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## **Technological proficiency in a dataful world; An STS empirical review of Greece-focused labor analytics**

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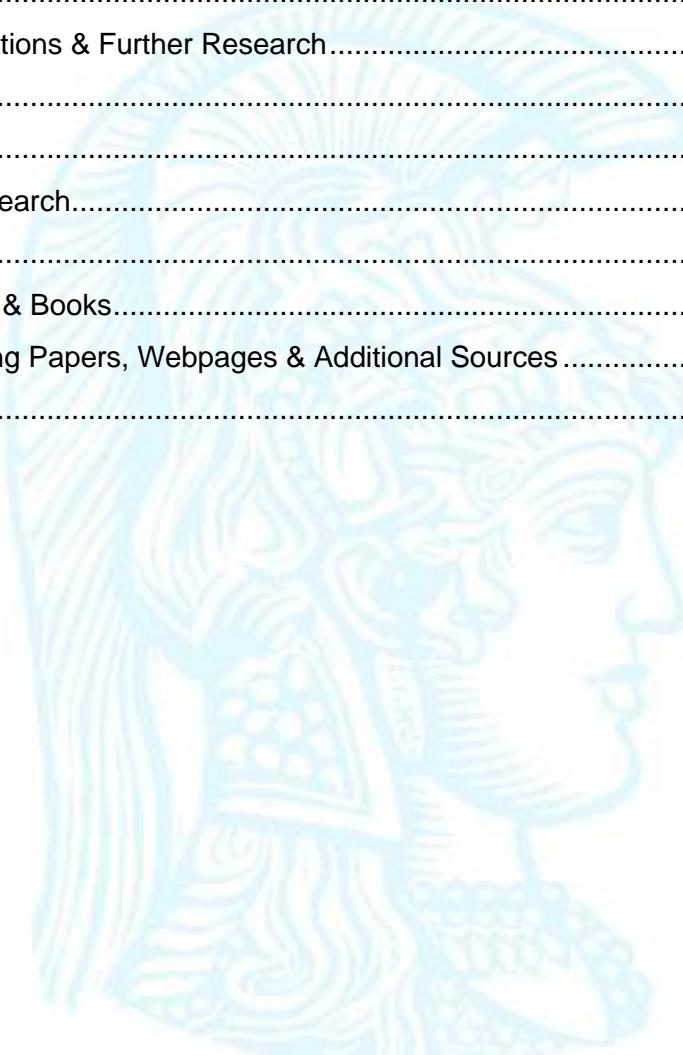
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## **Abstract**

This paper explores the perception of skills within the labor economics context under the scope of STS. We examine different takes of theoretical economics on labor skills and its interplay with technology, the conflation between education and skill, and inability to update its models in line with empirical economics' findings. We also address critical points towards the widespread human capital-based approaches and their positivistic nature. We explore available labor related data and how the digital proficiency is measured by European institutions, opening the black box and discussing biases they enclose, focusing on Greece and its respective institutions. We propose the creation of digital intensity indices of occupational group, industry and educational field, and incorporate them with PIAAC data, an international household survey conducted by OECD. We conduct analyses on the attributes' explanatory power of digital proficiency, using Problem solving in technology rich environments (PSTRE) score as a proxy. We modify the dataset to account or the design complexity of PIAAC, and implement linear regression analyses, as well as an XGBoost regression model. Our findings suggest that the significance of the provided attributes in PIAAC is highly suspect to the methodology employed. Education is indeed considered significant, but insufficient to explain digital proficiency under a linear relationship. Activity content at home in multiple occasions is considered more significant compared to its professional counterpart, creating an interest for further exploration along with other findings.

The paper stands right in the center of STS's interdisciplinary nature. It examines the sociotechnical implications of the academic discourse regarding the skill content of labor economics. It reveals the available, but concealed methodologies implemented by European institutions in the creation of indices, which are decontextualized and used as ground truth for relevant policy designs. Technology is prevalent in the content of the empirical analysis,

as the variable under examination is the digital proficiency. But it also connects on a instrumental basis, since the models along with data manipulation processes are included in a publicly available python resource, aspiring to be the starting point for further introduction of advanced analytical models to the labor analytics and large scale surveys – currently mostly examined under a linear scope.



# Chapter 1

## Introduction

It is a well known fact, that technological changes have played a crucial role in rapidly reshaping all aspects of our lives. As with any disruptive and continuous change, technological development keeps on leaving its footprint on our work life as well.

The digital age we are living in has shifted the function of work, with gig-economy and remote work emerging faster than ever, but has also substantially altered its structure. Occupations are created and destroyed, limited and expanded. Some have been left practically intact, while others have seen their content dramatically changing. Work is no faceless concept, as it is inseparably connected to the people conducting it. And it is no surprise that continuous debates in both academic and political cycles discuss the ways and extent that this footprint is being realized by the workforce, as well as how it is to be dealt with.

Within this paper we will review the different approaches on the content of work and how it is affected by technological change. We will approach it from an academic work standpoint, as well as a public organizational standpoint of relevant knowledge creation and analyses conducted. We will be discussing the black-boxed nature of the indices created by the organizations, and how they are used in terms of adult education strategy policy creation.

We will additionally create a practical framework in the form of a python notebook, enabling users to run analyses on readily available data, in a technical and methodological manner that - to the best of the author's knowledge- has not been implemented for the Greek labor force.

The paper is structured in the following way:

Section 2 includes a theoretical framework of work content and the implications of technological change. It reviews the relevant literature, and focuses on the different approaches of work content behind the notions of skills and tasks

Section 3 examines existing national and international organizations and bodies of knowledge regarding the content of work, as well as all related data, such as economical sector & educational classifications. The focus is around the institutions and items relevant to the Greek labor market, but brief examination and comparison is undertaken with additional entities. The section also explores the main labor analyses and indices implemented by the organizations and research entities, while connecting them to the theoretical framework approaches. An overview of academic work that has built on these analyses is also exhibited.

Section 4 clarifies the methodological approach used in order to create a publicly available python notebook, for a comprehensive implementation of labor analytics for the Greek market.

Section 5 discusses the results of an exemplary analysis based on the tool created in section 4, in an attempt to assess the efficiency of predictors to Greek labor market's digital proficiency.

Section 6 discusses the conclusions of the paper to the examined topics, as well as its limitations and proposals for further research.

# Chapter 2

## Theoretical framework of job content

Job content is no new to the academic community. It has historically been a topic of high interest for academics. It was Taylor, in his process of formalizing management practices under the scope of scientific management, stating that “by a great number of people scientific management has come to be known as ‘task management.’” and “[due to technological advancement] the cheap machinist or helper, who before was able to run perhaps merely a drill press, is taught to do the more intricate and higher priced lathe and planer work, while the highly skilled and more intelligent machinists become functional foremen and teachers”(Taylor, 1911, p. 41-43). As their name implies, industrial revolutions like the one currently underway, have many parallels among them to be drawn and have been subject to thorough comparison (Groumpos, 2021). The multifaceted importance of the job content and the workforce skills, however, was a realized fact as early as the first one. As per D. Autor, a task is defined as “a unit of work activity that produces output”. Similarly, a skill is defined as “a worker’s stock of capabilities for performing various tasks” (Autor, 2013, p. 2). Based on the canonical model, Autor expresses their correlation as skills being put in use by labor force, in order to perform a task. However, the interplay of technology and human labor in production creates the need to separately identify tasks related to a job, so as to assess this interaction. The above, and majority of below analyses on the content of work, and its correlation to the skills and tasks, will be based on the ‘human capital’ framework. It is defined as “the skills the labor force processes and is regarded as a resource or asset”. It is known to formally be used as early as 1897, and in economic

research, it has been used in multiple ranges of micro to macro analyses, in order to explain historically, economically and sociologically, economic phenomena that impacted markets, economic growth and the monetary capital structure of societies, in relation to evolving characteristics of the labor force. (Goldin, 2016). The starting point for our discussion will be the interplay between technology, organization, and human capital, which was considered to be responsible for the 67% of the US economic growth during the period 1899-1953, or else the “residual” that could not be explained by the previously realized three-factorial input model; labor, land, capital. (Frank, 1960).

## 2.1 On the classification of tasks and skills

Understandably, not all tasks and skills are identical. Autor (2003), while assessing the computerization implications on occupation content, classified tasks in three broad categories; routine (cognitive & non-cognitive) , non-routine (cognitive ie. analytical & managerial) and (non-routine) manual. Macias & Bisello (2021) create a comprehensive taxonomy of tasks based on two axes; content of task and methods/tools required to conduct them. The key differentiation is that routineness is realized as an implementation nexus, rather than an implicit characteristic of the tasks themselves. As such, while still inherently related to technological development, routineness is treated as “part of the process of organizational change, rather than as something given by the material nature of the production process” (Macias & Bisello, 2021 p.830). The complete taxonomy is summarized in fig 1.

<b>A. In terms of the content:</b>	<b>B. In terms of the methods and tools of work:</b>
<p>1. <b>Physical tasks:</b> aimed at the physical manipulation and transformation of material things:</p> <ul style="list-style-type: none"> <li>a. <i>Strength:</i> lifting people and heavy loads, exercising strength.</li> <li>b. <i>Dexterity:</i> precisely coordinated movements with hands or fingers.</li> <li>c. <i>Navigation:</i> moving objects or oneself in unstructured or changing spaces</li> </ul> <p>2. <b>Intellectual tasks:</b> aimed at the manipulation and transformation of information and the active resolution of problems:</p> <ul style="list-style-type: none"> <li>a. <i>Information processing:</i> <ul style="list-style-type: none"> <li>I. Visual and/or auditory processing of uncoded/unstructured information</li> <li>II. Processing of codified information <ul style="list-style-type: none"> <li>i. <i>Literacy:</i> <ul style="list-style-type: none"> <li>a. Business: read or write letters, memos, invoices,...</li> <li>b. Technical: read or write manuals, instructions, reports, forms,...</li> <li>c. Humanities: read or write articles or books.</li> </ul> </li> <li>ii. <i>Numeracy:</i> <ul style="list-style-type: none"> <li>a. Accounting: calculate prices, fractions, use calculators,...</li> <li>b. Analytic: prepare charts, use formulas or advanced maths</li> </ul> </li> </ul> </li> <li>b. <i>Problem solving:</i> <ul style="list-style-type: none"> <li>I. Information gathering and evaluation.</li> <li>ii. Conceptualization, learning and abstraction</li> </ul> </li> <li>II. Creativity and resolution <ul style="list-style-type: none"> <li>i. Creativity</li> <li>ii. Planning</li> </ul> </li> </ul> </li> <p>3. <b>Social tasks:</b> whose primary aim is the interaction with other people:</p> <ul style="list-style-type: none"> <li>a. <i>Serving/attending:</i> responding directly to demands from public or customers</li> <li>b. <i>Teaching/training/coaching:</i> impart knowledge or instruct others</li> <li>c. <i>Selling/influencing:</i> induce others to do or buy something, negotiate</li> <li>d. <i>Managing/coordinating:</i> coordinate or supervise the behaviour of colleagues</li> <li>e. <i>Caring:</i> provide for the welfare needs of others.</li> </ul> </ul>	<p>1. <b>Methods:</b> forms of work organisation used in performing the tasks:</p> <ul style="list-style-type: none"> <li>a. <i>Autonomy</i> <ul style="list-style-type: none"> <li>I. <i>Latitude:</i> ability to decide working time, task order, methods and speed.</li> <li>II. <i>Control (in reverse):</i> direct control by boss or clients, monitoring of work.</li> </ul> </li> <li>b. <i>Teamwork:</i> extent to which the worker has to collaborate and coordinate her actions with other workers</li> <li>c. <i>Routine</i> <ul style="list-style-type: none"> <li>I. <i>Repetitiveness:</i> extent to which the worker has to repeat the same procedures</li> <li>II. <i>Standardisation:</i> extent to which work procedures and outputs are predefined and encoded in a formalised system</li> <li>III. <i>Uncertainty (in reverse):</i> extent to which the worker needs to respond to unforeseen situations</li> </ul> </li> </ul> <p>2. <b>Tools:</b> type of technology used at work:</p> <ul style="list-style-type: none"> <li>a. <i>Non-digital machinery (analog)</i></li> <li>b. <i>Digitally-enabled machinery</i> <ul style="list-style-type: none"> <li>I. <i>Autonomous (robots)</i></li> <li>II. <i>Non-autonomous</i> <ul style="list-style-type: none"> <li>1. Computing devices <ul style="list-style-type: none"> <li>a. Basic ICT (generic office applications)</li> <li>b. Advanced ICT (programming, admin)</li> <li>c. Specialised ICT</li> </ul> </li> <li>2. Others</li> </ul> </li> </ul> </li> </ul>

fig 1: Taxonomy of tasks based on content of work, methods and tools; Macias & Bisello, 2021

Another foundational aspect of jobs' task content is offshorability. Alan Blinder (2007) offers a comprehensive analysis of the offshorability notion. Offshorable tasks are considered to be assigned to human workforce abroad. So, while not considered a direct technologically substituted task, they are of interest in the course of job task-content replaceability for the following two reasons.

i) Within the context of national (or international - among countries with similar development status) analyses, offshoreable tasks assigned to workers outside the spatial system under examination, impact the job tasks conducted by human labor force in a similar manner with

technological replacement.

ii) Technological innovations are catalysts towards the creation of methods/tools to enable offshorability, and thus themselves impact work conducted by human labor in an immediate manner

On the second note, the lack of a “beam me up, Scott” (Blinder, 2007, p.8) unforeseeable technological innovation in Blinder’s analysis was rendered untrue. Multiple technological developments have heated the debate regarding the “right-shoring” of occupations, and the reasons for and against offshoring occupations (eg. Hilletoft et al, 2019) . Additionally, COVID-19 exponentially and unexpectedly increased remote work and as such, allowed for a faster and wider offshoring of multiple occupations or tasks of them (Baldwin & Dingel, 2021).

In regards to skills, the vast majority of literature discussing labor economics tends to classify the workforce in two distinct groups: high-skilled, and low-skilled. The key differentiator among them is no other than formal education. This should not cause any surprise. Since the initial research on human capital, it was thought that great differentiation in contribution to productivity and wealth distribution existed among workers with different levels of education. This is expressed in one of the first academic works to examine human capital and its relation to education, the latter being described as either consumption or investment, but in any case integral to a person once completed.(Schultz, 1960). With educational attainment becoming more widespread, the majority of papers examine the differentiation in educational levels by mainly splitting them in pre- vs post-tertiary education. An example of this classification is Acemoglu and Autor, who approach the “college/ high school wage premium” and later on separately plot different educational levels’ wage evolution in more detail (“Acemoglu & Autor, 2011 p. 1050 -1056). A more granular approach

to education-skill matching is of Katz & Murphy (1992). In a thorough discussion of between-and-within industries' changes in wage and labor differential, breakouts are created up to years of schooling detail, rather than tertiary degree (non) attainment. These breakouts are combined with work experience and sociodemographic data. A different skills' analysis approach discusses occupational characterization, namely jobs classified as blue vs white collars, attributing low and high skills to each group accordingly, based on their expected requirements. An identical segmentation is found comparing production vs non-production occupations. (Berman et al, 1994). Perhaps the most comprehensive assessment of skills during the early era of systemic classification of skills, defines as skill determinants a multidimensional combination of education, work experience and occupation, as well as "unobserved residuals of skills". (Juhn et al, 1993). Similarly to the residual caused by educationally-enhanced productivity of the labor force during the first half of the century, it is clear that additional attributes needed to be examined. In a sociological - almost existentialist - approach to what exactly constitutes of a skill, Paul Atteweler (1990) heavily criticizes the positivist<sup>1</sup> approach to skills. While out of the present paper's scope, we will be visiting some points of his criticism under different scopes later on. Among others, he considers education to gain an increasingly credentialist nature, rendering it a skills' indicator of continuously deteriorating quality. He also puts into question the abstraction of a skill's definition; too wide of a definition would render it insubstantial to describe an actual ability, since it would enclose multiple context-based sub-skills with different complexity, while too narrow of a definition would assign the skill towards an occupation/task rather than an internal attribute of the person putting it in practice. Indeed, both points were acknowledged by the researchers following the human capital theory model. The first one, as previously expressed, led to the need for additional approaches in skills' definitions. The second was at the time a topic of interest, leading to what was searched for; an additional skills' characteristic - transferability. The first systematic approach to transferability will examine

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<sup>1</sup> As per Attewell, positivist is the approach that a skill is an attribute amenable to quantitative measurement and has an objective character independent of the observer

the retrospective assessment of occupation shifts of the labor force (Shaw, 1984). The assumption behind it is that shifts between occupations underline a commonality in the skills required to perform them. Albeit able to explain much of the within and among sectors movability of the labor force and wage evolution, it comes with certain shortcomings. It is susceptible to job demand, encloses socioeconomic biases that dictate the preferability of specific occupations, and while creating occupational associations, does not categorize skills themselves. Skills' transferability will be investigated under different light as well, such as cross-country skill transferability in the case of immigrants (Jasso, 2002), or context skills transferability in the case of simulated training(Sturm et al, 2008). A second approach to the market-wide skills' transferability will shift the focus from market dynamics to skills themselves, by assessing the KSA<sup>2</sup> similarity across occupations, and thus calculating the total transferability skills of an occupation. (Nawakitphaitoon, 2014; Ormiston, 2014). By KSA we need a framework of extensive documentation of skill, knowledge and abilities, followed by their attribution to occupations. The most widespread and comprehensive KSA frameworks have been conducted by institutions around the world and will be thoroughly discussed in the next section. While simply put, the cross-occupation skill similarity is by no means a simple notion. It comes against the aforementioned criticism on proper skill definition, and additionally the correct skill attribution to an occupation, as well as the relative skill importance between occupations (Nawakitphaitoon & Ormiston, 2016). To address the latter, significance weights were introduced to the model, which have been, however, under examination as per their robustness. A final skill classification examined in this overview , and potentially the most widespread, is of cognitive and non-cognitive skills; also known, and hereafter mentioned as hard vs soft skills. The main focus of our review thus far, and of theoretical economists up until recently, has been on hard skills, defined as “the technical and analytical competencies and know-how that allow the worker to perform the mechanical aspects of a job” (OECD as found in Gabor, Blaga & Matis, 2019). On the other hand, soft

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<sup>2</sup> KSA: Knowledge, Skills, Ability; used interchangeably with Knowledge, Skill, Competence.

skills are defined . The importance of the latter in the labor market and productivity, as well as individual wage growth and success have been highly discussed, mostly by empirical economists.(Deming, 2017; Almlund et al, 2011; Touloumako, 2020; Hendarman, 2017) And while a formalized representation of the exact skills they enclose has been attempted under multiple approaches, they have yet to find their way within theoretical economic models in an explicit manner. In a brief further categorization of them, they can be broken down to intrapersonal (personal), such as the ability of goal-setting and desire for continuous learning, and interpersonal (social), such as communication, active listening, cooperation & negotiation (Cimatti, 2016, p.99 ). They have been found to be highly transferable, and accommodate the transferability of hard-skill knowledge acquired in parallel (Laker & Powel, 2011). They have been accredited causal relation with task performance and adaptability, with a positive correlation of a task's complexity (Heckman & Kautz, 2012). It is more than evident nowadays, that they need to be included in macro-level labor analytics, especially towards the construction of a theoretical framework, as well as new skills' classifications. We will be examining such examples conducted by institutions and organizations in the next section.

## 2.2 Skill-biased technical change

The classification of skills investigated is not conducted without a goal at hand. The vast majority of the literature (and the totality of above references) assesses the skills of human workforce as an identifier of the wage and employment participation inequality of national and global workforce across many markets, as a result of technological change.

Zvi Griliches (1969) is the first, to the author's knowledge, to formally express the superior complementarity of high-skilled labor force with technological capital. It is important to note

that Grillches treats schooling as a directly identical term to skills, and as such uses it for skills measurement. Violante (2016) defines Skill-biased technical<sup>3</sup> change (hereafter SBTC) as “a shift in the production technology that favors skilled over unskilled labor by increasing its relative productivity and, therefore, its relative demand. “. This is the introduction of factor-bias, opposed to Sollow’s traditional conception of factor-neutral technical change. In the same work, discussing the recent Information Technology developments, Violante states that “[SBTC is] a “black box” that needs to be filled with economic content”. (Violante, 2016. p. 2-3). As per his perception, the IT development is (examined as) a case of SBTC. Indeed, analyses of SBTC and its implications in different time periods, have a wide variety of approaches & outcomes. While there is a vast amount of papers exploring the SBTC implications of (parts of) the 1960-1990s period, with different breakouts and controlling variables in their analyses, a top-line understanding of the situation was pretty much commonly accepted, and could be summarized to the below<sup>4</sup> :

- I. The participation of high-skilled workforce increased, with different growth rates, across the examined periods (job polarization)
- II. Skill wage premium growth peaked during the 1980s, and accounted for the majority of wage distribution between high/low skilled employment (wage polarization)
- III. The increased participation of high-skilled workforce accounted for the majority of total wage inequality during 1990s, while returns to education plateaued or diminished, resulting in moderation of total inequality growth (contradiction between job & wage polarization growth)

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<sup>3</sup> The terms technical and technological, in regards to Skill-biased change have been interchangeably used among literature sources

<sup>4</sup> Conclusions were extracted and expressed in a top-line manner based on the agreement by majority of the following sources: Katz & Murphy, 1992; Katz & Autor, 1999; Berman et al, 1998; Machin, 2002; Juhn et al, 1993

The constant widening of wage gap, in favor of high-skilled (ie. highly educated) workforce, expected by SBTC was not empirically validated towards the turn of the century. Trends specific to sectors and socio-demographic groups examined, could also not be interpreted through the SBTC scope. This sparked a great interest from the academic community to provide a framework that could better express the technological implications in the contemporary work environment.

