted to the words that distinguish the *positive*

pole, the dimension of the strategic and supportive purpose emerges, as well as the implementation of programs aimed at young people and the attention to defining community development projects. In this case, we have a set of meanings that leads back to the *education system* in a broad sense. Based on these considerations, the first factor is defined as *matching job demand-supply* as it summarises the tension between the *negative* and *positive poles* expressed by the relationship between the *job market* and the *education system,* both of whom look at the issue of digital skills, however starting from extremely different, often irreconcilable, objectives and points of view.

Factor 2: Training Model for Digital Development

The second factor allows observing the relationship between *micro* and *macro* dimensions. In the first one, we consider the school contest made up of students, teaching-learning paths, teachers, distance learning, etc.; in the second one, we observe the macro-institutional dimension. At this level, we note the government plans, the issue of financing, the social issues posed by digitalisation, its effects on the economy, the country's innovation, policy systems and public administrations come into play. In the tension between the two poles emerges the cultural, institutional, and regulatory model that distinguishes educational policies at the national level by tracing the borderlines within which school governance can exercise their institutional micro-policies (Benadusi, 2004). Based on these reflections, the second factor has been defined as *Training Model for Digital Development*. Through the analysis of the narration reconstructed by the partner countries, it is possible to detect that there is no attention to the world of work, confirming the widespread self-referentiality that characterises the school system in a generalised way.

Factor 3: National Digital Innovation

The third factor allows us to observe in the *negative pole* the co-occurrence of a set of words that very clearly indicate the most crucial development trends traced by the digital revolution: market analysis, artificial intelligence, cybersecurity, to underline the areas where the demands for ICT skills were advanced by the labour market. This semantic space is called *development trend.* On the opposite pole are words related to assessment, such as DESI index, expect, increase, evaluation, estimate, score, low, replacement. The double tension between *development* and *assessment* leads to defining the third factor as the *National Digital Innovation trend*.

Table 4: Correspondence analysis results (The first ten terms of each factorial axe are ordered by absolute contribution value in descending order)

Factor			**Negative Axe**			**Positive Axe**		
n	**Label**	**Inertia%**	**Label**	**term**	**a.c.%**	**Label**	**term**	**a.c.%**
	Matching	42.6	*Job market*	demand	2.17	*Education*	aim	0.74
				profession	1.53		strategic	0.58
				high	1.43		Support	0.54
				graduate	1.28		implemen-tation	0.52
				ICT	1.21		program	0.47
				supply	0.88		Youth	0.47
				position	0.83		ministry	0.46
				Labour	0.83		project	0.45
				rank	0.81		design	0.45
				specialist	0.80		develop	0.32
				employment	0.79		community	0.32
	Training model for digital develop-ment	33.6	*Micro*	students	3.92	*Macro*	plan	1.57

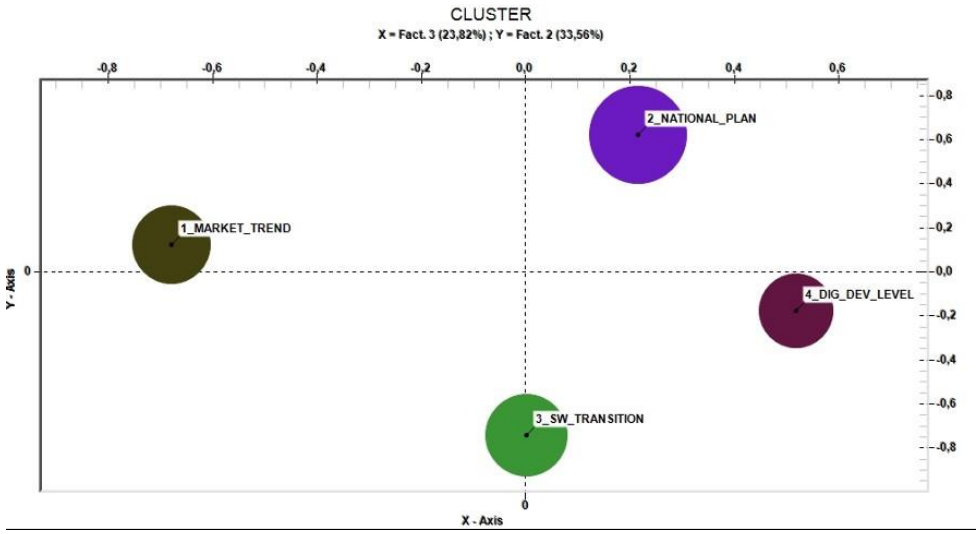
			school	learning	1.79	*Institution*	government	1.28
				teaching	1.52		fund	1.21
				teacher	1.42		action	1.11
				remote	1.41		social	0.97
				Schools	1.16		digitalisation	0.94
				computer	0.88		economic	0.93
				working	0.80		innovation	0.92
				pupils	0.77		policy	0.83
				educational	0.74		administration	0.76
	National	23.8	*Develop-ment*	analysis	3.63	*Assessment*	expect	1.29
	digital		*Trend*	market	3.48		DESI	0.92
	Innova-tion trend			intelligence	3.06		increase	0.81
				artificial	2.84		estimate	0.76
				labour	2.72		manager	0.68
				cybersecurity	1.07		low	0.66
				report	1.00		score	0.62
				measure	0.97		economy	0.58
				association	0.87		replacement	0.56
				focus	0.81		create	0.52

Source: RE-EDUCO. Comparative Report, 2021

In this factorial space are four main topics: *Market Trends; National Plan; School Work Transition; Digital Development Level.* Their positioning in the factorial space (Fig. 2) highlights the probable difficulty in matching education and the job market, which seem to remain two distinct elements located at the two opposite poles of the factorial space representing the semantic space through which each partner has reconstructed their analysis report. The four clusters, representing the main topics, are located on each pole of the second and third factors (Fig. 3), setting a two-

dimensional space. This happens when two concepts are culturally distinct and unrelated (Greco, 2016; Boccia Artieri *et al.*, 2021).

Figure 3: Cluster location in the factorial space set by the second and third factors



Source: RE-EDUCO. Comparative Report, 2021

In Table 5, we observe that the factorial space is organised in a two-dimensional space, as shown by the fact that some cells remain empty. The clusters in the first factor's *negative pole* (*Job Market*) are explained only by the third factor and not by the second one. Conversely, the clusters located at the *positive pole* (*Education*) of the first factor are explained only by the second factor and not by the third one. This type of cluster distribution in the factorial space is observed in dichotomous situations where there cannot be the simultaneous coexistence of two dimensions (life/death; peace/war; friend/enemy, etc.). That is, the culture expressed by the countries involved in the project do not lack of the symbolic-cultural categories connecting education and the job

market, but they lack a representation connecting these two dimensions. In specific areas of the symbolic space are four main topics (Table 5), subdivided into nine sub-topics.

Table 5: The cultural symbolic space

CU%	**Cl**	**Main Topic**	**Factor 1**	**Factor 2**	**Factor 3**	**Cl**	**CU%**	**Topic**
			42,6	33,6	23,8			
			Matching	**Educational**	**Country digital innovation**			
23,60%	1	**Market Trend**	*Job market*		*Development*	1	9,40%	Cybersecurity
					Trend	7	14,20%	AI
29,60%	2	**National Plan**	*Education*	*Macro*		2	12,10%	Public Management
				Institution		5	9,10%	Resources & Strategies
						9	8,40%	Transition
24,60%	3	**School -to-Work Transition**	*Education*	*Micro school*		3	7,50%	Training model
						6	17,20%	Training Process
22,30%	4	**Level of Digital Development**	*Job market*		*Assessment*	4	11,60%	Performance
						8	10,70%	Standard