## 2.3 Task-biased technical change

The initial expression of job content as a determinant characteristic towards technical change complementarity is discussed by Autor et al(2003). The workforce classification is no longer done solely based on the attributed skill level, but rather on the combination of the former with the routineness-related classifications of job tasks mentioned above. The research does not shift away from skill-intensive technical changes, but it now includes routine-intensive job tasks. The authors find that occupations with routine tasks, both cognitive and manual, face a declining demand in the labor market. On the contrary, non-routine tasks are in increasing demand - irrelevant to their cognitive or manual nature - and can mostly explain the increasing high-skilled work participation observed in the 1960-1998 period. Using the Dictionary of Occupational Titles, the authors explore the change in occupation skills' requirements, under the scope of industry task input. Spitz (2005, p.4) considers the inclusion of routineness task intensity of skills, to "shed light on the 'black box' that typically encloses studies on SBTC". Drawing a parallel to the routine attribute, Caines, Hoffman & Kambourov (2017) examine the correlation of task-complexity to wage and its growth, finding a positive correlation, while given a task complexity, its routineness is not a strong determinant of the wage metrics. She then proceeds to one of the first empirical researches of task-based occupation development in the European region. A key

contribution of the paper in the domain is the usage of labor surveys that directly examine the claimed tasks that individual workers exercised in their occupation. Goos et al (2009) expand the research across Europe, using the unified Labor Force Survey (LFS). The task content of occupations' is acquired through the O\*Net database (discussed below), in a more prescriptive manner than Spitz's. Most of the analyses during the period come to the conclusion - driven by multiple hypotheses and approaches - that the larger decline in employment participation was not towards low-skilled occupations, but rather from middle-skilled occupations that the routinization effect was mostly evident. On the contrary, low-skilled occupations - with low routinization levels - met an increase in demand. This was formally expressed as "job polarization". (eg. Goos & Manning, 2007). From a sociological standpoint, this expresses the ethnomethodological paradox. tasks that might be considered as low-skilled enclosed a level of unconscious automation that required their embodiment by the actors; while highly complex in their nature, their wide spread across humans deemed them devalued. However, when it came to codifying and automating them, technological entities found it extremely difficult to replicate. This was especially evident in early stages of AI systems (Attewel, 1990). The positivist approach to the matter can be found in Acemoglu & Autor (2011), who consider job polarization to co-exist with wage polarization, as the demand for low-skilled workers was under low-wage jobs, increasing the previously examined wage gap/return on education/wage inequality. As such, regardless of their intrinsic complexity, 'low-skilled' tasks were conducted by human labor due to their low cost - and as such high opportunity cost of their technological replacement. An important note on the above, is the usage of mean occupational wage as the occupations skill percentile determinant (Acemoglu & Autor, 2011, p. 1070-1071); an even coarser approximation of skills compared to educational attainment previously discussed on SBTC. They attribute their initial analyses to what was called "the canonical model". Under the canonical model, technological advancements were considered to be relatively stable, and sector/occupation agnostic. On the contrary, their incorporation of a Ricardian approach to a newly proposed analytical framework provides two key analytical breakthroughs; i) Strictly separates skills

from tasks and ii) Introduces the worker's comparative advantage. More specifically, the comparative advantage is the relative implementation factor of skill-level workers for a specific task, implying that high-skilled workers could perform low-skilled tasks more efficiently. The introduction of those breakthroughs allows for multiple new analyses, and superior explainability of the technological implications in the labor market.

Some self-derived newly possible analyses are the following:

- I. Chronological evolution of task content between and within occupations
- II. Skills assignment to tasks and occupations
- III. Productivity premium of skill-possessors on specific task

Building on the above, Autor & Handel (2013) provide empirical validation on the predictability of relative wage through the task content occupational standpoint, and additionally provide an interesting analysis approaching skills (spanish-speaking population) with a clear societal non-neutrality, towards a tendency for increased manual and routine occupations. This was also evident compared to educational counterparts that were not Spanish speakers. (p. S92).

# Chapter 3

## Standardizing labor data:

Labor force data surveys, labor data classifications, academic and institutional labor analyses.

Under this chapter we provide an extensive - yet not exhaustive - exploration of available workforce data. We approach it through the lens of large-scale surveys, by assessing the most important ones gathering information regarding occupational representation and job content - including EU countries. -We also examine data classifications. More specifically, we explore occupational classifications, skills & knowledge classifications, and sector classifications. We focus on institutions that base their analysis on European labor - reaching a national granularity level for the Greek market - and briefly discuss their comparison with other international equivalents. Finally, we discuss some of the substantial analyses the institutions & organizations conduct and assess their compatibility with the theoretical frameworks visited in the previous section.

### 3.1 Large Scale Surveys & Workforce Data Availability

Arguably there are three main sources of Labour Data for European countries, all of which are of unique importance and, while partially overlapping, they arguably provide analytical potential that cannot be met by their counterparts.

### 3.1.1 Labor Force Statistics (LFS)

Conducted by EU members' national statistical institutes under common principles, and gathered by Eurostat under 'EU - LFS', Labor Force Statistics is a quarterly survey deployed to a sample of the EU citizens over 15 y.o., on a person and household basis; For Greece, the sample size is around 43000 (Eurostat, 2019). The main goal of the survey is to keep track of various aspects of employment, and mostly to classify potential workforce to employed, unemployed, and people outside the labor force. Measured data are split to quarterly and yearly/biennial, but in both cases can be split to the below categories as per Eurostat:

- Person and household characteristics (eg. Sex, Age, Birth Country)
- Labor Market Participation (eg. Work Status, Unemployment reasons, Occupation & Sector)
- Educational attainment & background (educational level)
- Job tenure, work biography and previous work experience (Job duration & history)
- Working conditions including working hours and working time arrangements (eg. overtime)
- Participation in education and training (eg. recent participation in formal/informal training)
- Income, consumption and elements of wealth, including debts (eg. income level)

In terms of related data classification (discussed in more detail later on), LFS uses NACE v2 for Economic Activity (Sector) classification, and ISCO-08 for occupational classifications. It is important to note that the survey covers no aspect of skills within occupations through collected or derived variables. The only relevant reference is the recent participation in (non) formal training programs. Household-level aggregation allows for analyses on their composition, and how interpersonal relationships are affected/affect occupational status & relevant indicators. At the same time, the duration and frequency of the survey's waves allow for time series analyses, exploring how multiple measures (eg. unemployment) evolves over

time with the short time intervals capturing seasonal employment. It is, however, evident, that the dataset is not fit for a complete analysis of the labor workforce, especially under the scope of skills & content of work.

### 3.1.2 European Skills and Jobs Survey (ESJS)

ESJS is a periodical survey conducted by Cedefop (European Center for the Development of Vocational Training - further discussed below). With a targeted cycle of 5-6 years, ESJS has had its first wave carried out in 2014, and its second wave carried out in 2021 and currently (2023/2024) deployed. The first wave, currently publicly available, has a sample size of 2037 valid respondents for Greece. As per Cedefop (Cedefop, 2023l), the survey includes variables that cover:

- sociodemographic characteristics
- job characteristics
- job-skill requirements (literacy, numeracy, digital, analytical, manual and interpersonal skills)
- skill mismatches (vertical; horizontal; mismatches in specific skills; skill gaps and deficits; skill mismatch transitions)
- initial and continuing vocational education and training participation;
- labor market outcomes (wages, job insecurity, job satisfaction)

ESJS only includes salaried employees, leaving outside its scope self-employed or unemployed workforce. Within this sample, however, its questionnaire covers multiple aspects of job content & work conditions. We will focus on the approach of skill & task based information gathered, since this will be our discussion base on the experimental part of the paper. (cedefop, 2015b). ESJS covers the occupation classification based on ISCO Classification (major & sub-major group levels, sometimes loosely in group namings) and the educational classification based on ISCED, but follows a different, while similar economic

activity classification compared to NACE or ISIC. Occupational qualification assessment is conducted through collecting qualifications of workers within an occupation, and their perceived qualification requirements for the acquisition, as well as the effective conduct of their work with today's standards. Similarly, the skills associated with an occupation are collected through the self assessment of employees regarding the required level of specific skill groups for the effective conduct of their work, the importance of those groups, as well as their skill level, relative to the required one. Job satisfaction, work progress and training through, while, or in parallel with working are also tracked. Data for the incentives for the job acquisition, skills' comparison to previous work, as well as household status are also gathered. The focus on the content of work is evident within the survey, as it is also its main goal. ESJS is a great source of knowledge regarding the content of modern days' occupations'. It does not come, however, without its shortcomings. Leaving out of its scope self-employed and unemployed workforce, the survey misses a lot on the skill structure of each national workforce, in terms of skills employability, representativeness of skills development within a country - especially countries like Greece that have a significantly lower vs avg number of avg employees per company-. Additionally, the reliance on self reported data intrinsically gathers multiple biases. This holds both regarding existing, but mostly regarding expected skills for an occupation, as well as the self assessment of employees; especially while expected to rate themselves while wearing the societal 'hat' of the employee. Regarding the content of work itself, while multiple skill groups are assessed, and so are some work characteristics (non-routine tasks, work autonomy etc.), no tasks are tracked. This impacts the potential of content-based analyses, as well as overlooks an easier assessment domain by the employees themselves. At the same time, the frequency of the waves does not allow for a consistent trend assessment. While comparison between waves in key metrics is expected, this is a snapshot comparison, rather than an evolution tracker. Also, despite the limited household information gathered in the survey, many analyses possible with LFS data, cannot be conducted with ESJS (eg. intergenerational evolution of

educational level within households, employment participation of second generation immigrants, etc.).

### 3.1.3 Programme for the International Assessment of Adult Competencies (PIAAC)<sup>5</sup>

PIAAC is a work of OECD (Organization of Economic Cooperation and Development). It is defined as ‘a program for assessment and analysis of adult skills’. It is the adult equivalent of PISA, a student’s skills programme conducted by the same organization. OECD produces publications based on PIAAC data among other sources, which will be thoroughly discussed later on. PIAAC data survey is conducted in over 40 countries, extending the international spectrum outside the EU which was a common attribute of the two previous datasets. The survey has a declared 10 year interval, with the first cycle implemented in three rounds (2011-2018), the first round of the second wave to be published in 2024, and an additional round planned for 2024-2029. PIAAC uses a sample of 5000 valid respondents for each participating country (with an above 90% completion rate as an accepted margin). PIAAC includes people with all types of employment, unemployed, and non-participants to the labor force, aged 16-65. The survey gathers background data including sociodemographics, occupational and sectoral information. It also uses ISCO & ISCED for occupation and education classification respectively, but uses ISIC instead of NACE for economic activity classification. The comparison between the two classifications will be discussed later on, but it is important to note that they are directly comparable. PIAAC also collects ‘a broad range of information,

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<sup>5</sup> All information gathered from <https://www.oecd.org/skills/piaac/about/#d.en.481111>, unless differently stated

including how skills are used at work and in other contexts, such as the home and the community'.

We will briefly examine some topics that PIAAC cover in terms of variables (OECD, 2016)

#### Education:

- Highest/Current/Incomplete educational level & study domain
- Recent (non) formal education participation (P12M), & employer involvement

#### Work:

- Current/Previous sector/occupation
- Reasons for unemployment/methods of job search

#### Work Skills:

- Frequency of tasks/activities within work & in everyday life (as skills proxies)
- Worker's skill level relative to job requirements
- Self-assessment on literacy,numeracy proficiency

#### Personality traits & values:

- Self assessment on personality traits (eg. connect ideas with applications, willingness to learn)
- Social perceptions (eg. others' tendency to take advantage off people, citizen participation in governmental decisions)

While PIAAC does not cover the household level respondents' relationship that LFS does, it captures many crucial data for intergenerational analyses (eg. respondent's & parents' country of origin, parents' educational level, years since migration to Greece). In addition to the gathered information of the survey, PIAAC includes a testing module, which includes a number of questions and tasks, and measures three key scores; literacy, numeracy, problem solving in technology-rich environments (PSTRE) . It is the only source that examines actual proficiency scores, apart from the self-reported proficiency proxies by the respondents. This enables interested parties to perform analyses that not only rely on actual proficiency scores, but also compare those scores with the multiple self-assessments, sociodemographic data and occupation,education,economic sector aggregates.

Based on the above, we consider PIAAC to provide the most useful information as a single source of skills, job content & labor force analytics, and thus it will be the source survey for the experimental section of the present paper. In the relevant section, further methodological details and information gathered by the variables, will be discussed.

## 3.2 European Commission

### 3.2.1 DigComp

DigComp (Digital Competency Framework for Citizens) is a framework constituted of 5 dimensions, that measures the digital literacy across a few sectors of European citizens. Identified by the European Union (Vuorikari et al, 2022a), and expressed by the European Commission, as one of the key competencies to be achieved through lifelong learning, is classification is as follows:

I. Dimension 1 consists of five competence areas; namely:

- A. Information and data literacy
- B. communication and collaboration
- C. Digital content creation
- D. Safety
- E. Problem Solving

The content of each area is briefly described below, in fig 2.

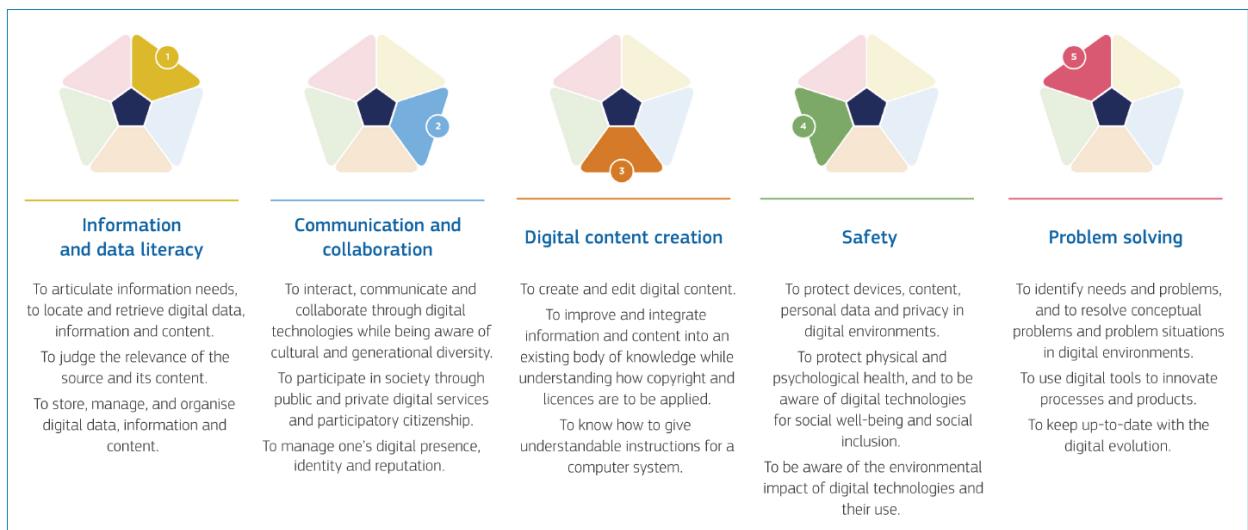


fig 2. Brief description of Dimension I competence areas. Vuorikari et al, 2022a

It is noteworthy that the first three dimensions can be attributed to specific activity/uses, while the latter two are applied to any digital activity carried out (transversal).

## II. Dimension 2 maps the competence areas to more specific competences, as shown in fig 3.

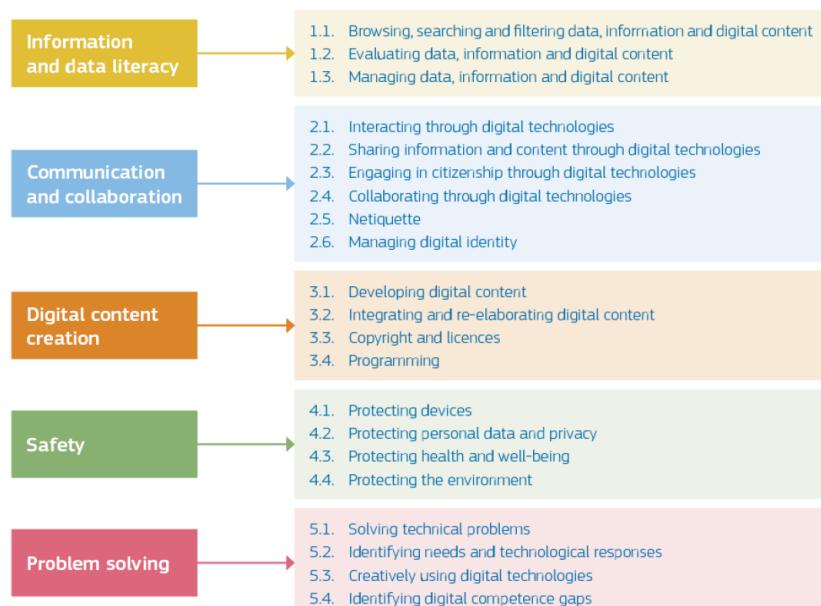


fig 3. Dimension II competences to competence areas. Vuorikari et al, 2022a

III. Dimension 3 examines the proficiency of a specific competence. With “Developing digital content” as an example, dimension 3 consists of the below statements towards



FOUNDATION	<b>1</b> At basic level and with guidance, I can:	<ul style="list-style-type: none"> <li>identify ways to create and edit simple content in <b>simple</b> formats,</li> <li>choose how I express myself through the creation of <b>simple</b> digital means.</li> </ul>
	<b>2</b> At basic level and with autonomy and appropriate guidance where needed, I can:	<ul style="list-style-type: none"> <li>identify ways to create and edit <b>simple</b> content in simple formats,</li> <li>choose how I express myself through the creation of <b>simple</b> digital means.</li> </ul>
INTERMEDIATE	<b>3</b> On my own and solving straightforward problems, I can:	<ul style="list-style-type: none"> <li>indicate ways to create and edit <b>well-defined and routine</b> content in <b>well-defined and routine</b> formats,</li> <li>express myself through the creation of <b>well-defined and routine</b> digital means.</li> </ul>
	<b>4</b> Independently, according to my own needs, and solving well-defined and non-routine problems, I can:	<ul style="list-style-type: none"> <li>indicate ways to create and edit content in different formats,</li> <li>express myself through the creation of digital means.</li> </ul>
ADVANCED	<b>5</b> As well as guiding others, I can:	<ul style="list-style-type: none"> <li>apply ways to create and edit content in different formats,</li> <li>show ways to express myself through the creation of digital means.</li> </ul>
	<b>6</b> At advanced level, according to my own needs and those of others, and in complex contexts, I can:	<ul style="list-style-type: none"> <li>change content using the <b>most appropriate</b> formats,</li> <li>adapt the expression of myself through the creation of the <b>most appropriate</b> digital means.</li> </ul>
HIGHLY SPECIALISED	<b>7</b> At highly specialised level, I can:	<ul style="list-style-type: none"> <li>create <b>solutions to complex problems with limited definition</b> that are related to content creation and edition in different formats, and self-expression through digital means.</li> <li>integrate my knowledge to contribute to professional practice and knowledge and guide others in developing content.</li> </ul>
	<b>8</b> At the most advanced and specialised level, I can:	<ul style="list-style-type: none"> <li>create <b>solutions to solve complex problems with many interacting factors</b> that are related to content creation and edition in different formats, and self-expression through digital means.</li> <li>propose new ideas and processes to the field.</li> </ul>

the competence proficiency level.

fig 4. Dimension 3 mapping of proficiency possession key activities; case examination of “Developing Digital Content” Competence. Vuorikari et al, 2022a

IV. The fourth dimension provides tangible examples of knowledge, skills and relevant attitudes regarding each competence.

V. The fifth, and final dimension of the framework includes use cases of the competence in learning and working scenarios.

Using the above example, dimensions 4 & 5 for “Developing digital Content” are displayed in fig 5

DIMENSION 4 • EXAMPLES OF KNOWLEDGE, SKILLS AND ATTITUDES		DIMENSION 5 • USE CASES
<b>KNOWLEDGE</b> 	<p>118. Knows that digital content exists in a digital form and that there are many different types of digital content (e.g. audio, image, text, video, applications) that are stored in various digital file formats.</p> <p>119. Knows that AI systems can be used to automatically create digital content (e.g. texts, news, essays, tweets, music, images) using existing digital content as its source. Such content may be difficult to distinguish from human creations. (AI)</p> <p>120. Aware that “digital accessibility” means ensuring that everyone, including people with disabilities, can use and navigate the internet. Digital accessibility includes accessible websites, digital files and documents, and other web-based applications (e.g. for online banking, accessing public services, and messaging and video-calling services). (DA)</p> <p>121. Aware that virtual reality (VR) and augmented reality (AR) allow new ways to explore simulated environments and interactions within the digital and physical worlds.</p>	<p><b>NEW IN 2.2</b></p>  <p><b>FOUNDATION</b></p> <p><b>EMPLOYMENT SCENARIO:</b> develop a short course (tutorial) to train the staff on a new procedure to be applied in the organisation</p> <p>With the help of a colleague (who has advanced digital competence and who I can consult whenever I need) and having as support a tutorial video with the steps on how to do it:</p> <ul style="list-style-type: none"> <li>I can find out how to add new dialogues and images onto a brief support video already created on the intranet to illustrate the new organisational procedures.</li> </ul>
<b>SKILLS</b> 	<p>122. Can use tools and techniques to create accessible digital content (e.g. add ALT text to images, tables and graphs; create a proper and well-labelled document structure; use accessible fonts, colours, links) following official standards and guidelines (e.g. WCAG 2.1 and EN 301 549). (DA)</p> <p>123. Knows how to select the appropriate format for digital content according to its purpose (e.g. saving a document in an editable format vs one that cannot be modified but is easily printed).</p> <p>124. Knows how to create digital content to support one's own ideas and opinions (e.g. to produce data representations such as interactive visualisations using basic datasets such as open government data).</p> <p>125. Knows how to create digital content on open platforms (e.g. create and modify text in a wiki environment).</p> <p>126. Knows how to use Internet of Things (IoT) and mobile devices to create digital content (e.g. use embedded cameras and microphones to produce photos or videos).</p>	<b>LEARNING SCENARIO:</b> prepare a presentation on a certain topic that I will make to my classmates
<b>ATTITUDES</b> 	<p>127. Inclined to combine various types of digital content and data to better express facts or opinions for personal and professional use.</p> <p>128. Open to explore alternative pathways to find solutions to produce digital content.</p> <p>129. Inclined to follow official standards and guidelines (e.g. WCAG 2.1 and EN 301 549) to test the accessibility of a website, digital files, documents, e-mails or other web-based applications that one has created. (DA)</p>	<p>Helped by my teacher:</p> <ul style="list-style-type: none"> <li>I can find out how to create a digital animated presentation, using a video tutorial from YouTube provided by my teacher to help me to present my work to my classmates.</li> <li>I can also identify other digital means from an article in my textbook that can help me to present the work as an animated digital presentation to my classmates on the interactive digital whiteboard.</li> </ul>

fig 5. Dimension 4 & 5; knowledge, skills and attitudes & use cases of competences; case examination of “Developing Digital Content” Competence. Vuorikari et al, 2022a

DigComp is not a labor specific, but rather a broader citizen classification framework. It also does not provide directly quantifiable attributes, but rather descriptive data that provide directions towards the mastery of a competence. However, its use cases include employment scenarios, and it has been the basis of ESCO’s (discussed below) digital skills identification. Large-Scale labor surveys also include questions for the respondents, which correspond to the competencies defined by DigiComp.

### 3.2.2 ESCO Classification<sup>6</sup>

The ESCO (European Skills, Competences, Qualifications and Occupations) is a classification project under the European Commission's jurisdiction, developed by Directorate General Employment, Social Affairs and Inclusion (EC-DG EMPL) in collaboration with Cedefop (examined below in detail). Initially launched in 2017 and undergoing continuous improvement, ESCO has its latest version (as of August 2023) 1.1.1 deployed in 2022.

ESCO is based under three main pillars: Occupations, Skills and Qualifications. Each pillar has their own classification levels.

Two main entities across ESCO classification pillars are concepts and terms.

A concept is defined as a language independent “thing, idea or shared understanding of something”. On the other hand, a term is the “linguistic description of a concept”.

#### **Occupations' classification**

ESCO adopts ILO's<sup>7</sup> definition for occupations, as ‘a set of jobs whose main tasks and duties are characterized by a high degree of similarity’. The same applies for jobs, which ILO defines as ‘a set of tasks and duties carried out, or meant to be carried out, by one person for a particular employer, including self-employment’. Jobs are classified under occupations, which in turn are classified under occupation groups. Top level ESCO occupational groups are identical to the ISCO classification ( International Standard Classification of

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<sup>6</sup> Unless differently stated, the source of this subsection is EC-DG EMPL, 2017

<sup>7</sup> ILO: International Labor Organization

Occupations), on which ESCO builds in more granularity, down to the job level. At the same time, ESCO provides a translation to each common level, in almost all EU languages. Within ESCO, an occupational profile includes a short description, expected skills & knowledge, required typical qualifications, and (non-)preferred terms of a job/occupation.

### **Skills, knowledge & competencies' classification**

Knowledge, skills and competencies (hereafter skills) are attributed to each job. The key differentiator of attributions to a job, is whether the examined term is essential or optional. The definitions of skills, knowledge & competencies are adopted by the Council Recommendation on the European Qualifications' Framework for lifelong learning (hereafter EQF) (CoEU, 2017) and are summarized in Table 1.

**Table 1.** Definitions of knowledge, skill, competence used in ESCO ( EC-DG EMPL, 2017)

Term	Definition
Knowledge	The body of facts, principles, theories and practices that is related to a field of work or study. Knowledge is described as theoretical and/or factual, and is the outcome of the assimilation of information through learning.
Skill	The ability to apply knowledge and use know-how to complete tasks and solve problems. Skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).
Competence	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations, and in professional and personal development.

ESCO also Classifies Skills in four categories based on their transferability, as shown in Table 2

**Table 2.** Transferability Classification of Knowledge, Skill, Competence ( EC-DG EMPL, 2017)

<b>Category</b>	<b>Transferability level</b>
Transversal	Relevant to broad range of occupations/sectors
Cross - Sector	Relevant to occupations across several economic sectors
Sector Specific	Relevant to multiple occupations within a specific sector
Occupation- Specific	Usually only applied to one occupation/specialism

Skills are also structured in four distinct approaches:

1. Relationship with occupation
2. Relationship with relevant skills<sup>8</sup>
3. Hierarchical structures<sup>9</sup>
4. Functional subset correlations<sup>10</sup>

## Qualifications Classification

Based on the definition adopted from EQF (CoEU, 2017), qualification is defined as the “formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards). ESCO includes two qualifications provided by EQF- based national body

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<sup>8</sup> Mostly occurs between transversal & less transferable skills, providing skill contextualisation

<sup>9</sup> The hierarchical structure only holds true for transversal skills, due to their semantics breadth. They are organized under five headings; thinking, language, knowledge application, social interaction, attitudes & values.

<sup>10</sup> The functional correlation groups skills that would have similar use cases, so as the linguistic similarity with other skills would not interfere in a skillset exploration. The three existing groups are digital transversal (replicating digicomp), transversal, and language skills

Qualification databases, as well as other awarding bodies' provided qualifications directly provided to ESCO. The qualifications are approached during the learning outcomes approach. This allows for the below interrelation of the three pillars shown in fig 6. Through the concept of learning outcomes, occupational skill requirements can be matched to skills acquired through recorded qualifications. We can perceive this as an evolution of the educational attribution to skill. The attribution of education levels to the skill groups need not be arbitrary anymore, but can be backed by the skill, competence framework, and examined by case.

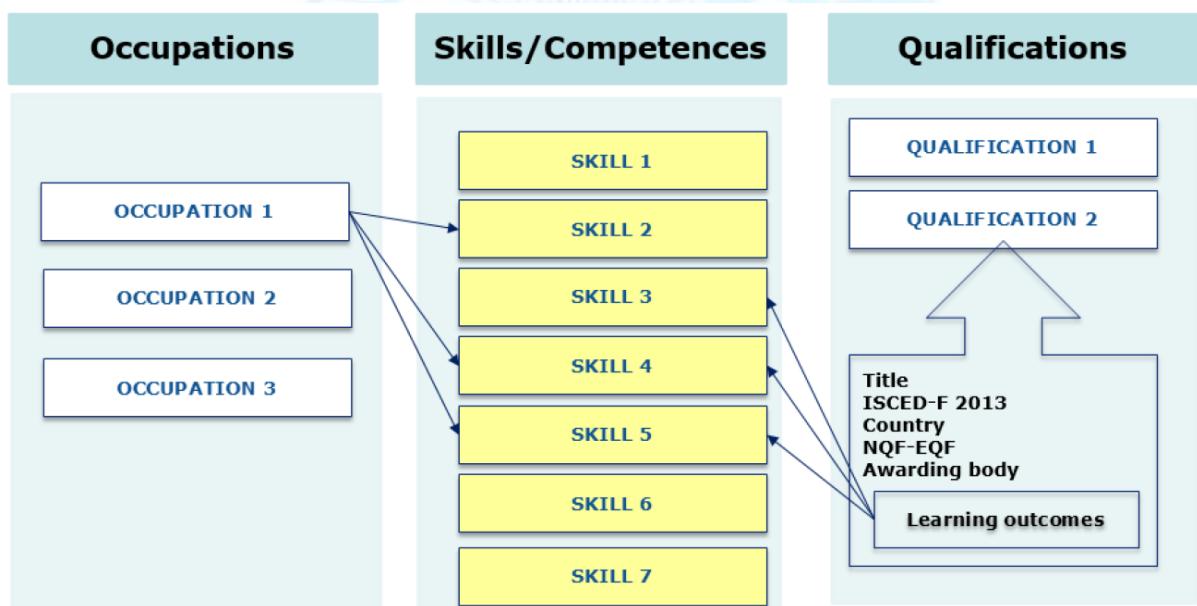


Fig 6: Occupations, skills & qualifications interrelation; EC-DG EMPL, 2017

A noteworthy topic discussed within ESCO's handbook, is in regards to the notions of 'semantic interoperability' and 'linked open data'. The idea of semantic interoperability data realizes each knowledge and cognitive process result as having its potential only partially exploited, until the very moment that it is integrated to an analysis system, and/or combined with other knowledge sources. Linked open data is nothing more than a methodology of construction and publication of such knowledge sources, which enables the interoperability.

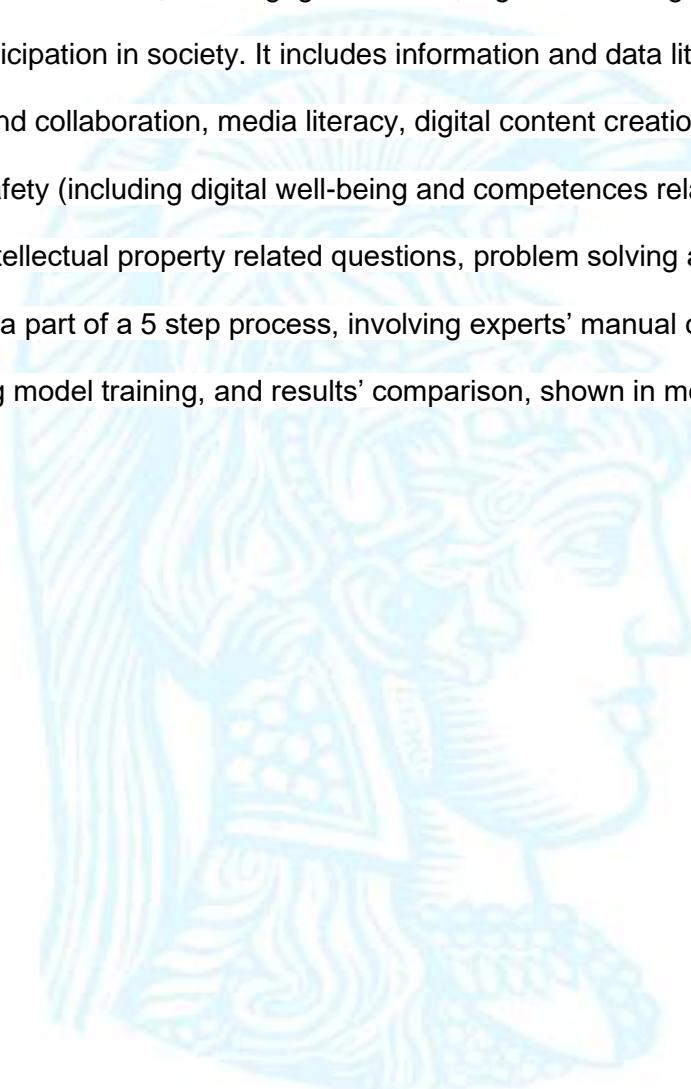
## **European frameworks and their international counterparts**

We briefly (but outright) discussed the way ESCO occupations' classification incorporates ISCO within its top-level hierarchical groups. It is important here to examine the role of some more EU classification frameworks - directly related to ESCO -, and compare them to their international counterparts. We will start with the role of EQF compared to ISCED. ISCED is an international standardized framework to classify levels and domains of education. While EQF executes a similar role in the education classification scope, it does so with a specific goal in mind. Through the learning outcome, it provides meta-data with a skill-like form, allowing for the integration of multiple classification bodies-of-knowledge, as discussed earlier. At the same time, it provides a framework for national databases and multiple institutions to provide readily comparable, and translated data of their own markets. As such, we consider it to play the role of the intermediate towards data unification, rather than a standalone source of knowledge. The same applies in the ESCO-ISCO classification, where reaching to a job level, ESCO achieves to attribute a set of skills and knowledge. This enhances the integration-driven mindset that was previously discussed. At the same time, the proximity of both frameworks to their international counterparts is evident, both in their pairwise structural similarity, as well as in the inclusion of the international frameworks in the regulatory specifications for the national adaptations of such knowledge sources. NACE, the European Classification of Economic Activities follows a similar derived approach with its international counterpart (ISIC). Their top levels are identical, while more granular levels of NACE can be aggregated to more granular subgroups of ISIC (Eurostat, 2008).

## **Digital Skills in ESCO Classification**

Digital occupations and skills have been second to very few discussion topics in the recent labor analysis research community, as well as educational and occupational policy-making

institutions. ESCO has provided a very impactful piece of work within the context of its continuous evolution; the digital labeling of skills & knowledge. (Vuorikari et al, 2022a) The “digitalness” of a skill or knowledge was the first characteristic in ESCO’s labeling system that had its own label, followed by their “greeness”. They still remain the only two. ESCO uses DigComp’s definition of a digital competence, which is one that “involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking”. Digital labeling is a part of a 5 step process, involving experts’ manual classification, a Machine Learning model training, and results’ comparison, shown in more detail in fig 7



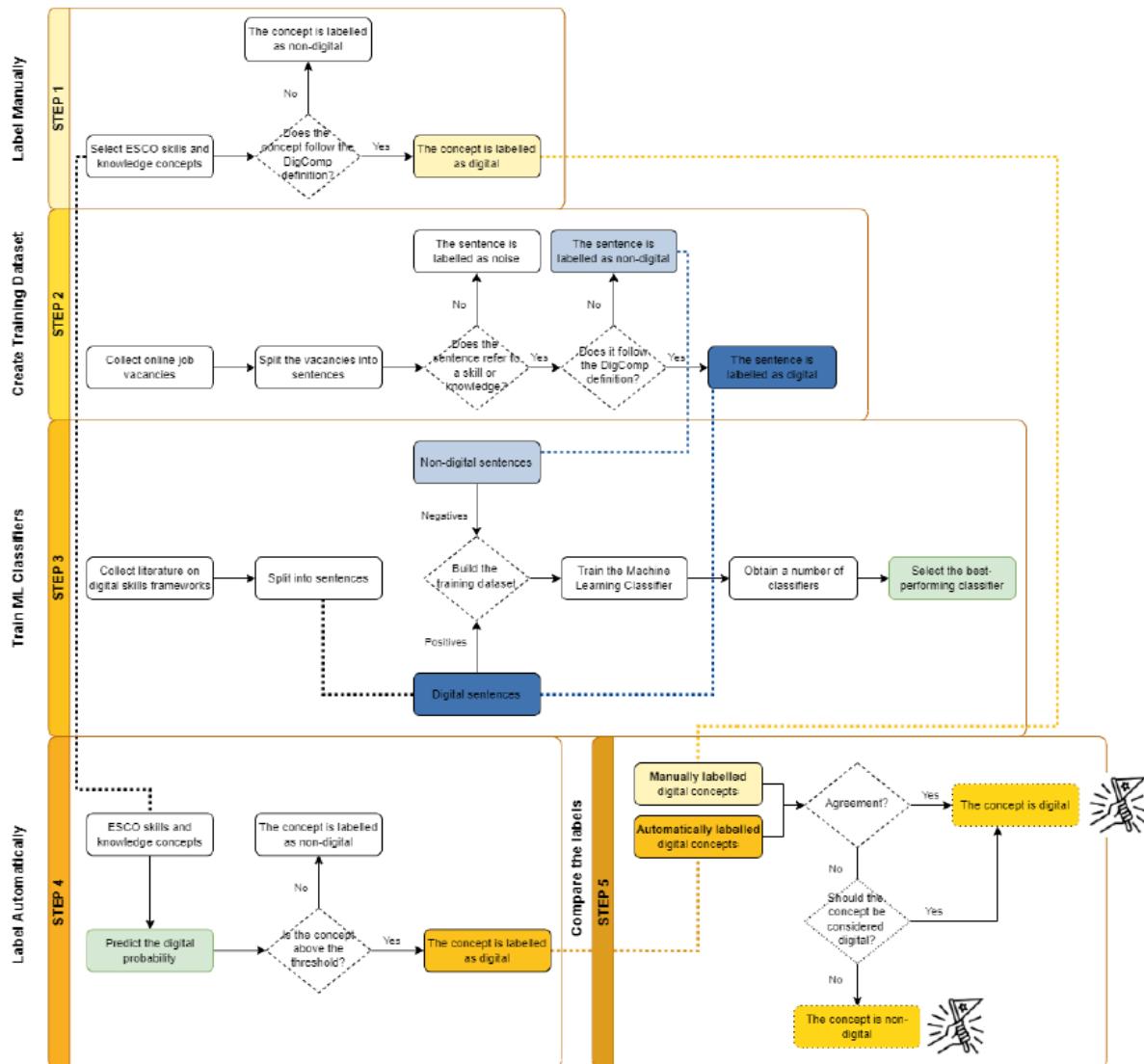


Fig 7: Digital labeling methodology; European Commission, 2022a

The key actions per step of the methodology are the following:

1. Manual labeling of skills based on the definitions of DigComp 2.2 framework
2. Manual labeling of Online Job Vacancies (OJAs) from EURES<sup>11</sup> database per sentence
3. BERT ML Classifying algorithm training, with step 2 & literature frameworks as inputs
4. ESCO concepts' digital probability calculation with ML model from step 3

<sup>11</sup> European Cooperation Network of Employment Services

## 5. Concept labeling & manual validators' revision in case of labeling disagreement

The end result is a set of 1201 ESCO concepts labeled as digital.

### The O\*NET - SOC Case

The United States has also implemented their own approach on the standardization of occupation content. This is built behind two main pillars: i) SOC (Standard Occupation Classification) and ii) O\*Net. SOC is what we would consider the equivalent of ISCO classification, as it provides 4 levels of occupational classification (International Labor Organization, 2016; Bureau of Labor Statistics, 2014). The comparison of the hierarchical levels is shown in table 3.

**Table 3.** SOC (US) , ISCO Classification levels' comparison\*.

SOC Level	ISCO Level
Major Occupation Group	Major Group
Minor Occupation Group	Minor Group
Broad Occupation	Sub-minor Group
Detailed Occupation	Unit Group

\* Levels shown in the same line, do not necessarily enclose the same occupations/groups in both sources

Intuitively, O\*NET is the equivalent of ESCO. The first major difference between O\*NET and ESCO is that O\*NET does not always provide additional levels of granularity for occupations, compared to its structure basis (SOC). Indeed there are cases where O\*NET provides additional classification levels (eg. 17-2112.01 Human Factors Engineers and Ergonomists, belonging to 17-2112 Industrial Engineers Unit Group) (Gregory and Lewis, 2019). However, most of the times this is not the case, and O\*NET retains the granularity of SOC, in contrast to ESCO that provides additional classification levels on top of ISCO classifications. The key functional similarity between O\*NET and ESCO is the enclosure of skills, knowledge & competencies (abilities in O\*NET vocabulary). However, the aspects' inclusion within each framework vary substantially. Following are some elements included in O\*NET that are not met (or are heavily differentiated) in ESCO.

i. Education, experience, training

Standalone files map occupations to expected education, experience & training - as does ESCO. A key differentiating concept included in this subset of files is that of “job zone”. It is the categorization of occupations to synthetic actions’ bundles, so as a worker of each occupation to be fully prepared for what is expected *in principle*.

ii. Interests

The interests module contains mappers of occupations of the “five profiles” (RIASEC) interests framework, through a “basic interests” intermediate extraction from the key activities & all relative job profile details of O\*NET (Rounds, Putka & Lewis, 2023). It offers a reverse direction mappings to illustrative activities & illustrative occupations of specific interests.

iii. Work Values & Work Styles

The subsection includes mapping of O\*NET occupations to Work Styles (a not strictly defined notion, albeit organized to 7 dimensions breaking down to 16 factors, such as independence & social orientation) and occupational value profiles (OVPs), based on the theory of Work Adjustment (Rounds et al, 2008).

#### iv. Work context

Work context is the totality of physical, interpersonal & structural characteristics of a job, with attributes ranging from time spent in body positions, to consequence of error.

#### v. Tasks

The tasks subset of files includes nominal mapping, intensity rating, task group & emerging tasks' mapping to O\*NET occupations.

#### vi. Work Activities

This subset of files creates a task-based activities mapping for O\*NET occupations, through the usage of three detail-levels of activities' description and intermediate mappers.

#### vii. Technology Skills & Tools Used:

The corresponding files map O\*NET occupations to the expected technological skills to be possessed, as well as tools to be used. The technology skills' file is the rough equivalent of the 'digital' label in ESCO's terminology.

Additional data include related domains & occupations, data collection references, as well as competency frameworks.

It is clear up to this point, that O\*NET offers a much more wide and structured representation of labor related data enclosed within its database. That is especially when compared to ESCO, which heavily relies on adopting seemingly independent classifications for multiple data dimensions it makes use of. It is worth noting that in O\*NET, different files have drastically different design, examination and updating approaches and protocols. Methodological choices vary from the input of questionnaires provided by O\*NET and completed by randomly assigned citizens, to experts' identification of trends from online job vacancy sources. It is, however a common practice for O\*NET to be more frequently assessed and updated across its aspects (about once a year as per the past 4 years' archive of update reports).

In a schematic representation, fig 8 is the summary of what O\*NET calls "The content model". It separates the aforementioned concept groups based on the worker - job oriented axis, as well as specific - agnostic to occupation data axis.