Source: RE-EDUCO. Comparative Report, 2021

The first main topic, the *Market Trend,* is subdivided into two sub-topics: *Cybersecurity* and *Artificial Intelligence* (Tab. 6). The first sub-

topic includes terms such as ICT, report, Cyprus, measure, information, security, enterprise, country, strategy, professional, and system. This macro-theme is defined as the *job market* because it highlights the specific skills mismatch issue. The second includes terms such as market, intelligence, need, demand, and artificial intelligence to which the security request refers. Two topics, the latter, are closely connected, which leads to the identification of the category as a *development trend*. Within this semantic category, cybersecurity (cluster 1) and artificial intelligence (cluster 7) assume a significant weight expressed by the development trends reconstructed at a national level by each report, as we can observe by the extract of the national report.

Cluster 1: Cybersecurity

"Regarding the use of ICT security 82, 9% of all enterprises declared that they use one or more security measures (such as strong password, authentication, up-to-date software, biometric methods of user identification and authentication, data backup (cloud), network access control, ICT security tests, etc.) to ensure their data and their information systems" SCORE (200.167).

"CCS, in cooperation with information security specialists in Cyprus, from both academia and the industry, are organising the Cyprus Cyber Security Challenge (CCSC), a competition which aims to select and train the Cyprus National Team which competes at the annual European Cyber Security Challenge (ECSC) which takes place annually" SCORE (193.079).

Cluster 7: AI

"CPI also participates in numerous EU and National funded projects that enable it to develop and participate in innovative projects. National need analysis on the digital revolution and its effects on the labour market to revolutionise the labour market, it has been identified all across the world that Education has to adapt and change to meet the market needs" SCORE (243.151).

"The demand for digital skills will affect both existing professional figures and new emerging professions, such as data scientists, big data analysts, cloud computing experts, cyber security experts, business intelligence analysts and artificial

intelligence system engineers, as well as more traditional figures who will need digital skills to face the changing world of work" SCORE (208.360).

Source: RE-EDUCO. Comparative Report, 2021

The second main topic is the *National Plan* (Tab. 7), subdivided into three sub-topics that summarise the crucial challenge of all educational policies at the national level, particularly at the *macro* level. The first includes terms such as public, business, government, administration, citizen, plan, action, digitalisation, sector, and development. This macro-theme is labelled *Public Management* (cluster 2) because it looks like the national digital plans addressed to lead the local digital revolution. The second subtopic includes innovation, funding, research, development, program, support, project, and policies. This macro-theme is defined as r*esources & national strategies* (cluster 5) because it refers to using resources to implement specific strategies and needs. Cluster *5* brings together the theme of the *resources* needed, and the national *strategy* pursued to guide the process of innovation and digital transition. Resources alone are not enough. No innovation is possible without a national strategy capable of putting European guidelines and tools into practice. Moreover, the two excerpts from the comparative analysis of the reports allow us to focus attention on this crucial dimension. The third sub-topic includes terms such as transition, industry, people, society, company, resilience, play, role, key, and government. This macro-theme is defined as a *transition* (cluster 9) because it refers to the transformation determined by the digital revolution and industry 4.0. It expresses the transition to work seen by the company about the type and management of resources made available by the *Recovery, Transformation and Resilience Plan* (EE.CC., 2020). This plan sets very high objectives for all member states regarding social and technological transition and monitoring its impact on people. These

three topics express the planning effort to govern the digital challenge through the national policies acted by the *macro institution* to run the triple digital, ecological and social transition to ensure adaptation, inclusion, and innovation capacity. To manage the digitisation of the educational system emerges as an urgent requirement at the macro level. However, a long-term vision is absent, due to the fact that it remains crushed under the weight of an administrative vision of resource management that is not able to imagine paths of innovation for the education system and its mechanisms. The education system should operate an active and responsible role for the future development of society and active citizenship by integrating their sub-system through education-vocational training-labour market and career guided processes such as orientation and transition policies (Capogna, 2006). As summarised in the relevant extract from the reports analysed, the urgency and anxiety in managing the problem is evident in this dimension.