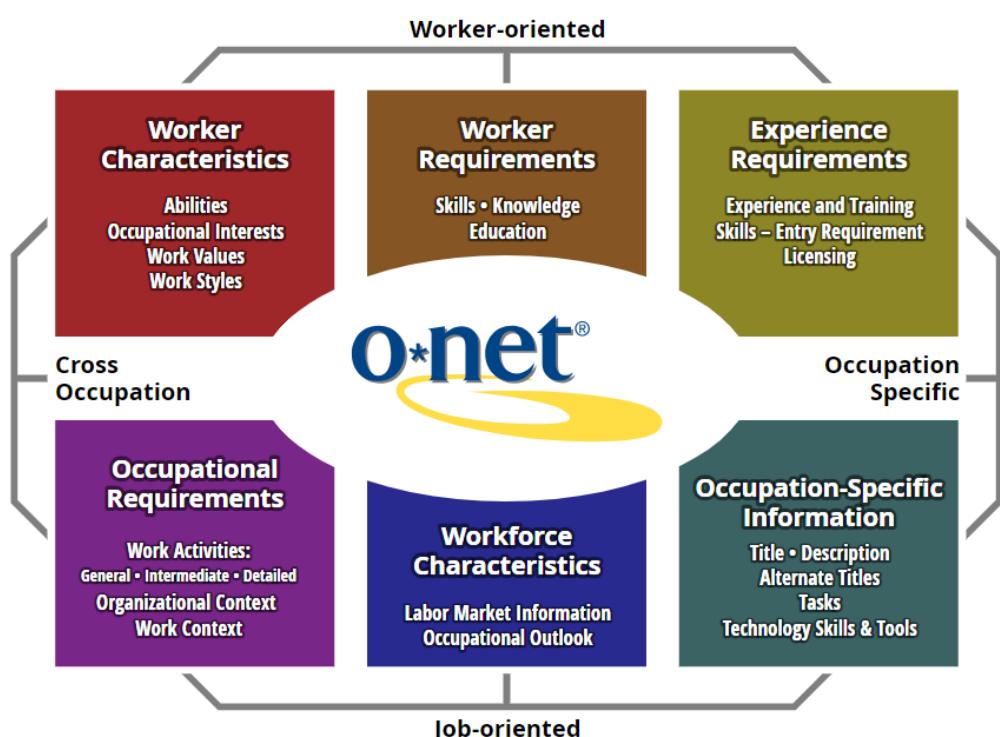


Fig 8: O\*NET's Content Model graphical representation, <https://www.onetcenter.org/content.html>

From a societal point of view, there are two topics that need to be addressed. The first one is in regards to 'over-standardization' of occupations. The attempt to cover in the most detailed approach all relevant aspects to workers & occupations, creates a narrative and cultivates a common understanding that the provided dataset is exhaustive, rather than extensive. As a result, every occupation is strictly defined, not only in terms of job content, but also at a very narrow candidate profiling; a situation that can easily lead to social exclusions and biases, either based on policy makers' and recruiters' own biases, or by the de facto superiority of specific social groups, in regards to specific attributes, values etc. It is thus critical to realize the directional, instead of directive, nature of the available data. At the same time, the different methodologies behind the design of the dataset dimensions can cause confusion regarding the approach of the captured information's semantics. Here, we provide an example by using the 'hot and in demand' technological skills. The definitions of the two terms are partially identical, namely 'software and technology requirements frequently included in employer job postings', with the key differentiation being the universe in which the frequency is assessed; for 'hot' skills, the analyzed dataset is the totality of job postings, while 'in demand' skills pertain to each occupation separately. In summary, the process follows the steps of terms' extraction from job postings, frequency analyses per universe, assessment of a term's technological nature, attribution to technologies instead of specific tools/suites, and a manual sense-check from occupational experts. (Lewis & Morris, 2022). Firstly, the naming conventions of the two terms (*technologies* vs *technological skills*) create confusion, since they are both defined as frequent technologies. Secondly, their characterization (*hot* vs *in demand*) is not indicative of their key differentiation, since they are commonly used interchangeably. Thirdly, while their identification process is more of descriptive nature (analyzes the current situation through exogenous sources to the classification model - ie. job postings), the proposed use cases of the dataset itself, attributes a prescriptive role to the data (used as input for policy-makers, as a guideline for the current US workforce in terms of vocational training proposals & upskilling guidelines).

Especially since the supply side of those technologies/skills is not taken into consideration in the evaluation process (eg. the percentage of the job postings covered within a defined period of time), their suggestive role of educational/training focus can be potentially misleading - intensifying, for example, occupational saturation on high demand & high supply competences / specialisms. The same case applies to more modules of the data, since their methodological identification can be either completely prescriptive (solely based on occupational experts' indication of what constitutes a job), or heavily reliant on descriptive methods as examined above. In general, the O\*NET content discussion is an exemplary case of the social criticism on the positivist approach to skills classification mentioned in our conceptual framework section. The hierarchical classification allows for analyses in multiple abstraction levels, trying to provide the best equilibrium in the over-abstraction / over-standardization nexus for each case it is utilized. However, the expression of its suggestive & continuously evolving nature is of crucial importance.

Actions have been taken in order for the two frameworks to become systematically related, so as statistical & market comparisons can be made, and labor & educational frameworks can be assessed in a unified way. In a similar approach to the digital labels' creation of ESCO, the mapping was implemented using a language processor AI model (BERT language analysis) model to conduct a semantic textual similarity between the two frameworks, getting input by expert feedback to the algorithm, and finally manually validated by experts of both classification frameworks. (European Commission, 2022). This is presented in fig 9.

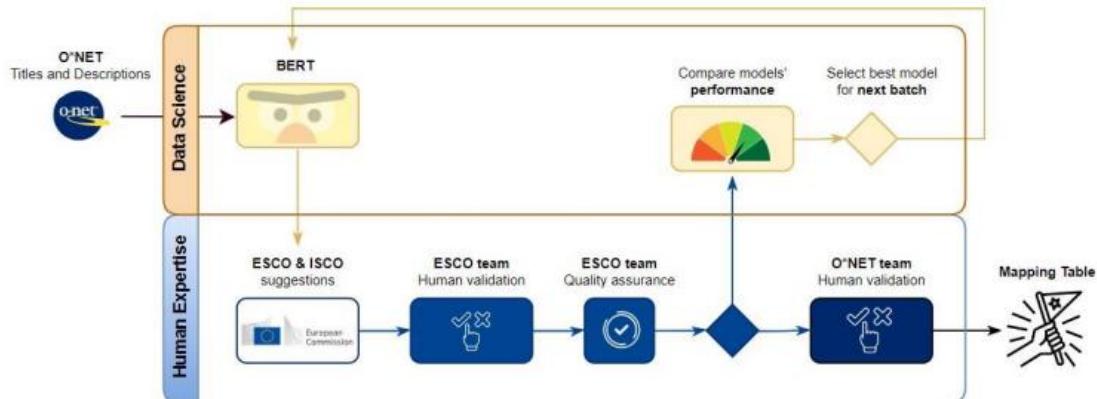


Fig 9: ESCO - O\*NET frameworks unification, European Commission, 2022

A completely manual labeling process was conducted for the mapping of ISCO-08 to SOC (BLS, 2012).

### 3.2.3 DESI

The European Commission has established an annually published index of Digital Economy and Society Index (DESI) to monitor its Member States' performance towards digitalization, since 2014. In line with the Commission's Policy Programme 'Path to the Digital Decade', in 2021 DESI was partially aligned in structure with the expressed goals of the program. Its most recent structure builds on four pillars, and includes 16 KPIs in total, shown in tables 4 and 5. (Vuorikari et al, 2022b)

**Table 4.** DESI 2022 Structure

DESI Dimension	Desi sub-Dimensions
Human Capital	Internet user skills and advanced digital skills
Connectivity	Fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices
Integration of Digital Technology	Business digitalisation and e-commerce
Digital Public Services	e-Government

**Table 5.** DESI 2022 Dimensional KPIs

DESI Dimension	Desi sub-Dimensions
Human Capital	At least basic digital skills ICT specialists Female ICT specialists
Connectivity	Gigabit for everyone (Fixed very high capacity network coverage) 5G coverage
Integration of Digital Technology	SMEs with a basic level of digital intensity AI Cloud Big data
Digital Public Services	Digital public services for citizens Digital public services for businesses

In our analysis we will focus on the pillar of human capital, which is relevant to our labor analytics scope. The human capital indicator consists of 8 sub-indices, which we will list in table 6, and further investigate.

**Table 6:** Human Capital sub-indices

1a1. At least basic digital skills (as % of individuals 16-74)
1a2. Above basic digital skills (as % of individuals 16-74)
1a3. At least basic digital content creation skills (as % of individuals 16-74)
1b1. ICT specialists (as % of individuals in employment aged 15-74)
1b2. Female ICT specialists (as % of ICT specialists)
1b3. Enterprises providing ICT training (as % of enterprises)
1b4. ICT graduates (as % of graduates)

## Digital Skills

The digital skills index (DSI) calculation methodology is used to assess the values of sub-indices 1a1, 1a2 and 1a3. More specifically, 1a2 is a subset of 1a1, which includes the percentage of individuals within a country that have basic, or above basic digital skills (Vuorikari et al, 2022b). The index has been in use since 2015, but was updated in 2022, following the new metrics of DigComp 2.0, discussed above. For each of the Dimension I categories of digital competence, specific actions have been identified as indicative proxies.

In the European bi-annual survey of *ICT usage in households and by individuals*, questions on whether a person does those actions or not are stated. We will not get into the detail of assessing each activity for every skill area name, but we will proceed in providing a schematic representation of the DSI values based on the methodology. Figure 10 depicts the areas' names, the number of the identified actions, and the thresholds for basic & above basic classification proficiency level of each area. Figure 11 further explains the total DSI score, based on the sub scores of each area. (Vuorikari et al, 2022b)

Skills' Area Name (# of activities) Exemplary activity	Skills' Area proficiency thresholds		
	No Skills	Basic	Above Basic
<b>Information and data Literacy (4)</b> Finding health-related information	0	1	>=2
<b>Communication &amp; collaboration (6)</b> Sending/Receiving emails	0	1	>=2
<b>Digital Content Creation (7)</b> Using Spreadsheet Software	0	1-2	>=3
<b>Safety (6)</b> Managing access to own personal data by reading privacy statements before providing personal data	0	1-2	>=3
<b>Problem Solving (7)</b> Downloading or installing software / apps	0	1-2	>=3

Fig 10. Area proficiency categories, based on # of Activities used per Area



Fig 11. Total DSI Category based on # of Areas on each Area category

Based on the above figures, we can explain the first three indices of the human capital DESI sub-metric.

*1a1. at least basic digital skills*, measures the % of the people that are classified in the top two boxes in figure 11. That is, people whose total DSI category is basic or above basic skills, meaning that they have all of their area proficiency levels in basic or above basic category

*1a2. above basic skills*, measures the % of the people that are classified in the top box in figure 11. That is, people whose total DSI category is above basic skills, meaning that they have all of their area proficiency levels in above basic category

*1a3. at least basic digital content creation skills*, measures the % of the people that are classified in the basic or above basic category, of Area 3 in figure 10. That is, people who

have used at least one out of the seven activities indicated in the digital content creation skills.

Indices 1a1 - 1a3 are all based on the above figures. The interesting fact is that for the first time in this paper's analysis, everyday life tasks' content is considered a proxy of digital skills measurement. This is mainly due to the fact that DSI, implementing the DigComp framework, is not a labor-oriented metric, but rather a civilian one. It is still, though, a proxy for human capital. A summary of the measures and their sources can be seen below in

Table 7.

**Table 7.** DESI Human Capital sub score indices, descriptions and Sources

Indicator	Description	Unit	Source
1a1 At least basic digital skills	Individuals with 'basic' or 'above basic' digital skills in each of the following five dimensions: information, communication, problem solving and software for content creation and safety	% Individuals	Eurostat - EU survey on ICT usage in Households and by individuals (I_DSK2_BAB)
1a2 Above basic digital skills	Individuals with 'above basic' digital skills in each of the following five dimensions: information,	% Individuals	Eurostat - EU survey on ICT usage in Households and by individuals

	communication, problem solving and software for content creation and safety		(I_DSK2_AB)
1a3 At least basic digital content creation skills	Individuals with at least a basic level in using software for digital content creation	% Individuals	Eurostat - EU survey on ICT usage in Households and by individuals (I_DSK2_DCC_BAB)
1b1 ICT specialists	Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers	% Individuals in employment aged 15-74	Eurostat LFS (isoc_sks_itpst)
1b2 Female ICT specialists	Employed female ICT specialists. Definition as per 1b1	% enterprises	Eurostat LFS (isoc_sks_itpst)
1b3 Enterprises providing ICT training	Enterprises who provided training in ICT to their personnel	% graduates	Eurostat - EU survey on ICT usage and eCommerce in enterprises (E_ITT2)
1b4 ICT graduates	Individuals with a degree in ICT		Eurostat (table educ_uee_grad03, using selection ISCED11=ED5-8) and ISCED_F13 [F06] information and Communication technologies

The human Capital subsector of DESI includes a comprehensive set of proxies for multiple levels of IT & Digital Literacy. However, all data are built behind two pillars: tasks & education - formal or not. At the same time, all data are based on a specific type of input: self-report survey data. Expectedly, this is heavily prone to survey input bias. (Suchman, 1962; Brenner & DeLamater, 2016). What is lacking here, and will be discussed later on in this paper, is the correlation of these proxies with a more direct measurement of IT & digital literacy.

### 3.3 Cedefop

Cedefop is the European Union's center for vocational education and training (VET).

Operating since 1975, the agency has been contributing to the development of VET policy design and implementation within the European Union, producing valuable knowledge through its reports and research, by exploring topics as the labor force's skills supply and demand, employability prospects and skills attainment (Cedefop, 2015a). More specifically, its mission is to 'support the promotion, development and implementation of [the European] Union policies in the field of vocational education and training as well as skills and qualifications policies by working together with the Commission, the Member States and the social partners. To that end Cedefop shall enhance and disseminate knowledge, provide evidence and services for the purpose of policy making, including research-based conclusions, and shall facilitate knowledge sharing among and between Union and national actors.' (Regulation No 337/75). Cedefop revolves around three strategic themes; Skills and labor market, VET knowledge center, delivering VET and qualifications.

The theme of interest for this paper's scope is Skills and labor market.

This theme is organized in axes of sub-topics, and tools. Both of them explore, visualize and communicate multiple matters of the changing occupational and societal environment. With particular interest in the data communication and online resources available to the public, we will examine Cedefop's content by exploring those online tools<sup>12</sup>

#### 3.3.1 Skills Intelligence

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<sup>12</sup> Skills forecast by Cedefop (available in <https://www.cedefop.europa.eu/el/tools/skills-forecast>) will be omitted. It is a single source visualization suite, with measures overlapping with other sources. Some key findings by the forecast analysis, as well as its methodological approach are discussed in the analysis of other cedefop's tools metrics.

Cedefop has created an aggregate online resource in the form of an interactive web portal, named skills intelligence, with data provided on indicator, sector, occupation and country levels.

All views are constructed based on the same data, with a difference based on the user's focus. As an example, we provide a part of the country view for Greece in fig 12

**Greece**

Agriculture, the maritime industry and tourism are important sectors of the Greek economy, which recovers slowly from long and deep recession. The country has still the highest unemployment rate in the EU and size of employed workforce decreased by almost 10% in just last five years.

The forecast paints more optimistic future for Greece, with decent employment growth, driven by health & social care, ICT services and construction. Sales workers and health care occupations are predicted to grow substantially till 2030. Although most job openings (including replacements for vacated jobs) till 2030 will be for high- or medium-level qualifications, decent job opportunities will be available for low-skilled people, too.

**Key facts**

Future employment change <b>0.6%</b> in 2022-2035 in Greece	Share of employed in high-tech economy <b>4.1%</b> in 2035 in Greece	Share of people with above basic digital skills <b>22%</b> in 2021 in Greece	The unemployment rate <b>14.7%</b> in 2021 in Greece
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**Data insights**

**Greece: Mismatch priority occupations**  
Managers and ICT professionals belong to high shortage occupations for Greece.

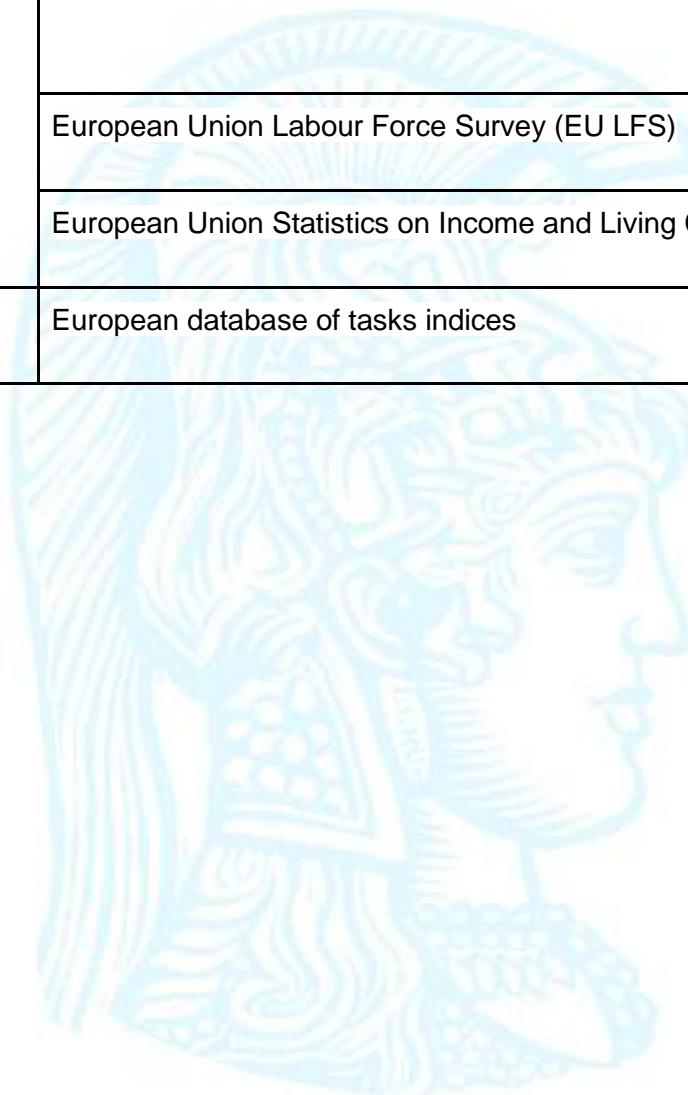
**Skills anticipation in Greece (2022 Update)**  
Overview of the Greece approach Skills anticipation activities such as skills assessments, skills foresight analysis and ad hoc employer surveys are undertaken in the country. Recent policy actions have been concerned with setting up and improving the operation of a permanent process to provide a...

fig 12. Part of country view for Greece; <https://www.Cedefop.europa.eu/en/tools/skills-intelligence/countries?country=EL>

Cedefop utilizes three data sources that provide six datasets. Table 8 provides a mapping of data sets to data sources.

**Table 8.** Cedefop Skill Intelligence Data Sources and related Data sets

Data Source	Data Set
Cedefop	Cedefop Skills Forecast
	Skills in Online job advertisements
Eurostat	ICT Usage in Households and by Individuals
	European Union Labour Force Survey (EU LFS)
	European Union Statistics on Income and Living Conditions (SILC)
Eurofound	European database of tasks indices



The above datasets are used in order to extract the 36 indicators used by Cedefop. Many of them are fairly straightforward in terms of content & way of acquisition (eg. Employment by Occupation, sourced by EU LFS). However, we will examine some of them that are of particular interest in terms of labor composition and job content.

## **Automation risk for Occupations**

Cedefop has created a report and an interactive online view on automation risk for occupations. The organization calculates an automation risk indicator, which accounts for the percentage of people within an occupation or occupations within an occupation group exposed to high risk of automation. (Cedefpop, 2023n) The measurement is based on Pouliakas' skill-task approach (2018). Pouliakas draws from the highly impactful occupations susceptibility to automation on 70 occupations by Frey and Osborne (2013, 2017 as cited by Pouliakas , 2018), based on SOC occupation classifications & O\*NET skills & tasks content. They assess a latent relationship between ‘ “true” automobility’ and the content of occupations, with the former expressed through 9 ‘engineering bottlenecks’. Pouliakas then proceeds to map the 70 occupations of Frey and Osborne from SOC to ESJS occupational classes, and accordingly O\*NET variables that are considered the manifest variables of the 9 engineering bottlenecks, to corresponding ESJS variables. The bottleneck - O\*NET variable - ESJS Variable mapping is described in fig 13.

Bottleneck	FO O*NET Variable	O*NET definition	ESJS variable	ESJS definition
Perception manipulation	Finger dexterity	<i>The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate or assemble very small objects</i>	Technical skills	<i>Specialist knowledge needed to perform job duties; Knowledge of particular products or services; Ability of operating specialised technical equipment</i>
	Manual dexterity	<i>The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate or assemble objects</i>		
	Cramped work space, awkward positions	<i>How often does this job require working in cramped work spaces that requires getting into awkward positions?</i>	NA	
Creative intelligence	Originality	<i>The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem</i>	Problem solving skills	<i>Thinking of solutions to problems; Spotting and working out the cause of problems</i>
			Learning skills	<i>Learning and applying new methods and techniques in your job; adapting to new technology, equipment or materials; Engaging in own learning</i>
			Learning tasks	<i>How often, if at all, does your job involve 'learning new things'?</i>
			Non-routine tasks	<i>How often, if at all, does your job involve 'responding to non-routine situations during the course of your daily work'?</i>
	Fine arts	<i>Knowledge of theory and techniques required to compose, produce and perform works of music, dance, visual arts, drama and sculpture.</i>	NA	
Social intelligence	Social perceptiveness	<i>Being aware of others' reaction and understanding why they react as they do.</i>	Team working skills	<i>Cooperating and interacting with co-workers; dealing and negotiating with people</i>
	Negotiation	<i>Bringing others together and trying to reconcile differences.</i>	Planning and organisation skills	<i>Setting up plans and managing duties according to plans; Planning the activities of others; Delegating tasks; Organising own or other's work time</i>
	Persuasion	<i>Persuading others to change their minds or behaviour.</i>	Foreign language skills	<i>Using a language other than your mother tongue to perform job duties</i>
	Assisting and caring for others	<i>Providing personal assistance, medical attention, emotional support, or other personal care to others such as co-workers, customers or patients.</i>	Communication skills	<i>Sharing information with co-workers/clients; Teaching and instructing people; Making speeches or presentations</i>
			Customer handling skills	<i>Selling a product/service; Dealing with people; Counselling, advising or caring for customers or clients</i>

fig. 13 Engineering bottleneck - O\*NET variable - ESJS Variable Correspondance (Pouliakas, 2018)

Similarly, an occupational mapper is created based on the 70 sample occupations examined by FO, and thus a skills susceptibility to automation is calculated, and allows for the calculation of individual level automation risk.

## Digital Skills Level

Digital skills level have a rather straightforward data source and measurement set. As per Cedefop (2023a), the data are sourced from Eurostat's 'Use of Information and Communication Technologies by households and individuals (ICT)'. A single metric is assessed for three distinct target samples. As a result, the visualizations include calculations of 'Share of people whose digital skills are above basic level across countries in 2021' for 'All in Employment, All Individuals, Individuals ages 25-34'. A cross-country comparison is conducted within the online resource. The indicator's definition of 'above basic digital skills' follows the DigComp guidelines. The methodology followed by Eurostat in the aforementioned survey, so as to provide the required information for the index calculation, will be thoroughly discussed later on.

## Employment (growth) in high-tech economy / occupations

This is a grouping of four distinct indicators. (Cedefop, n.d.)

In detail, they are

- Employment in high-tech occupations
- Employment growth in high-tech occupations
- Employment in high-tech economy
- Employment growth in high-tech economy

Diving into more detail, a formal definition of high-tech economy & occupations is required.

Occupations are considered high-tech when classified under ISCO 2-digit groups:

- 21-Science and engineering professionals
- 31-Science and engineering associate professionals
- 25-Information and communication technology professionals
- 35-Information and communication technicians.

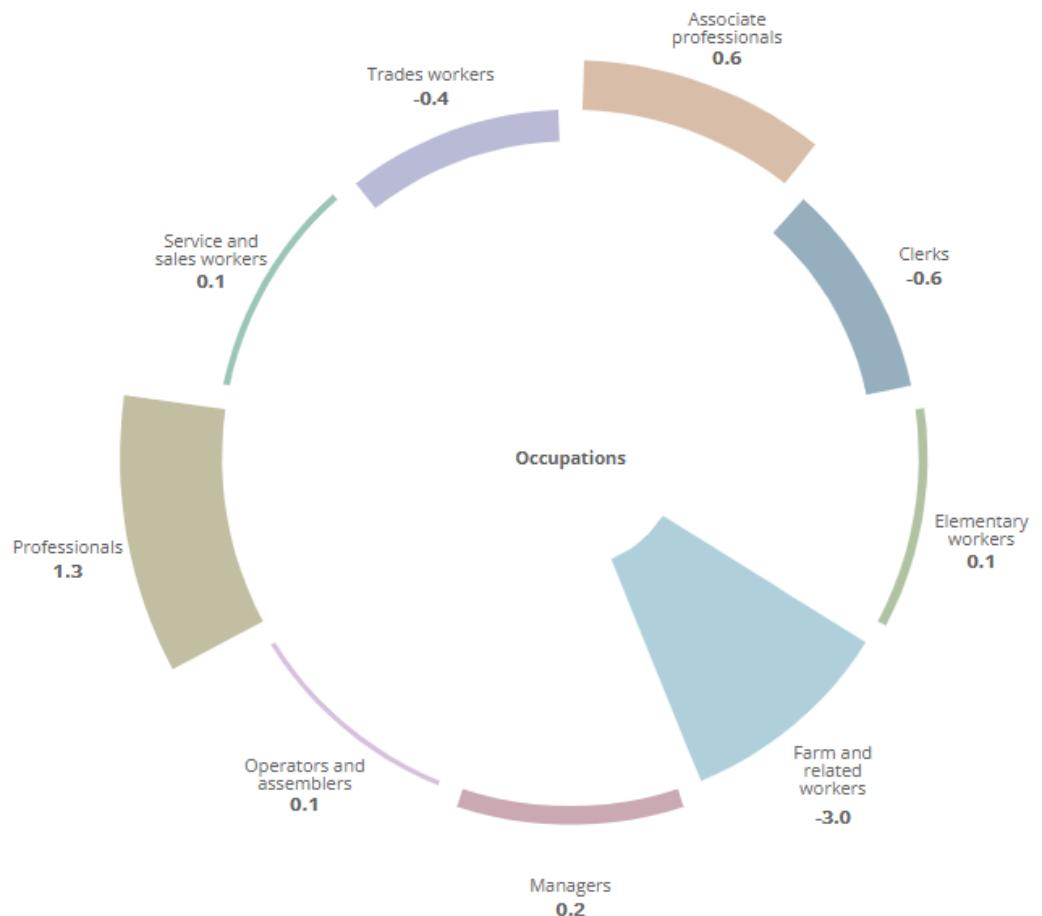
The process to conclude to the specific occupation groups has not been declared to the best of the author's knowledge, but it can be assumed that it is based on the occupational group

name, rather than a content analysis of the included occupations. (Cedefop, 2023b).

High-tech economy is accounted for as the percentage of employment in two sector groups; high technology manufacturing & knowledge intensive hi-tech services. The organization provides no specific definition of which NACE sectors are included in those sub-groups to the best of the author's knowledge, although regarding knowledge intensive hi-tech services, it is stated that 'Sectors are selected on the basis of incidence of highly educated workers (share of employed persons with tertiary educational attainment)'. (Cedefop, 2011). The static indicators provide three points in time (2009, 2022, 2035), and the growth indicators provide growth comparison between consecutive pairs. All indicators source their data from Cedefop Skill Projection Database, and use NACE v2 for sector classifications.

### **Future (Annual) Employment Growth**

Employment Growth and Annual employment growth are indirect expressions of expected skills shift. The two indicators represent the demand side of labor analysis conducted by Cedefop. (Cedefop, 2023c, 2023d) National, sectoral & occupational group breakdowns are provided in Cedefop's interactive visualizations, with figure 14 providing an example.



 Cedefop

Future annual employment growth mean in EU27 over the period 2022-2035 is estimated at -0.2. Professionals exhibit the highest value equal to 1.3, while Farm and related workers the lowest equal to -3.

fig. 14 Annual employment growth for EU 27 by occupation (Future Annual Employment Growth, 2023)

The direct data source is Cedefop's Skills Forecast. Methodologically, the indicators are a result of expansion demand effects based on qualification (QMOD) and occupation (EDMOD), and are based on LFS historical data and Cambridge econometrics model E3ME (Cedefop, 2023e). The same holds for all projections in the below indicators, unless differently stated.

## **Employment needs / Job openings**

Employment (Cedefop, 2023g) needs and job openings (Cedefop, 2023f) provide different visualizations on the same metric. The complete future occupational demand in absolute numbers, considering both the aforementioned extension measures (QMOD, EDMOD) caused by the creation of new jobs, as well as the replacement demand effect, which is the number of occupational positions required to replace people exiting the workforce (RDMORD). (Skills Forecast Methodological Framework, 2023).

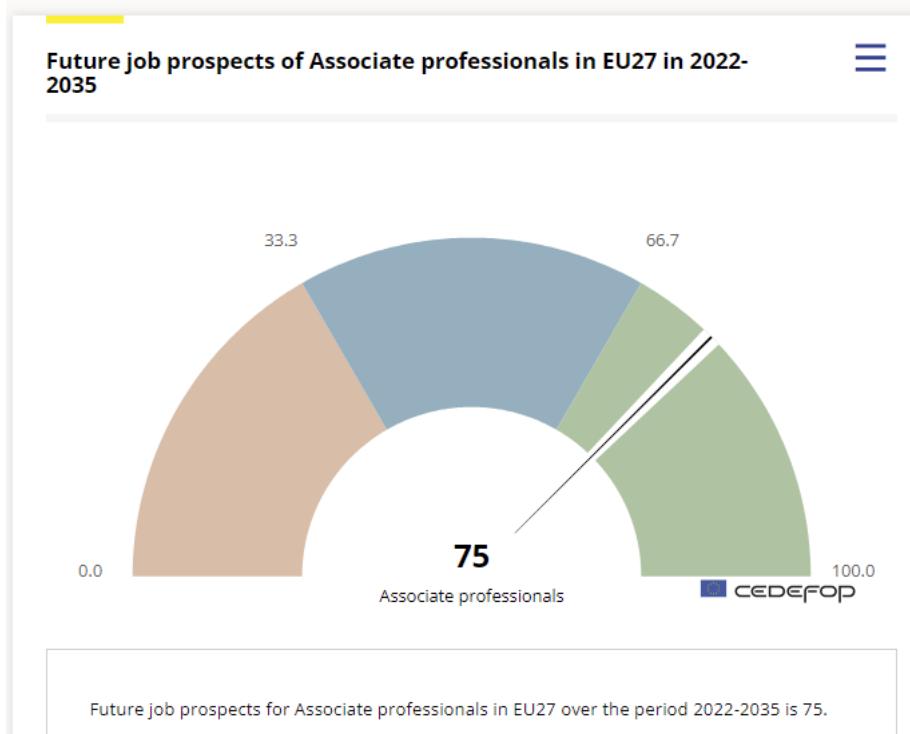
## **Job prospects**

Job prospects provides a prospect index in the range of 0-100, providing a ratio of new job openings of an occupation compared to its current employment levels. Values above 60 indicate positive prospects. The visualization provides additional key data directly from EU-

## Key facts



## Charts



LFS(e.g. women's participation and relative gross wage to total employment), as shown in figure 15. (Browse by occupation, 2023).

fig. 15 Example of complete view for prospect index & additional information (Browse by occupation, 2023)

## **Future Qualification Demands**

The indicator provides the projected evolution of employment share in country totals or occupational groups, based on three educational level aggregates ( low - ISCED levels <2, mid - ISCED levels 3-4, high - ISCED levels 5> ). (Cedefop, 2023h)

## **VET Occupations / Future of VET Occupations**

Cedefop adopts LFS's data and definition of VET qualifications, being of highest Qualification level ISCED 3-4, and the survey respondents being 15-34. (Cedefop, 2023i). The definition does not take into consideration older people participating in reskilling/upskilling programs, or respondents within the age limits, that have higher qualification levels, but still actively participate in VET programs. The analysis of VET occupations follows the percentage of employees within an occupational group, classified to have VET qualifications.

Future of VET occupations takes into account a more extensive set of VET qualifications. The indicator includes traditional VET occupations (having historically relatively stable educational requirements), modern VET occupations (having an increasing trend of educational requirements), and new VET occupations (with increased demand in educational requirements & outside the scope of traditional VET occupations). Based on the indicator, Cedefop assesses the participation % evolution of the VET sub-pillars in EU, as well as VET participation % in total, across countries. (Cedefop, 2023j)

## **Over-Qualification Rates**

The over-qualification indicator conducts a direct assessment of education to occupation comparison. In detail, a respondent is considered overqualified when they are within the age limits of 25-34, have completed tertiary education (ISCED levels 5,6) and their occupation is classified under ESCO major groups 4-9. Data are sourced by EU-LFS. (Cedefop, 2023k)

## **Skills in Online Job Advertisements**

Cedefop provides an online visualization of the most commonly met Sector,Occupation & Skills online job advertisements of the past year. Multiple metrics indicative of an occupation's quality of work. Part of the visualizations is provided in figure 16. The data source is Cedefop's 'Skills in online job advertisements', provided in the online capability Skills-OVATE, which will be discussed in detail later on. (Cedefop, 2023m)

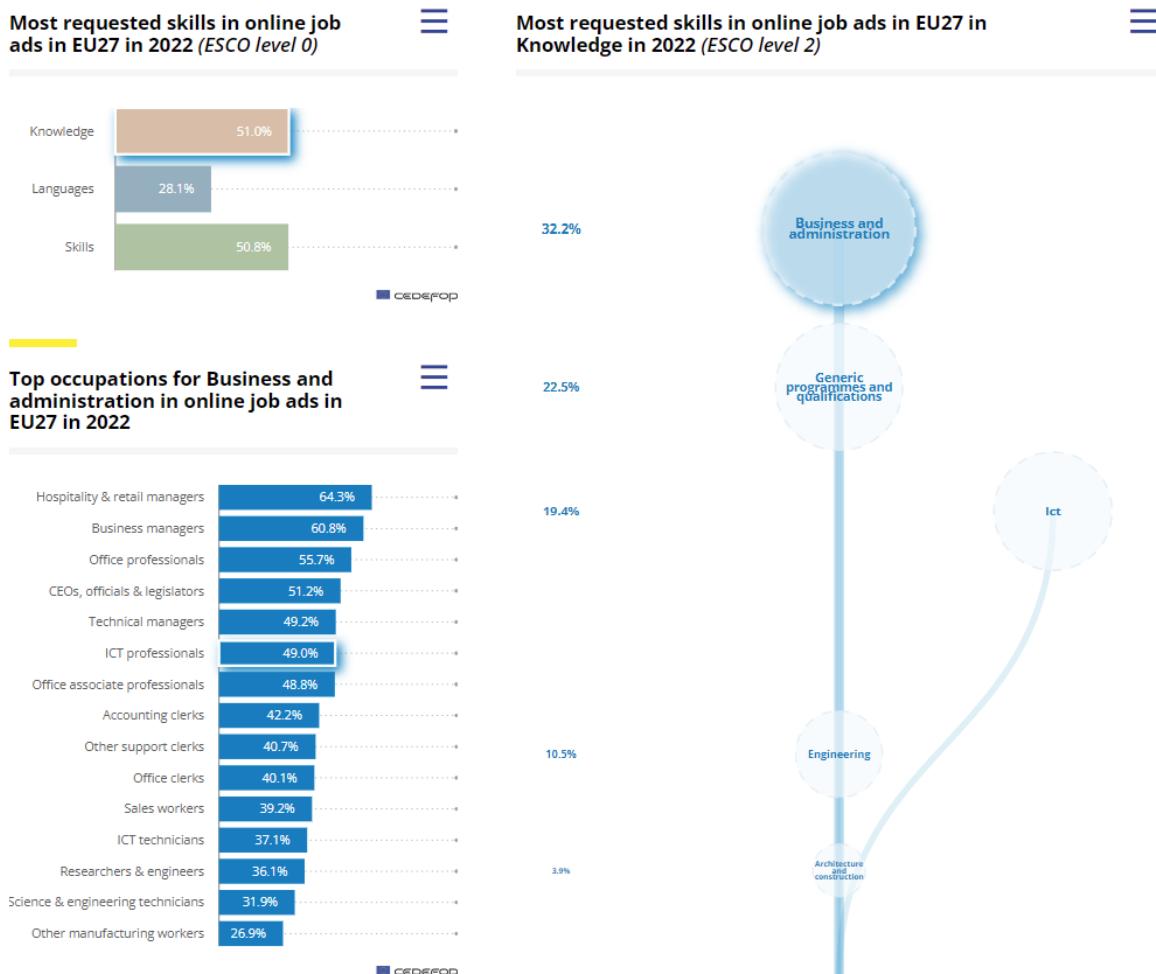


fig. 16 Example of views of online job advertisement KPIs. (Cedefop, 2023m)

## Tasks within occupations

The indicator provides a skill-occupation importance mapping, at a 2-digit ISCO level. The data are sourced from a Cedefop's interpretation of Fernández-Macías' & Bisello's framework on content of work, provided earlier in the paper. (cedefop, 2021a). The exact framework - heavily relying on the aforementioned paper - was created by Eurofound, but the current implementations were solely provided by Cedefop's estimations. figure 17 provides a sample of what the indicator looks like.

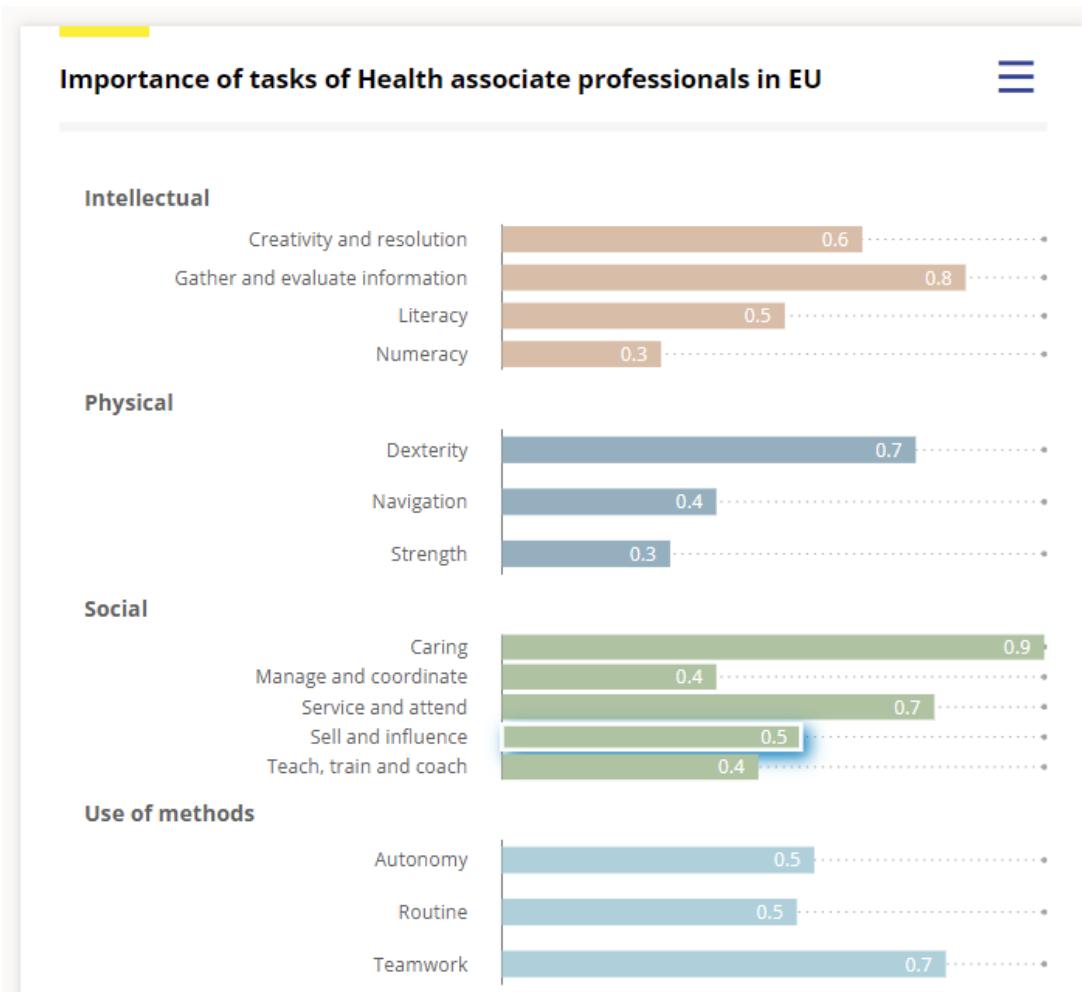


fig. 17 Example of visualization with tasks' importance for specific occupation(Cedefop, 2021a)

### 3.3.2 Skills-OVATE

Skills-OVATE is a project by Cedefop utilizing Online Job Advertisements on a pan-European level, to conduct jobs and skills demand analysis (cedefop, 2021b). Its analysis follow the expected classification standards; ISCO-08 for occupations, Nace rev.2 for Economic Sectors, NUTS-2 for Regions. Skills are available in ESCOv1, as well as O\*NET. While the data collected are not themselves available to the public, Cedefop provides resources to the technical report discussing the methodology of Skills-OVATE, as well as publications sourcing from this pool of data. Here we will focus on the analysis process of

the tool. Skills-OVATE has utilized the existence of both public and private Online Job Vacancy (OJV) portals. The project is structured in a five-step process exhibited in fig. 18

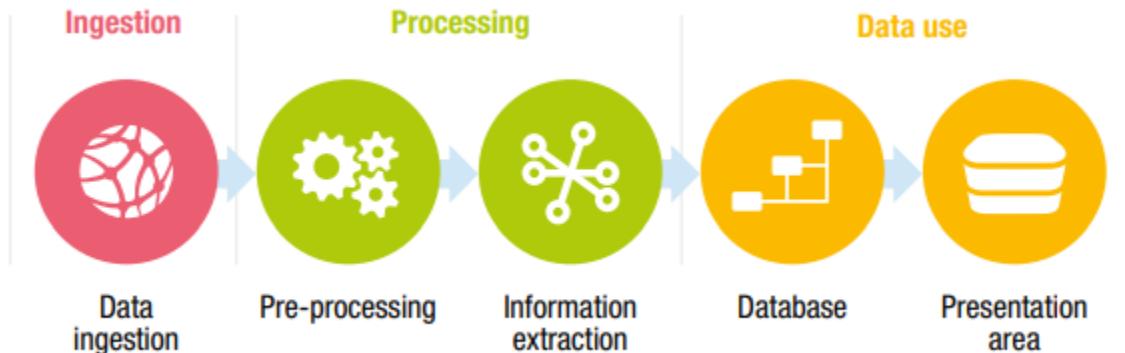


fig. 18 Process Stepsof Skill-OVATE (Cedefop, 2019, p.20)

### **Data Ingestion & preprocessing**

Cedefop acquires vacancies' data in three ways:

- i. API connection for direct data exchange, where the capability existed and permission was given
- ii. Website scraping for websites with large volumes of vacancies and structured websites.  
Relevant information are directly gathered
- iii. Website crawling, for smaller or less structured websites. Whole pages are gathered, and further preprocessing is required for the relevant data acquisition

Once the relevant data are extracted, there is a need for preprocessing which includes noise cleaning, vacancy merging & de-duplication

### **Information Extraction**

Information extraction happens with the utilization of two main components; Ontology-based models & ML models. Their key differentiator is that ontology-based models are pre-coded, while Machine Learning are self-trained on data that cannot be strictly predicted beforehand. The process is as exhibited in fig. 19

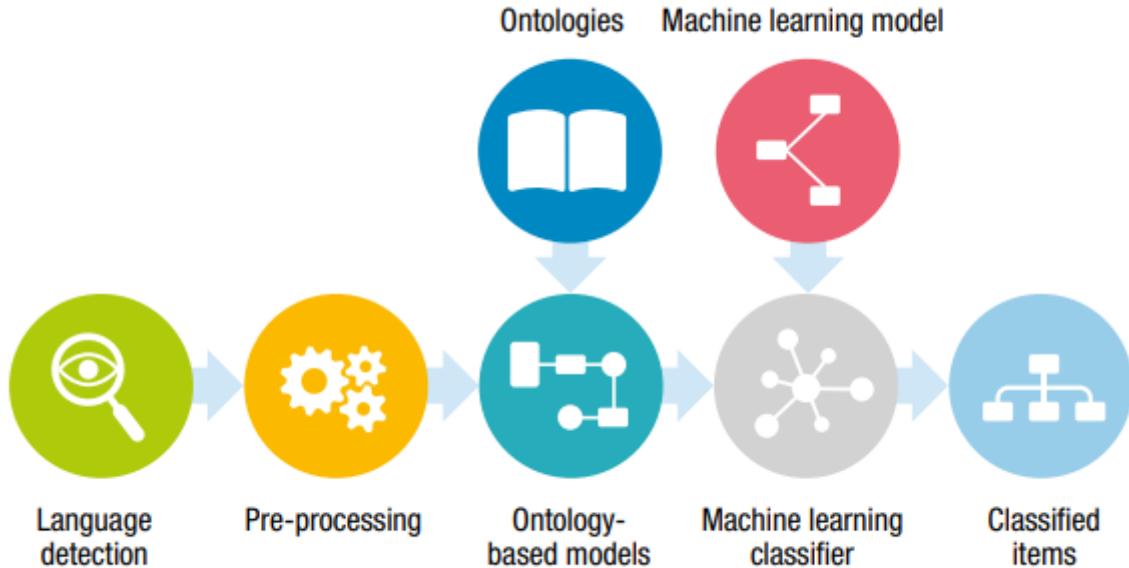


fig. 19 Knowledge extraction process steps of Skill-OVATE (Cedefop, 2019, p.24)

As stated in the report, the Machine Learning Algorithms are trained by country, on a minimum of 70000 vacancy samples' for each. It includes supervised models, and experts' corrections are inserted as input between ML epochs. At the time of the report, ML functionality was only available for occupations.