Cluster 2: Public Management

"This recovery plan is intended to mobilise a remarkable volume of public resources: almost €70 billion are expected to be invested within the 2021-23 period. Furthermore, public administrations will not work alone in this process. Attracting private capitals is a government priority well, both through direct collaborations and public-private partnerships" SCORE (215.318).

"The use of information and communication technologies (ICT) in administrative processes will make the action of the public administration increasingly efficient, improving, on the one hand, the quality of public services provided to citizens and decreasing, on the other, the costs for the community" SCORE (172.249).

Cluster 5 Resources & Strategy

"Establishment of the Deputy Ministry of Research, Innovation and Digital Policy in

March 2020; the Deputy Ministry of Research, Innovation and Digital Policy was established, aiming for Cyprus to become a dynamic and competitive economy driven by research, scientific excellence, innovation, technological development and entrepreneurship" SCORE (443.765).

"Among the various funds made available for the digital transformation, we should also mention: a fund for technological innovation and digitisation. Its initial endowment is 50 million euros, entrusted to the Ministry for Technological Innovation and Digitisation" SCORE (236.306).

Cluster 9: Transition

"Recovery, transformation, and resilience plan contains an ensemble of 212 measures, 110 of their investment plans, while the other 102 are strategical reforms" SCORE (124.594).

"It aims at a more fundamental economic and social transition affect only economic activity, technologies, attitudes, and institutions. A transition that combines economic efficiency with social inclusion and justice" SCORE (124.309)

Source: RE-EDUCO. Comparative Report, 2021

The third main topic is the s*chool-to-work transition* (Tab. 8)*;* it is divided into two subtopics, the *training model* (cluster 3) and the *training process* (cluster 6). The first sub-topic includes terms such as axis, course, Greek, society, company, pupils, workforce, initiative, good, design, and pandemic. This macro-theme is defined *training model* because it represents the training necessary to prepare the workforce through the provision of certifications and adequate training and professionalism. It responds to the skills challenges required by the disruptive innovation (Christensen, 2000), determined by the digital revolution. The second subtopic includes terms such as student, learning, support, teaching, training, develop, project, teacher, working, offer and university. This macro-theme is labelled the *training process* because it

concerns the teaching and learning model, which characterizes each educational organisation differently to its specific cultural traditions and institutions (Capogna *et. al.*, 2020). The *training process* corresponds to the formal learning space through which it is possible to acquire certification and educational titles. These two topics are closely related to the local governance space where the *school-to-work transition* takes shape, creating good relationships between school, company, and recognised skills (Capogna and Ciraci, 2008), as witnessed by the following excerpts from the report.

Cluster 3: Training model

"Teaching these courses at the Gymnasium and the Lyceum aims to engage pupils in meaningful learning using the computer as a problem-solving tool. In all Gymnasia, IT courses are mandatory for all pupils and are taught for two periods per week in each of the three classes. The main objective of these courses is for pupils to cover material of European standards (ECDL)" SCORE (252.677).

"Strategic Axes of Intervention for Digital Transformation in Greece according to the Digital Transformation available for the years 2020-2025 (available at https://digitalstrategy.gov.gr/principles_of_implementation), the critical interventions of Digital Transformation incorporate a series of actions and projects organised in six distinct strategic axes" SCORE (90.059).

Cluster 6: Training Process

"Omnia offers innovative learning environments, new learning solutions and innovations. Entrepreneurship and employment are key themes aligning all development activities of Omnia and the ICT/Digital Learning Solutions Team. This team acts as a support team for the entire Omnia staff in making the digital leap and engaging them in using digital tools as part of their teaching" SCORE (485.443).