It is easily understood that the process encloses multiple aspects of biases. The target user of an online portal is, with no doubt, susceptible to qualification and occupation bias. This holds true from many approaches. It is obvious that an ICT hardware possession, and digital tools' familiarity is a prerequisite for the usage of such services. (Colombo et al., 2019). At the same time, for many countries, public sectors' job vacancies follow a different externalization path, which is in no way related to OJV platforms. Multiple lower-end skills and wage vacancies are spread through word of mouth, such as unskilled manual workers,

even more so in countries with larger percentages of immigrants to the labor participation. It is of importance that the inclusion of public OJV portals partially mitigates this effect, since many vacancies posted on public platforms aim to welfare beneficiaries & registered unemployed workers, which typically tend to be of lower-skills (mdaae, 2023b).

### 3.3.3 European Skills Index (ESI)

Cedefop has proceeded in calculating a European Skills Index (ESI). With a normalized score at 100 for the best performance among all countries during the past 7 years, the value of the index indicates the room for improvement a country has, compared to a model case within EU (cedefop, 2021d) The visuals, shown in fig 20, are fairly straightforward, and provide an immediate international comparison on total score, as well as side-measures that the index consists of.

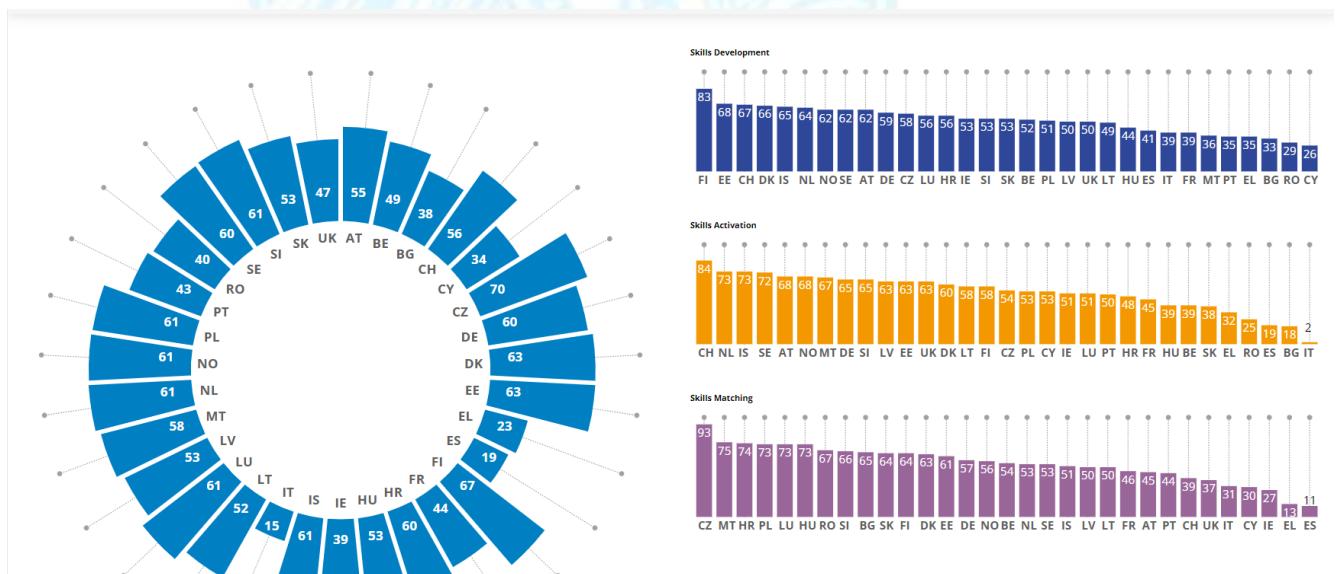


fig. 20 Visuals of Total ESI, and its structural components per country (cedefop, 2021d)

Full data of all ESI iterations, as well as technical reports are also publicly available. Making use of the latest technical report, we will attempt to further deconstruct the Index.

ESI is a synthetic index consisting of three main activities regarding skills. (Livanos, 2022)

- i. Skills Development
- ii. Skills activation
- iii. Skills matching

In figure 21, the further breakdown to indicators per structural component is exhibited.

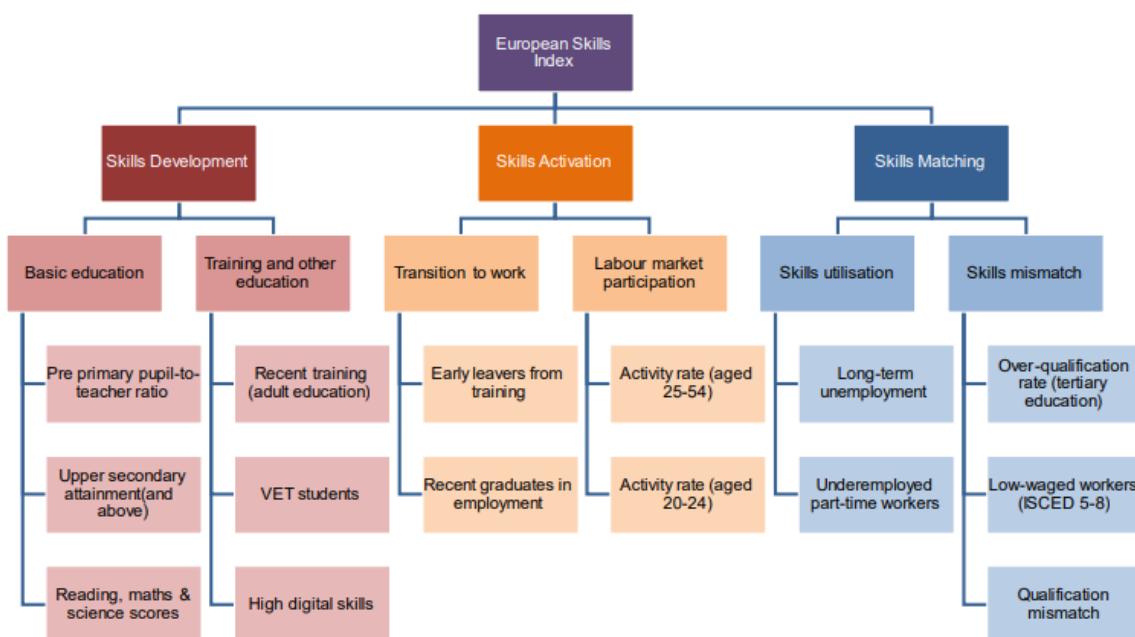


fig. 21 Complete ESI structure (Livanos, 2022)

While the complete analysis of all indicators is out of scope for the specific paper, we point out conditions that are directly related to the notion of a skill, and the content of work.

## Skills Development

In ESI, skills development consists of two sub-pillars; basic education and training & other education. Within those two sub-pillars, we discuss the most relevant to our analysis. Within basic education, we find 'upper secondary attainment (and above)'. This measure directly matches education with skills acquisition. However, an additional indicator of

'Reading, maths & science scores' is included. The source of this indicator is the average of OECD's PISA scores (Livanos, 2022 p.9). This allows for the simultaneous impact of the index's score based on the actual measured knowledge of students, rather than relying solely on the educational attainment. The educational attainment equivalent on the second pillar is the participation of adults in non-formal educational attainment (training or VET studies). Contrasted to PISA scores, however, PIAAC data are not utilized for the adults' proficiency in key categorical knowledge domains (literacy, numeracy, problem solving in technology-rich environments). Instead, the percentage of adults that performed more than one activity in each digital skills' domain on Eurostat's ICT usage Survey is employed. This allows for a subjective bias in the self-declaration of activities conducted, as well as limits the proficiency scope to digital skills, while literacy and numeracy are still highly relevant for a large number of countries in their current labor force.

## **Skills Activation**

While in the right direction, there are two points that when interweaved make for a contradicting perception of tertiary education. Activity rate (%), meaning the percentage of people within the examined age groups, has a positive correlation with ESI. It is intuitively correct to consider that adults participating in the workforce is a positive thing. But especially when examining the 20-24 group, this becomes somewhat problematic. An active full-time student is not considered economically active, and as such reduces the index of this skills' activation indicator. Putting aside the societal perception that full time education is penalized when compared to parallel work and study (which would be expected to have a negative impact either on educational and occupational performance, or on the appointed workload in youth), this is somewhat expected. Indeed full-time students' skills are not being put up to use yet, and as such correctly aren't positively accounted for on this sub-pillar. One would think that this effect would be mitigated in an increasing indicator of Skills Development. However, the indicator 'recent training' only takes into consideration adults 25-64, and the indicator 'upper secondary education' only takes into account adults that have completed

their studies. As such, a paradox is created, where a high percentage of not economically active adults attending post-secondary studies, would have a negative impact on the index in total.

## **Skills Matching**

The metrics of skills matching can be split in two groups, based on a differentiating factor; deliberate choice. On one hand, 'long-term unemployment' and 'underemployed part-timers' assess involuntary situations. Unemployment measurement of LFS required the intent of a respondent to find work, and underemployed part-timers are defined as being involuntarily in this situation. On the other hand, the fact that Overqualification (%) and Qualification mismatch (%) are assessed on an educational attainment level, take for granted that the employment in a job with lower typical skills' requirements is strictly due to inability to secure a higher skills' demand job. This assumes that educational attainment aims - or should aim - strictly at job attainment. Additionally, occupations with typically high educational skill requirements, but not strict exclusion of non-conforming candidates, are considered to hire the latter solely due to inability to find a more well-equipped candidate, which is considered as a negative indication. This overlooks, however, the chance of people acquiring skills from non-typical educational paths, or personal interest. A very common example is code development, cybersecurity and relevant jobs. This is not an issue of cedefop or ESI per se, but more of an issue on the way LFS examines the topics. (and OECD aggregates qualification mismatch calculations based on LFS in OECD wise database). OECD has provided an alternative approach in PIAAC, where apart from other measurements, respondents self-declare their skills relative to their occupational requirements. This can also be assessed, for specific skill groups, as a comparison of respondents' test scores, compared to the occupational average, in order to identify positive and/or negative outliers,

while mitigating the subjective bias that might incur from the claimed skills level of the respondents.

Despite existing societal biases and drawbacks within the indicators of the ESI index, it is indeed a sophisticated and broad identification of skills' implications. The incorporation of PIAAC data could reduce those biases and improve the social explainability of the index. Oddly enough, cedefop has also identified the gap between educational attainment and PIAAC skills level on a national scope, and while PIAAC data are not included in the calculation of any skill metric, they are examined in skills' anticipation governance report published by the institution (cedefop, 2020 p.37).

### 3.4 Greek Institutions

#### 3.4.1 Public Employment Service

Greek Public Employment Service (DYPA) is a public authority operating under the supervision of the Greek Ministry of Employment & Social Affairs, deemed responsible for multiple policy design, management and implementation for the benefit of the greek labor force. In this context the authority has prepared and published the national strategy for the improvement of workforce skills and labor market integration (DYPA, 2022). DYPA sets seven distinct goals of the national strategy; namely:

- Match of labor demand and supply in terms of required skills & competences
- Monitoring and identification of contemporary trends and skills the meet the national market's needs, focusing on digital and green development
- Access reinforcement of all interested individuals to VET and retraining programs, facing no discrimination and lack of access.
- Advocacy of social partners' active participation for the design and implementation of VET programmes
- Systematic VET results measurement and evaluation, and quality control assurance over VET providers and offered VET programmes
- VET funding model evaluation and improvement, by linking vendors' payment with participants' employability results.
- Assessment and simplification of Skills' Strategy governance by simplifying it and ensuring stakeholders' cooperation.

Seven action axes are declared in order to achieve the above goals:

1. Transformation of the labor market for the creative utilization of labor force skills
2. Reinforcement of companies' innovation and resilience through upgrading digital literacy of the workforce
3. Cultivation of environmental consciousness and responsible environmental behavior to employed and unemployed population
4. Promotion of cyclical economy and energy conservation
5. Decrease of skills' mismatch through targeted activations on sectoral, occupational, spatial level
6. Investment on occupations and skills of the future
7. enhancement of labor force's horizontal skills while matching to the real needs of the market.

While a complete analysis of the national strategy is out of this paper's scope, we will briefly discuss some topics covered in the strategy's report, which are highly relevant with the utilization of labor force data & methodologies on how specific measures are being defined and calculated. Dypa follows the ESCO for occupations & skills classification. Combining multiple data sources, Dypa identifies five determinants of labor skills demand described in table 9 below. (DYPA, 2022)

**Table 9.** Determinants of labor skills demand identified by Dypa

	<b>Determinants of labor skills demand</b>
1	The economic cycle, impacting labor demand in total, but also in sectoral level in a different way - with implications to labor structure of the economy
2	Global trade, internalization of the market and international division of labor.
3	Shifts in national consumption as a result of increased disposable income, or consumer behavior shifts (eg. population age, demand for healthy products).
4	Focusing on specific economic sectors as a result of international agreements or needs (discussions on renewable resources as a result of agreements regarding environmental conservation)

## **5 | Technological development and innovation reshaping the nature of jobs.**

In terms of skills in the labor market, the national strategy report conducts multiple analyses revolving around labor supply and demand. We attempt to identify the ones that provide the most useful insights on which data sources are used, and in what way.

### **Occupational skills , educational level unemployment**

Making use of Elstat's LFS data, the report visualizes the annual evolution(2011-2021) of unemployment, based on the skills' level of the respondents' previous occupation. The skills are split into high-medium-low levels. The classification mechanism is not specified. (figure 22). Alignment of the classification with ILO skills' requirements classification is mentioned further down in the report (p. 28). The ILO classification, however, includes four levels of skills' requirements, and no methodological note on the reduction of groups to three is provided. In a similar manner, the report provides a visualized analysis on unemployment annual evolution based on educational level, closely following the ISCED classification. Combinations of the above two factors are examined in the report's text. Similar analysis is provided for the desired occupation of unemployed workforce as well.

**Άνεργοι, ποσοστό ανέργων ανά επίπεδο δεξιοτήτων προηγούμενου επαγγέλματος  
και ποσοστό μεταβολής ανά έτος**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Υψηλό επίπεδο δεξιότητων	103.375 (11,72%) ()	136.861 (11,45%) (32,39%)	174.642 (13,13%) (27,61%)	170.971 (13,42%) (-2,10%)	157.702 (13,18%) (-7,76%)	143.422 (12,68%) (-9,06%)	124.026 (12,08%) (-13,52%)	103.559 (11,32%) (-16,50%)	85.443 (10,43%) (-17,49%)	82.454 (10,92%) (-3,50%)	83.275 (12,29%) (1,00%)
Μέσο επίπεδο δεξιότητων	438.267 (49,70%) ()	588.720 (49,26%) (34,33%)	642.109 (48,27%) (9,07%)	606.200 (47,57%) (-5,59%)	559.158 (46,71%) (-7,76%)	530.674 (46,92%) (-5,09%)	475.717 (46,32%) (-10,36%)	396.753 (43,36%) (-16,60%)	352.812 (43,08%) (-11,08%)	329.316 (43,62%) (-6,66%)	250.213 (36,92%) (-24,02%)
Χαμηλό επίπεδο δεξιότητων	85.460 (9,69%) ()	119.679 (10,01%) (40,04%)	125.596 (9,44%) (4,94%)	117.477 (9,22%) (-6,46%)	116.710 (9,75%) (-0,65%)	119.223 (10,54%) (2,15%)	107.012 (10,42%) (-10,24%)	98.891 (10,81%) (-7,59%)	99.617 (12,16%) (0,73%)	99.986 (13,24%) (0,37%)	72.106 (10,64%) (-27,88%)
Δεν έχουν εργαστεί ποτέ	215.323 (24,42%) ()	293.173 (24,53%) (36,16%)	314.447 (23,64%) (7,26%)	299.820 (23,53%) (-4,65%)	278.088 (23,23%) (-7,25%)	238.174 (21,06%) (-14,35%)	204.037 (19,87%) (-14,33%)	185.007 (20,22%) (-9,33%)	161.603 (19,73%) (-12,65%)	139.516 (18,48%) (-13,67%)	195.009 (28,78%) (39,77%)
Σταμάτησαν να εργάζονται πριν από >8 έτη	39.407 (4,47%) ()	56.668 (4,74%) (43,80%)	73.544 (5,53%) (29,78%)	79.938 (6,27%) (8,70%)	85.308 (7,13%) (6,72%)	99.442 (8,79%) (16,57%)	116.256 (11,32%) (16,91%)	130.798 (14,29%) (12,51%)	119.416 (14,58%) (-8,70%)	103.710 (13,74%) (-13,15%)	77.092 (11,38%) (-25,67%)

Πηγή: ΕΛΣΤΑΤ

fig. 22 Visualization of annual unemployment growth per previous occupation's skills requirements (Dypa, 2022 p. 28)

## Occupational skills labor demand

The report also provides visualizations on regional breakdown of jobs percentage per skills' level. (fig. 23). For skills demand, the data source is ERGANI, an information system of the ministry, providing a complete set of data for all legally declared work positions.

	Υψηλό επίπεδο Δεξιοτήτων	Μέσο επίπεδο Δεξιοτήτων	Χαμηλό Επίπεδο Δεξιοτήτων
Αττικής	22,47%	64,96%	12,57%
Κρήτης	20,40%	65,25%	14,35%
Κεντρική Μακεδονία	20,27%	63,31%	16,42%
Θεσσαλίας	19,64%	62,93%	17,43%
Δυτικής Ελλάδας	19,43%	66,03%	14,54%
Βορείου Αιγαίου	18,56%	66,69%	14,75%
Ήπειρος	18,07%	63,97%	17,96%
Δυτική Μακεδονία	17,57%	66,76%	15,67%
Ανατολική Μακεδονία και Θράκη	17,28%	64,50%	18,22%
Στερεάς Ελλάδας	15,93%	62,52%	21,54%
Πελοποννήσου	14,83%	66,98%	18,19%
Ιονίων Νήσων	12,88%	72,03%	15,10%
Νοτίου Αιγαίου	12,42%	72,93%	14,65%

fig. 23. Regional breakdown of jobs' percentage per skills requirement (Dypa, 2022 p. 31)

## Skills utilization

The first pillar on the utilization of skills - based on educational attainment - concerns the distribution of occupational skill requirements. This includes, among others, the percentage of tertiary education graduates on high-skill occupations, identifying the low percentage of

## skill-wise employment compared to EU (fig. 24)

### Ποσοστό απασχολούμενων σε θέσεις υψηλών δεξιοτήτων ανά κλάδο

	Greece	Eurozone
Εκπαίδευση	89,00%	80,13%
Επαγγελματικές, Επιστημονικές και Τεχνικές Δραστηριότητες	84,00%	86,87%
Δραστηριότητες σχετικές με την Ανθρώπινη Υγεία και την Κοινωνική Μέριμνα	73,00%	62,60%
Διαχείριση Ακίνητης Περιουσίας και Χρηματοπιστωτικές & Ασφαλιστικές Δραστηριότητες	68,00%	76,33%
Ενημέρωση και Επικοινωνία	62,00%	88,60%
Τέχνες, Διασκέδαση και Ψυχαγωγία	57,00%	67,73%
Δημόσια Διοίκηση και Άμυνα- Υποχρεωτική Κοινωνική Ασφάλιση	33,00%	59,67%
Μεταφορά και Αποθήκευση	19,00%	23,00%
Μεταποίηση	19,00%	34,40%
Διοικητικές και Υποστηρικτικές Δραστηριότητες	14,00%	22,33%
Χονδρικό και Λιανικό Εμπόριο- Επισκευή Μηχανοκίνητων Οχημάτων και Μοτοσικλετών	13,00%	28,73%
Κατασκευές	13,00%	24,20%
Υπηρεσίες Διαμονής και Εστίασης	11,00%	18,27%

Πηγή: ΕΛΣΤΑΤ

fig. 24. Tertiary education graduates employed in high-skill demand occupations, per economic sector (Dypa, 2022 p.41)

The second pillar concerns the ability to cover existing occupational needs, utilizing the pool of registered unemployed workforce. fig. 25 visualizes the low percentage of new job openings filled by registered members of the unemployed workforce.

### Ποσοστό προσλήψεων σε σχέση με τις νέες κενές θέσεις

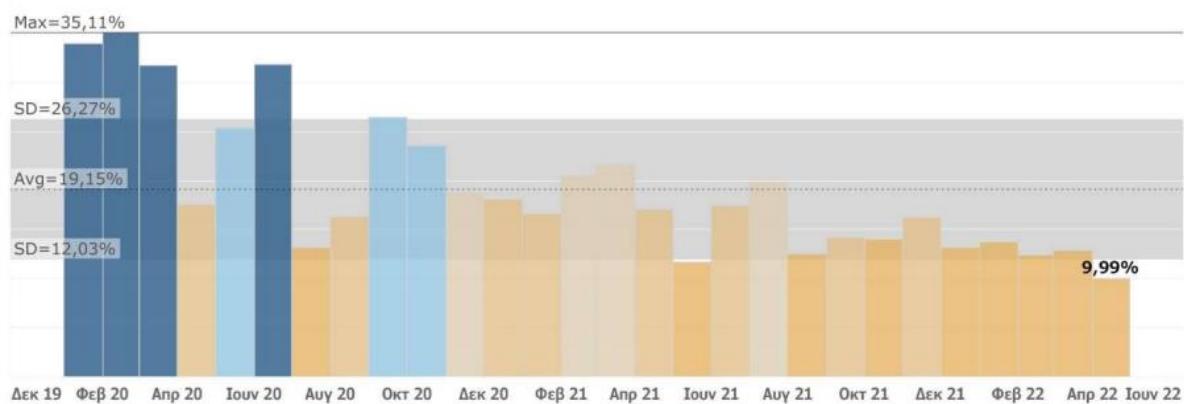


fig. 25. Percentage of job openings covered by registered members of the unemployed workforce (Dypa, 2022 p.44)

## Technological literacy

The last data source in the report is a company survey conducted by the national mechanism of labor market diagnosis (mdaae). It calculates the percentage of digital literacy for each economic sector, based on companies' perception, shown in fig. 26.

### Ψηφιακή επάρκεια ανθρώπινου δυναμικού επιχειρήσεων

(Ο Πολύ Χαμηλή - 10 Πολύ Υψηλή, Περίοδος Έρευνας 27/7/2020-14/9/2020,  
Συμμετείχαν Επιχειρήσεις 3278 που απασχολούν προσωπικό, CL 95%, CI 1.73%)

ΚΛΑΔΟΙ ΟΙΚΟΝΟΜΙΚΗΣ ΔΡΑΣΤΗΡΙΟΤΗΤΑΣ	ΜΟ ΚΛΑΔΟΙ	Χαμηλή	Μέτρια	Υψηλή
<b>ΜΕΣΟΣ ΟΡΟΣ</b>		<b>13,56%</b>	<b>38,60%</b>	<b>47,83%</b>
Ενημέρωση και Επικοινωνία	7,78	2,70%	22,30%	75,00%
Εκπαίδευση	7,23	7,38%	36,07%	56,56%
Μεταφορά και Αποθήκευση	7,22	13,42%	32,21%	54,36%
Επαγγελματικές, Επιστημονικές και Τεχνικές Δραστηριότητες	7,02	4,81%	28,87%	66,32%
Δραστηριότητες Υπηρεσών Εστίασης	6,86	15,69%	40,52%	43,79%
Μεταποίηση	6,72	17,62%	41,28%	41,10%
Κατασκευές	6,67	12,08%	40,94%	46,98%
Χανδρικό Εμπόριο, εκτός από το Εμπόριο Μηχανοκίνητων Οχημάτων και Μοτοσικλετών	6,65	10,42%	38,88%	50,70%
Διαχείριση Ακίνητης Περιουσίας & Χρηματοπιστωτικές και Ασφαλιστικές Δραστηριότητες	6,61	7,27%	34,55%	58,18%
Καταλύματα	6,51	10,00%	33,00%	57,00%
Δραστηριότητες σχετικές με την Ανθρώπινη Υγεία και την Κοινωνική Μέριμνα	6,43	7,69%	37,76%	54,55%
Διοικητικές και Υποστηρικτικές Δραστηριότητες	6,25	13,49%	38,10%	48,41%
Άλλες Δραστηριότητες Παροχής Υπηρεσιών	6,10	11,40%	42,11%	46,49%
Τέχνες, Διασκέδαση και Ψυχαγωγία	6,07	11,39%	32,91%	55,70%
Λιανικό Εμπόριο, εκτός από το Εμπόριο Μηχανοκίνητων Οχημάτων και Μοτοσικλετών	6,06	18,51%	40,65%	40,83%
Χανδρικό και Χανδρικό και Λιανικό Εμπόριο- Επισκευή Μηχανοκίνητων Οχημάτων και Μοτοσικλετών	5,51	8,86%	40,51%	50,63%

fig. 26. Percentage of employed labor force per digital skills' literacy - as perceived by their companies. (Dypa, 2022 p.45)

### 3.4.2 Mechanism of Labor Market Diagnosis (MDAAE)

The mechanism of Labor Market Diagnosis is a national institution, part of the Unit of Experts in Employment, Social Insurance, Welfare & Social Affairs, and under the supervision of the Ministry of Labour and Social Insurance. Its mission encloses(mdaae, 2023a) :

- Recording, analysis, and visualization of current labor market needs in occupations and skills in relation to the skills offered by the workforce.
- Capture the participation of businesses and employees and the unemployed in training programs.
- Forecast of the needs that will arise in the immediate future and the medium term, based on the dynamics developed by the various economic activities.

- Monitoring changes in the content of occupations and technological developments affecting employment.

Its key data sources are ELSTAT, Ergani, DYPA, AADE, EFKA, Eurostat, ESCO, and its content is provided in the forms of periodical reports & publications, as well as online interactive visualization tools. MDAAE provides interactive visualizations for multiple views and data co-plots that have been explored in previous sources (especially the national national strategy by DYPA). Within the paper, we will focus on visualizations that include unique data co-plot analysis, as well as new data sources or derived measures not met in rest sources.

### **Labor demand-supply of salaried employment**

MDAAE provides an interactive visualization of supply-demand of occupations. The provided visuals include a geospatial analysis, as well as a table with a synthetic classification of occupations (ISCO levels 1,2 & national classification STEP 92), with a ranking score, occupational unemployment records, and job vacancies evolution, as can be seen in fig 27. Visual filters allow for a three-categorical skills' filtering - in the same way as DYPA strategy visuals-. A methodological description or technical report is not provided, and as such an elaboration on the ranking of occupations, and the exact approach in the synthetic occupational classification are not known. (Mechanism of Labor Market Diagnosis, 2023b)

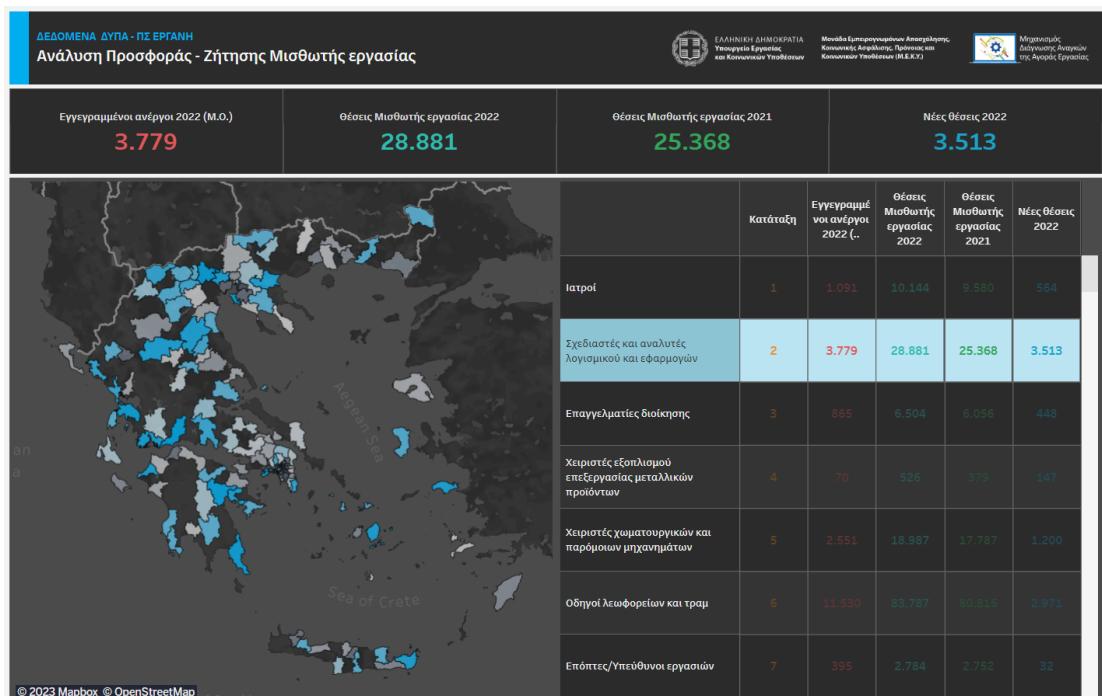


fig. 27. Labor demand-supply Interactive Visual . (MDAAE, 2023b)

## Sectoral demand for Skills in Greece

The ability to examine the dynamics and desirability of specific skills within an occupational sector is provided by a distinct visualized analysis by MDAAE. (MDAAE, 2023c). Currently available only for 'Information and Communication' NACE Section, the analysis proceeds with a very interesting visualization of co-plotting skills in the following two axes (fig. 28) :

- Median salary of occupations that require it
- Jobs evolution during past year on those occupations

Hovering over the visual, the user has the ability to examine details of each skill.

By selecting a skill - or subset of-, the analysis allows for a geospatial assessment of jobs evolution per municipality, plotted on an interactive map (fig. 29). It is a highly useful group of visuals, and the first time the correlation of ESCO skills and wages is directly assessed in the institutions we've examined.

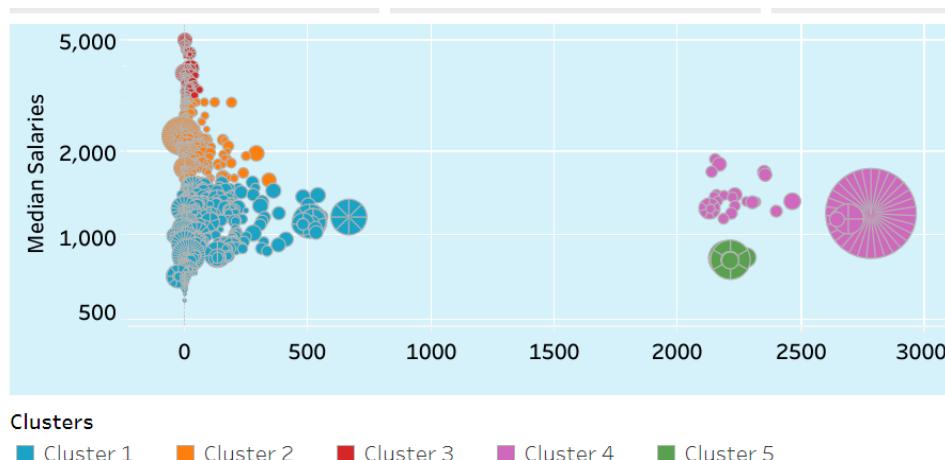


fig. 28. Clustered skills plotted on jobs evolution and median salaries of occupations requiring them. (MDAAE, 2023c)

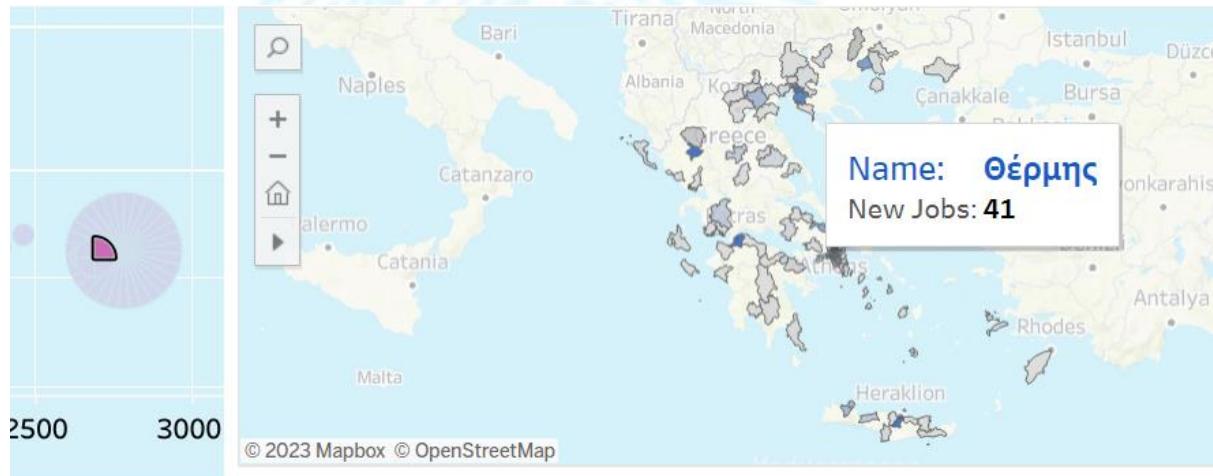


fig. 29. Geospatial visualization of new jobs requiring selected skill. (MDAAE, 2023c)

## Occupational Guide

Occupational Guide is a single-page multifaceted analysis of 3-digit ISCO occupational groups. It includes the vast majority of required information for many interested parties, from prospect employees, to policymakers. (fig. 30)

In terms of employee profiling, the visuals include gender, age, geographical region, field and level of education representation.

In terms of employability data, the visual includes occupational status, contract type & work hours status. More interestingly, it provides timelines for Salaries per worktime status, as well as employed population and dynamism<sup>13</sup>

Finally, in terms of skills, a complete list of skills, knowledge, abilities with a ranking - most likely conducted based on the frequency of appearance - is provided for the selected occupational group.



fig. 30. Occupational Guide - Complete Information Hub on multiple metrics of an occupation . (MDAAE, 2023d)

## Salaried employment dynamics of private sector 2022

The last interactive dashboard that will be assessed is that of employment dynamics.

<sup>13</sup> Dynamism is not explicitly defined, but based on the bottom left visual of fig. 26, it is safe to assume that it is almost identical to the annual persons employed evolution

Mentioned as ‘dynamism’ in rest reports, it is evident that the term expresses the annual job positions evolution. (MDAAE, 2023e) The dashboard consists of tables that provide breakdowns of the job positions’ evolution, based on the following attributes: 2-digit/4-digit sector, municipality, region, national occupation classification ‘ΣΤΕΠ 92’ 2-digit/4-digit occupations. It also includes total job positions per skills’ level.

### **Occupation to Skills Intelligence transition**

In 2023, MDAAE published a report on the incorporation of multiple data sources, in order to ingest skill-level intelligence to policy and exploration of labor analytics. Figure 31 schematically represents the data sources combined to the data pool, which is the master data source for all MDAAE analyses and the visuals examined above.

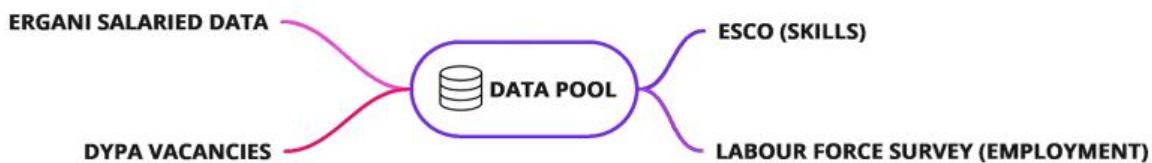


fig. 31. Data sources combination to master data pool schema . (MDAAE, 2023f, p.3)

The creation of the tool is claimed to be used by DYPA for service provision from DYPA counselors to the unemployed labor force, as well as the formulation of an evidence-based National Skills Strategy (MDAAE, 2023f, p.11). OECD analyses and data are acknowledged by MDAAE as a valuable source of knowledge towards the creation of skills’ strategies (MDAAE, 2019). As such, it is considered a serious omission that OECD’s PIAAC Data are not ingested into the model, exhibited in any visual, or explicitly taken into consideration for the formation of any used measure.

### 3.4.3 National Organisation for the Certification of Qualifications & Vocational Guidance (EOPPEP)

EOPPEP is a statutory body operating under the supervision of the Minister of Education, Research and Religious Affairs. While its primary mission is geared towards linking VET with labor market needs, upgrading people's occupational qualifications, reinforcing their employment perspectives and strengthening social cohesion, they have implemented a project that offers a different perspective to the occupational content, and as such to skills themselves. The institution has conducted an analysis, providing occupational outlines; (Eoppep, n.d.1).

These are thorough descriptions of occupations, and more specifically include:

- occupation/specialty title
- historical context
- current legislative framework
- analysis of job to occupational self requirements
- Required knowledge, skills, competences
- proposed routes towards the acquisition of the required qualifications
- indicative assessment methods of knowledge, skills & competencies

An example of a summary is presented in figure 32

## **Δημιουργός Τρισδιάστατης (3D) Κινούμενης Εικόνας με Ψηφιακά Μέσα**

### **Τι αφορά**

ο «Δημιουργός Τρισδιάστατης (3D) Κινούμενης Εικόνας με Ψηφιακά Μέσα» σχεδιάζει τρισδιάστατες εικόνες μέσω της αξιοποίησης και εφαρμογής των νέων τεχνολογιών και προγραμμάτων που προσφέρει η χρήση των ηλεκτρονικών υπολογιστών, για εμπορικούς, διαφημιστικούς και καλλιτεχνικούς λόγους. Το εύρος των τομέων της απασχόλησης είναι μεγάλο και περιλαμβάνει τομείς όπως κινηματογράφο, τηλεόραση, διαφημιστικές εταιρείες, εταιρείες πολυμέσων κ.ά.

### **Υπάρχουσα κατάσταση απασχόλησης**

Στοιχεία για την υφιστάμενη κατάσταση της απασχόλησης δεν είναι διαθέσιμα. Σύμφωνα με την ΕΕΤΤ ο αριθμός των ευρυζωνικών συνδέσεων στο τέλος του Ιουνίου έφτασαν τις 1.753.434 (διείσδυση 15,63% στον πληθυσμό), έναντι 1.629.322 (διείσδυση 14,5%) τον Μάρτιο του 2009, παρουσιάζοντας αύξηση 7,6% κατά τη διάρκεια του τριμήνου. Σε απόλυτα μεγέθη, η αύξηση αυτή μεταφράζεται σε 124.112 νέες ευρυζωνικές συνδέσεις κατά τη διάρκεια του τριμήνου, έναντι 122.708 νέων συνδέσεων που σημειώθηκαν το προηγούμενο τριμήνο. Κατά τη διάρκεια του 1ου εξαμήνου του 2009, η ευρυζωνική διείσδυση στην Ελλάδα αυξήθηκε κατά 2,19 μονάδες (από 13,44% σε 15,63%).

Θετικές προοπτικές μεταξύ άλλων επισημαίνονται και από την πρόσφατη έκθεση της Ευρωπαϊκής Επιτροπής για την Ψηφιακή ανταγωνιστικότητα των κρατών μελών της Ε.Ε. Σύμφωνα με την έκθεση ο ψηφιακός τομέας της Ευρώπης σημείωσε μεγάλη πρόοδο από το 2005: το 56% των Ευρωπαίων χρησιμοποιούν σήμερα το Ίντερνετ, το 80% εξ αυτών μέσω σύνδεσης υψηλής ταχύτητας (σε σύγκριση με το ένα τρίτο το 2004), δίνοντας παγκοσμίως στην Ευρώπη την πρωτοκαθεδρία στο ευρυζωνικό Ίντερνετ. Η χρήση του Ίντερνετ θα ανέβει στα ύψη καθώς οι πολίτες της Ευρώπης θα εισέλθουν στον επαγγελματικό στίβο, διαμορφώνοντας και καθοδηγώντας τις τάσεις της αγοράς ολοένα και περισσότερο. Βάσει των ανωτέρω και δεδομένου του γεγονότος ότι οι χρήστες τόσο του internet όσο και των υπολογίων μέσων (τηλεόραση, κινηματογράφος, video games κλπ) αυξάνονται συνεχώς, η απασχόληση στο επάγγελμα του «Δημιουργού Τρισδιάστατης (3D) Κινούμενης Εικόνας με Ψηφιακά Μέσα» εκτιμάται ότι θα αυξάνεται συνεχώς.

[Επαγγελματικό Περίγραμμα Δημιουργού Τρισδιάστατης \(3D\) Κινούμενης Εικόνας με Ψηφιακά Μέσα](#)

fig. 32.Example of an Occupational Outline summary. (MDAAE, 2023f, p.3)

Occupations offer a substantially more descriptive character compared to the ESCO classification. The above figure only provides the summary of an occupation, which is accompanied by an 88 page document (Eoppep, n.d.2) It is clear that there are many problematic aspects with this approach. The integration of one occupation would require such a big amount of time, that renders the process highly inefficient for a period with such a fast pace of occupations' creation. This holds true on the update of existing occupational descriptions. On the above example, and as of 2023, the data describing the current occupational state date back to 2005. It is also practically discouraging to conduct comparative analyses between occupation for most interested parties, as well as conducting international comparisons of occupational structures. It is clear that the goal of this body of

knowledge was not created with an analytical process in mind. However, it encloses the most comprehensive and holistic analysis for an occupation that has been examined across all sources. Apart from the aforementioned contents of the analysis, an indicative element is the inclusion of union & scientific bodies supporting the development and work conditions of each occupation. In terms of codification, the occupation includes comprehensive tables that discuss occupational specialties, key work functions & activity groups, further split to sub-key activity groups, and individual activities. It also includes assessment criteria for the adequate conduct of those activities. Furthermore, apart from the qualifications and educational attainment required, and the alternative routes to cover those requirements, the report goes as far as analyzing the different assessment methods that a candidate may face during a hiring process, or a qualifications attainment process. It is indicative that the labor of institute by the Greek general confederation of workers (INE-GSEE) in a critical report on the latest national strategy of DYPA, proposed EOPEP's Occupational Outline as a societal viable alternative to DYPA's data pool and created tools for labor analytics. (INE-GSEE, 2023). The report noted that the strict skill & activity analysis of an occupation, as long as its reduction to numerical KPIs and aggregation to a faceless Supply-Demand equilibrium does not provide for the qualitative assessment of workers' well-being, and the holistic understanding of workforce's needs & work conditions. Looping back to our theoretical framework, we see that the standardization of employment & skills, as well as the positivistic approach to labor is a point of societal debate - even on an institutional level. A constructive deliberation on the matter should propose a parallel utilization of the two broad resource groups. The analytical capabilities - and agility in incorporating with relative ease new occupations and skillsets - of the positivistic approach can far more efficiently provide for a top-line strategic and policy guideline resource, while the quality and societal factors included in EOPEP's provided resources should be taken into consideration of much better use for individual level examinations & occupational consultation, as well as formation of social policy for societal groups that face educational & occupational attainment barriers. At the same time, the utilization of modern technological techniques (such as Machine Learning

NLPs) could provide for a far enriched version of data consolidated by the two sources, as well as for the timely update and ingestion of new knowledge to EOPEP's data.