Learning analytics can improve personalised learning, e.g. by identifying at-risk students and can assess the impact of various teaching strategies. (COM, 2013) 654 final: opening-up education. Innovative teaching and learning techniques for all

through new technologies and open educational resources)" SCORE (293.466).

Source: RE-EDUCO. Comparative Report, 2021

The fourth main topic is the *Level of digital development* (Tab. 9), divided into two subtopics. The first subtopic includes replacement, total, level, optimistic, case, qualified, occupation, speed, moderate, employ, position, and expansion. This macro-theme is defined as *Performance* (cluster 4) because it refers to the *performance* set. The second subtopic includes EU, DESI, data, member, profession, economy, survey, rank, score, and position. So, this macro-theme is labelled *Standards* (cluster 8), because it refers to the reference model that the countries involved in the project must comply with through the European framework of digital skills (DIGCOMP). So, in the *Level of digital development,* we can distinguish the *performance* from the *standard* of what should be achieved by following the international digital framework. They are closely related to the effort led by the European Union, since the end of the 90s, to bring the old continent back to leadership positions in the global digital market.

Cluster 4: Performance

"On the contrary, a dramatic increase in the supply of skilled labour is expected. The supply of moderately skilled work is projected to be relatively stable. Overall, people with moderate skills will continue to make up about half of the workforce. Respectively, the share of people with a Higher Education degree is expected to exceed 30% of the total" SCORE (693.706).

"In the demand for and supply of skills Greece is rapidly increasing its share of higher qualified [workers] in the labour market. While the share was at 32% in 2018, it is expected to increase to 40% by 2030. The increase in the share of higher qualified is expected to come from the outflow of older workers, both low and medium qualified" SCORE (689.005).

Cluster 8: Standards

"Finland has been ranked as one of the leading countries in several digital transformation-related assessments. According to the Commission's annual Digital Economy and Society Index (DESI), Finland was ranked in the first position in 2020 with a score of 72, 3" SCORE (238.504).

"DESI monitors the digital performance of EU Member States and tracks their progress in digitalisation (the maximum score is 100). 76% of the population has basic or above basic digital skills, which is considerably above the EU average 58%" SCORE (237.543).

Source: RE-EDUCO. Comparative Report, 2021

4. Discussion

The main categories that emerged from the analysis of the national reports is the development of ICT in the labour market; the financing programs; digital technology in education; the trends of the labour market; the professional development and emerging profiles, and the emerging competencies. Each partner country organisation shows different narrative perspectives and priorities in analysing digital transition elaborating the national reports. However, the national project reports differ significantly in the presence, or absence, of specific main topics (clusters) ($x2$, $df= 12$, $p>0.01$) (Tab. 6). The market trend is relevant in the Italian report, where the theme of mismatch is strongly felt, but it is almost absent in the Finnish and Greek reports. At the same time, the level of digital development is relevant in the Italian and Greek reports. The relevance of this issue for both countries is understandable in the light of the fact that they are in last place in the European comparison of the DESI index (Fig. 1), with a lower average than the European one. Only in 2022 did Italy gain two positions, overtaking Cyprus and the Czech Republic in the DESI

comparison. The national plan is relevant mostly in the Spanish report; this is probably also due to the specificity of the project partner, a business accelerator and incubator located in the start-up ecosystem of Valencia. School Work Transition is relevant in Cypriot and Finnish reports, where the dual model, in the first case, and the strong integration with the social system, characterise the school-world of work relationship in these countries. On the contrary, in the Italian and Spanish reports, this dimension does not appear to be very present, and the education system is traditionally separated from the world of work and professions (Capogna, 2004; 2005; 2006).

Table 6: Comparative perspective

Macro topic	**CY**	**FI**	**GR**	**IT**	**SP**
Market Trend	0.43	**-2.30**	**-2.67**	**2.41**	0.74
National plan	-1.08	-0.40	-0.76	-0.56	**2.85**
School to Work Transition	**4.41**	**3.89**	-0.22	**-4.04**	**-2.39**
Digital Development Level	**-3.84**	-1.27	**3.86**	**2.41**	-1.54

Source: RE-EDUCO. Comparative Report, 2021

The cultural symbolic space highlights the relationship between education and the job market, synthesizing the symbolic-cultural categories of sensemaking, and the collective representations (Tab. 3; 5). The curious observation is that despite the differences found in the various national education systems, more or less integrated with the world of work, the same disorientation emerges from the textual analysis when reflection focuses on the theme of the digital challenge. It represents the disconnection between the policy level and the practice one. ETM results suggest that the digital transformation is widening the job supply-demand mismatch instead of reducing it. A mismatch

which is first cultural rather than professional or technological. In other words, by the textual analysis, it is observed that when we talk about Education, we do not speak of the Job Market and conversely, when we focus on the Job Market, we do not consider the Training Model, and finally, when we consider the Educational Institutions, we do not consider the Country Digital Innovation. These dimensions do not interact between each other. Furthermore, despite the contextual specificities also linked to the different levels of digital development expressed by the DESI index, the lack of integration is common to all the country reports, and it could explain the labour supply-demand mismatch. Not surprisingly, even the DESI index does not look at educational systems considering the following four indicators: human capital, connectivity intended as accessibility, integration of digital technology and public service. Among the human capital's sub-dimensions, we find the number of ICT specialists, female ICT specialists, and the possession of basic digital skills. Moreover, Eurostat detects the possession of basic digital skills according to the number of citizens declaring to use the internet, but the educational reality remains disregarded.

ETM results suggest that there is a fracture at the level of policies that spills over into practice, fuelling the mismatch that we have tried to contrast through the interpretative categories of the education-work relationship. To counter this phenomenon, therefore, it is necessary to invest on a cultural level to create new connections between systems. The critical reflection around the four empty areas of the cultural symbolic space (Tab. 5) suggests that to reduce, or to avoid, the mismatch between education and job market we should promote the construction of a new cultural representation and sensemaking which will fill the empty spaces related to the bare areas of the before-mentioned factorial space. To conclude, this specific factorial space configuration, which

summarises the cultural-symbolic categories of sensemaking (Weick, 1979), shows that an apparent separation persists between the two exploration targets: the education system and the labour market. Despite the efforts made since the 1970s (Capogna, 2004; 2005) to promote the construction of an integrated macro-system, capable of favouring the transition to active life, a radical separation emerges from the analysis of the representations of reality. These collective representations (Moscovici, 1961; Jodelet, 1989) and culture (Greco, 2016b) are not measurable by other types of detection; they are hidden in communication through which we reconstruct the sensemaking framework that guides social actors' interactions. The analysis of the discourse (Tab. 5) shows that when it comes to education, the attention is focused on its repercussions and implications at the macro (public management, strategy, resources, plans, projects) and micro level to reconstruct its training model and process. When the discussion develops around the theme of the job market, the recurring elements are the development trends (with regard to the driving and sensitive sectors such as *cybersecurity and Artificial Intelligence*) and the relative assessment, as standards and performances expressed by the level of digital development of the country and the reference market. This dichotomy represented by the semantic space is explanatory of the distance between the job market, which does not pose the problem of the training model, and the education system, which is unable to guide and support the digital innovation trends of the countries under investigation. In the sphere of the underlying world visions, these two dimensions continue to refrain from speaking to each other, which is why every legislative and regulatory effort does not produce the expected results. The analysis results suggest that one aspect that affects the level of digital development is the generalised digital culture and critical capacity to interpret the digital environment.

This dimension identifies the categories used to interpret reality (Capogna *et al.*, 2022).

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All Correspondence analysis result and interpretation are available at the following link:
https://docs.google.com/document/d/1u7GutX3mh3GnW9hLna0A1uFGA2IEUE96/edit?usp=sharing&ouid=104072481847345464200&rtpof=true&sd=true