### 3.5 OECD

Apart from PIAAC Data, OECD has been an impactful contributor to the trajectory of empirical research regarding the content of work, and skills interplay with occupations. With its published reports, and the utilization of PIAAC data, the organization has attempted to systematize relationships that were not properly included in the theoretical economical models. Brunello & Rocco (2015) conduct one of the first analyses utilizing the totality of CEDEFOP's PIAAC data. The authors identify educational attainment as mutually exclusive alternative paths between vocational and academic education, and proceed to conduct one of the few systematic direct comparisons of their impact on multiple fronts. Controlling for the educational level - classified on ISCED - they conclude that vocational education ill-performs when compared to academic equivalent, on all monetary and non-monetary fronts. Within this context, they explore the impact of the two in core proficiencies directly measured by the PIAAC survey. This is an introductory approach to assess the quality of those attributes as actual skill determinants. They conduct their analyses on national, age and gender groups, as well as in total population. At the same time, they test the hypothesis of beneficiary consequences that vocational training provides compared to lower secondary education attainment, since vocational training has been considered to allow students to proceed with additional educational attainment. (p. 6). Providing a much more sophisticated and comprehensive alternative to the skills matching approach, compared to the one adopted by cedefop's ESI, McGwan & Andrews (2015) create a methodological framework that assesses mismatch based on two attributes; skills and qualifications. The first key differentiator with the mismatch methodologies that the majority of labor analysis institutions follow, is that education is no longer considered a direct proxy to skill. On the contrary, skills

are considered a distinct attribute, next to qualifications - that education falls under. The scope of their paper is to compare the impact of skills and qualifications mismatch (independently, as well as combined) to within-firm and total labor productivity. Qualifications mismatch calculation is conducted based on the question of PIAAC respondents on the current qualification level requirement for a candidate to get the respondents' job. Respondents were classified as well, over, or under-qualified based on the comparison of their own educational attainment level. While the occupational qualification stops at a fairly abstract level, samples are insufficient for detailed projections, and occupations are fairly heterogeneous within occupational groups, no aggregated validation is conducted in order to avoid subject biases in the claimed responses. However, the qualifications are structured enough that a valid estimation should be expected by respondents. Skills' mismatch is a result of a claimed relative skill set of respondents to the required level of skills for their occupation, statistically validated by their actual test scores. On an ISCO 1-digit level occupational groups, the scores' distributions of respondents that identified themselves as well-matched was calculated. Workers of each occupational group with scores below the 5th and above the 95th percentile of those values, were classified as under-skilled and over-skilled respectively. The approach is highly sophisticated, making use of the totality of the survey's capability -ie. the direct recording of self-perspective on skill possession, as well as the 'ground truth' of their proficiency scores. A robustness concern on the methodology is the high abstraction level of the proficiency aggregation in order to include a large enough sample, which in combination with the heterogeneity of occupational skill requirements might not properly depict the most indicative levels of skills (p.12). Additionally, the self-assessment subjective bias is only partially mitigated, since the well-matched respondents were treated as truthful by default. Lastly, the self-assessment of skills is based on the totality of required skills, while the statistical validation is provided only on a subset of them; the ones that PIAAC measures in the proficiency tests. Nevertheless, the approach is considered to be much more precise than the proxies met in all previously examined approaches of skills measurements. While the sophistication of the calculation methodology

is of particular interest for the scope of this paper, the produced results were equally insightful. It was concluded that while under-qualification is the most impactful determinant on productivity level, over-skilling had a significantly higher impact compared to over-qualification. As such, the sole reliance of skills mismatch to the educational level disjunction, is subject to serious drawbacks.

### 3.6 Academic interaction with labor force & occupational data

Apart from the institutions themselves, the broader academic community has provided insightful content that utilizes or examines the data sources that were analyzed above. We can categorize relevant research on the terms of assessing, enriching, and utilizing those sources. On the topic of completeness and timely update, Chiarello et al. (2021) constructed a natural processing language model in order to retrieve industry 4.0 related terms, and identify the most popular and emerging ones. When compared with the skills included in ESCO, the classification model included around 70% of the most popular ones, 11% of which was introduced in the latest update. Focused on enriching the existing data, Colombo et al (2019) implemented a Machine learning algorithm of support vector machines, in order to extract occupations and skills from online vacancies of the Italian market, and correlate them to the ESCO classification. By categorizing them to soft & hard as per ESCO's dataset, and to technical and non-technical using expert knowledge (prior to the formal digital label creation by ESCO), they conducted examined the statistical contribution of those categories to the online vacancies, controlling for occupational groups, providing insights on the importance of hard-soft and respectively digital non-digital skills to ESCO 1-digit groups for the Italian market. In a similar manner, Fernndez-Sanz et al (2017) constructed 'eSkills Match', a unified framework that combined ICT-relevant terminology from three distinct skills and occupation data sources; e-CF, ESCO and ICT BOK, in order to facilitate a more complete evaluation of IT skills for policy-making and workers' (self-)assessment, useful for educational purposes and hiring processes on an individual level. Shifting towards the

utilization of the existing frameworks in order to produce analytical insights, Nwakasi et al (2019) provided an assessment of PSTRE correlation with demographical data such as age and gender, with comparative results from multiple countries. Pouliakas and Russo (2015) explore the correlation of tasks' complexity to skills' needs, and assess the intra-occupational heterogeneity of skills' needs. Two methodological topics are of interest in their produced work. Skill demand is expressed through proficiency scores, in two different ways. On the one hand, the authors use the approach behind OECD's skills' match method (ie. calculation of anticipated skill demand based on the proficiency scores of people stating that are well-skilled for their occupation). In order to mitigate the drawbacks of this method, they additionally employ an alternative measurement, deriving the proficiency score of individuals with similar skills frequency use at work. Secondly, task complexity variables from the questionnaire are grouped together. This is done by using expert knowledge and literature review, with the statistical validation of cronbach's alpha similarity to ensure cohesion of within-group variables. Finally, another interesting utilization method of the PIAAC data is conducted by Lapatsioras et al (2020), who assess the susceptibility of the Greek labor force to digitalization consequences. They do so while creating multiple synthetic indices that measure fundamental components of the economical literature on technological implications (ie. routine, non-routine, manual and multiple subdimensions). Their methodological approach is of particular interest, due to the fact that they employ Principal Component Analysis in order to statistically justify their synthetic indices groupings.

# Chapter 4

## Methodological Approach

In this section, we will describe the methodology that will be followed during our analysis of the digital literacy determinants of the Greek market. From the sources we have examined so far, it is apparent that while there are multiple sophisticated analytical approaches tackling a wide range of research topics around the content of work and the concept of skills, there is none that simultaneously combines and utilizes all classification information, along with PIAAC data. The second key contribution of this paper focuses on the procession of labor analytics. It is the proposal of a data sources' combinatory approach, and the creation of a publicly available online code repository, to act as a starting point for any interested party wishing to conduct such analyses with the utilization of the available data sources. It also encloses the expansion of the classifications' data usability (occupational, sectors, educational), by creating synthetic metrics in a way that will be thoroughly discussed later on. To the best of the author's knowledge there has been no case in the scientific community or institutes' produced work that proposes this kind of simultaneous utilization of all those sources. A comprehensive approach in the classifications parallel utilization, albeit focused in educational policy-making and approaching it in a semantics top-line level, is proposed by Icociu et al. (2019)

### 4.1 Analytical Process

Our analysis aims to assess the quality of available survey and classification data as determinants to digital literacy. We use the term 'digital literacy' to express a combinatory proficiency in ICT usage skills & information processing. As such, digital literacy is

understood as the total PSTRE score of PIAAC Survey respondents. Based on the technical report of PIAAC, “PSTRE represents a domain of competence that involves the intersection of the set of skills that are sometimes described as “computer literacy” (i.e., the capacity to use ICT tools and applications) and the cognitive skills required to solve problems (. ...) the objective [of PSTRE] is not to test the use of ICT tools and applications in isolation, but rather to assess the capacity of adults to use these tools to access, process, evaluate and analyze information effectively.” (OECD, 2019, p. Preface– 4).

We will be using multiple variables to assess this outcome, the former of which can be grouped in many ways. We will provide one of them for interpretation purposes, but will not be limiting our analysis to its semantics. The four categories are i. Occupational data, ii. Sectoral data, iii. Work & everyday life tasks and traits, and iv. formal & VET education.

We will be conducting two distinct sets of analysis. The first one will be a straightforward regression, which will allow us to see how each variable performs in explaining shifts in digital literacy compared to the rest, as well as what are the collinearities arising within and among the self-assigned notional variable groups mentioned above. Our second approach will be a Principal Component Analysis (PCA) and a regression of our dependent variable with the shaped components. This is not only due to the fact that this analytical framework is quite commonly used in Large Scale Survey Analytics (eg. Lapatsioras et al (2020) on PIAAC; Caines et al. (2017) on O\*NET), neither due to the fact that it is proposed as the preferred analytical method for dimension reduction on Large Scale Survey Methodological guides (Khorramdel et al. , 2020). While commonly considered to deprive the components of interpretability, we made the deliberate choice to utilize PCA's component orthogonality. We needed to ensure that no collinearity between the created components was evident, so that we can assess the linear combination of the examined attributes that provides the largest explainability to our PSTRE score on its own. Provided that validity checks and variance explainability level of the first component are satisfactory, the first component of the PCA is

proposed to be used as an indicative importance ranking resource among the incorporated variables. And hence, the result will not be bound by the conceptual grouping provided above, but rather be organically created by its ability to explain what is a good measure of digital literacy for the Greek labor force.

Within this process, there are methodological barriers that need to be addressed.

Occupational & economic / educational sector categories do not endogenously hold any numerical value that could be utilized within our regression and component analysis models. Even numerically replacing their names, however, categories by themselves hold no comparative metrics in order for them to be properly ingested. In other words, we could not claim that ISIC category 4 was more or less in any measure compared to category 5.

In order to address this, we proceed to shape those data in a usable format. We achieve this by constructing digital/technological intensification measurements. Following are the approaches for the creation of the indices for occupations sectors.

#### 4.1.1 Occupational Digital Intensity Index (DII)

In the examined literature, we explored a few impactful pieces of research that aimed to create indices of technological or digital intensity based on various approaches and data sources. We have decided to implement a technique that utilizes in a combinatorial manner two recent data sets officially published by ESCO.

The first data source is ESCO's occupations to skills matrix (ESCO, 2020). As stated within the paper, following the vast increase in analytical needs by multiple interested parties, it was of benefit to expand the relationships between skills and occupations to all available group abstraction combinations.

Practically, occupational group - skills group indices are decimals in the range of [0,1].

The skill-group index of an occupation is the percentage of total skills for this occupation that follow under the specific skills' group. Subsequently, the skill-group index of an occupation-group is the aggregated contribution of this skill-group to the examined occupational group.

The second data source is ESCO's digital labeling. As analyzed in the respective section of the paper, ESCO has provided a labeling capability that defines all available skills, knowledge and competences as digital or non-digital.

Following the methodological approach of ESCOs occupation-skill mapper, we conduct statistical aggregations on the complete skills' hierarchies, in order to provide a Digital Intensity Index of skill groups. Combining it with the contribution factor of each skill group to occupations and occupational groups provided by the first source, our analysis has produced a complete digital intensity mapping on all ISCO/ESCO occupational groups, strictly utilizing official data. The skills' digital intensity will also be utilized for the introduction of the educational sector to the dataset. The technical details of the methodology will be discussed in detail in the data sources & variables sub-sections.

#### 4.1.2 Sectoral Technological Intensity Index (TII)

Multiple approaches exist for the determination of economic sectors' technological intensity. We have already examined cedefop's ill-defined approach, which provides little information of what fundamentally constitutes a high-tech economic sector. Eurostat provides a comprehensive list of alternative approaches on what potentially constitutes 'high-tech' on sector and firm level (Eurostat, 2020a). Namely, the different approaches stated by Eurostat are the sectoral approach (based on R&D expenditure for manufacturing sectors, and

knowledge intensive services for service sectors), the product approach (product group R&D expenditure per sales values), and the patent approach. However, Eurostat provides parallel classifications on the above data, with interchangeable usage of 2 and 3 level codes of NACE rev 2 (Eurostat, 2020b), which is explained due to data availability (Eurostat, 2022), and non-unified hierarchical classification on total high-tech classification and knowledge intensity (Eurostat, 2020b, Annex 3), this approach is not preferred.

In order to construct our, we will rely on two resources provided by OECD. In the main resource utilized, Calvino et al. (2018) asses technological intensity of sectors based on the below indicators:

- i. ICT investment
- ii. Purchases of ICT intermediates
- iii. Robot use
- iv. ICT specialists
- v. Online sales

Getting into more detail, indicator iv is calculated as the percentage of the following ISCO-8 occupations (Calvino et al. 2018, p. 22).

- 251 (Software and applications developers and analysts)*
- 252 (Database and network professionals)*
- 133 (Information and communications technology service managers)*
- 351 (Information and communications technology operations and user support)*

The occupations were chosen as they were common denominators on the top technological occupations rankings' on five methodological approaches. Four out of five utilized ICT-related tasks from the PIAAC survey. (p. 44-47). It is both indicative of what another PIAAC data usage has been, as well as interesting to examine the collinearities of the Sector ICT and multiple task-based determinants included in our model as independent variables.

The approach of Calvino et al. (2018) seems to consolidate all of Eurostat's and Cedefop's proposed indicators, with the exception of R&D intensity. This is why we will additionally employ the report by Galindo-Rueda & Verger (2016), calculating sector intensity based on R&D expenditure. Apart from the extensity of the parameters taken into consideration, the sources are also preferred due to their cohesive representation of the classified results. The compromise that needs to be made to limit the granularity of the classification on a 2 digit level, is more than offset by the benefits of the selected solution. Alternative implementation of the synthetic TII metric will be calculated based on the two sources, in order for a comparative assessment to be conducted in our analysis between them. The composition approaches of the index will be discussed in further detail in the following respective section.

The creation of those two indices also provides added value to our paper, since they allow for sector and occupation groups to be ingested into our mathematical models in a way that directly measures their impact on our analysis, rather than limiting their usability to being controlling variables or defining the population upon which an analysis is conducted.

## 4.2 Data Sources, flow & processing

Our data sources revolve around three main information domains

- i. PIAAC survey
- ii. ESCO skills & Occupation data
- iii. ISIC economic sector data

Following is a detailed discussion on the Processing performed to the data incorporated, the data flow until the creation of the dataset inclusive of all the relevant information, as well as methodological choices made due to the nature of the available data.

#### 4.2.1 ESCO Skills<sup>14</sup> & Occupation data

For the manipulation of the ESCO data, we use the following files

- i. Skills - Occupation matrix<sup>15</sup>: Providing Skills contribution to occupations on multiple hierarchy combinations
- ii. Digital Skills & Knowledge<sup>16</sup>: Binary mapper of whether a skill is labeled digital
- iii. Skills' Broad Relationship : Pairwise combination of skills & the broader concept they appoint to
- iv. Skills' Complete hierarchy : Complete hierarchical Pathways of top-4 skill levels

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<sup>14</sup> Unless specified differently in the text, the term 'skills' will be henceforth used to express the totality of skills, knowledge & competencies

<sup>15</sup> Available in <https://esco.ec.europa.eu/en/about-esco/publications/publication/skills-occupations-matrix-tables>

<sup>16</sup> Available in <https://esco.ec.europa.eu/en/use-esco/download>, along with resources iii,iv by request.

The data manipulation process at a top level is depicted in fig 33.

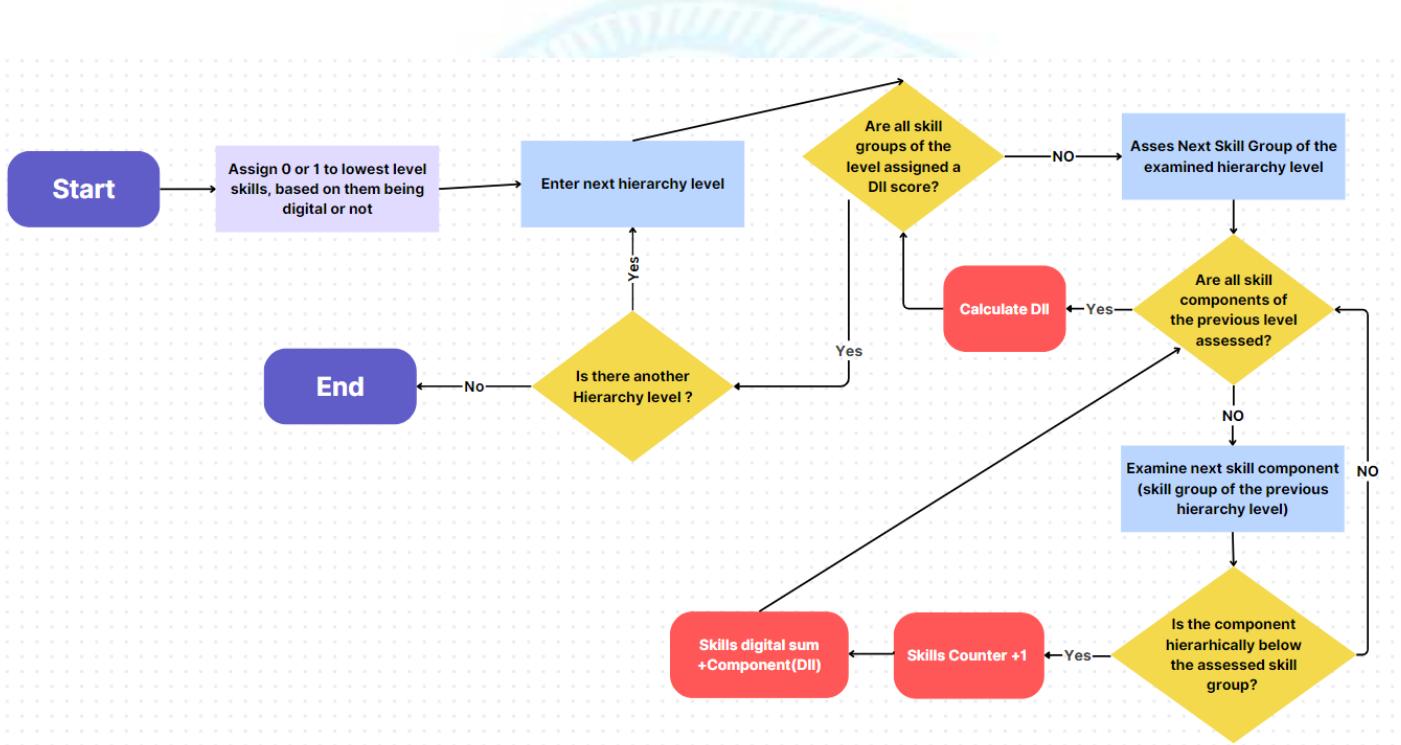


Fig. 33. Indicative ESCO skills-occupations data manipulation for the calculation of occupational groups DII.

The content and the shape of the resources revealed a few peculiarities of the data set, as well as some - subjectively considered - methodological flaws in the creation of ESCO's digital labeling index. Without getting into technical detail, the main issues of the ESCO hierarchy are as follows:

- i. The data files containing complete hierarchical pathways stop at concepts' level 3, while the majority of complete hierarchies include at least another hierarchical level of skills

ii. All digital skills are in lower hierarchical levels than level 3, meaning a direct mapping of a digital label is not possible

iii. The hierarchy includes self-references, and there around 30% of the hierarchical relationships were on a skills-to-skill schema, rather than skill-to-skill group. This caused another methodological difficulty in assessing the foundational (lowest level) entities from which the DII measurement was to begin.

An incorporation of files ii-iv was conducted in order to be able to calculate the DII index. As stated in the schema, the DII of each skill (group) is calculated based on its directly narrower components, rather than the totality of the full set of items indirectly appointing to it. The prioritization of ‘average of averages’ rather than ‘average of sums’ is in order to limit the disproportional impact of components with a larger set of narrow skills. ESCO treats each component as of equal importance, and the level isolation works towards this direction in the author’s opinion.

This results in a dataset containing all skills (transversal & not) and knowledge, in all hierarchical levels<sup>17</sup>, and the extent to which they are digital, and are exhibited in Appendix Table 1. Indicatively, we provide the top 30 skills with the highest DII in Table 10.

**Table 10.** Top 20 highest DII skills

<b>name</b>	<b>dii</b>
browsing, searching and filtering digital data	1.0000
computer use	1.0000
information and communication technologies not elsewhere classified	1.0000

<sup>17</sup> The skills with DII exhibited in the paper are of hier. level 0-3. The 1200 skills of the narrowest level explicitly mentioned in ESCO’s digital skills file are not listed here. They obviously have a DII = 1

programming computer systems	1.0000
programming computer systems	1.0000
resolving computer problems	1.0000
setting up computer systems	1.0000
using computer aided design and drawing tools	1.0000
using digital tools for collaboration, content creation and problem solving	1.0000
using word processing, publishing and presentation software	1.0000
working with computers	1.0000
working with computers	1.0000
working with digital devices and applications	1.0000
managing, gathering and storing digital data	0.9977
software and applications development and analysis	0.9963
using digital tools for collaboration, content creation and problem solving	0.9952
protecting ict devices	0.9938
using digital tools for processing sound and images	0.9906
designing ict systems or applications	0.9902
database and network design and administration	0.9901
accessing and analysing digital data	0.9900
using digital tools for collaboration and productivity	0.9854
accessing and analysing digital data	0.9722
using digital tools to control machinery	0.9497
using digital tools to control machinery	0.9497
working with computers	0.9472
operating communications equipment	0.9333
audio-visual techniques and media production	0.8775
engineering and engineering trades not further defined	0.8750
library, information and archival studies	0.8537

We subsequently utilize the skill-occupation mapper, in order to assign a DII score to all occupations and occupational groups. We need to note here, that ESCO has proceeded with the methodological choice to exclude from the mapping knowledge attributes and transversal skills. As such, while DII is calculated on all levels and types of concepts of the ESCO classification, only sector/occupation specific skills are utilized in the occupational digital intensity calculation. In the case of transversal skills it is understandable, since the attributes are also not linked at the lowest disaggregation level with any occupation. It is more unexpected in the case of knowledge concepts, since they are linked with single occupations. In both cases, however, the lack of the concepts is a serious methodological limitation that need to be taken into consideration.

#### 4.2.2 ISIC Data

As already mentioned, in order to assess the way ISIC is correlated with the PSTRE score of Greek labor force, we will create a synthetic Technological Intensity Index (TII) for each 2-digit sector. Given that the first source by Calvino et al. (2018) asses the intensity based on 5 aspects, and Galindo-Rueda & Verger (2016) provide an additional one, we will be following two approaches for the Technological Intensity Index (TII).

In our first approach, we construct our index on a source basis, considering each source to be of equal importance, and as such define the TII (expressed as  $TII_{1-1}$ ) as the average of the two sources' indices.

$$TII_{1-1} = \frac{TII_{comb} + TII_{R&D}}{2}$$

In a similar spirit, the second approach constructs our index on a aspect basis, considering each aspect to be of equal importance, and as such defines TII (expressed as  $TII_{1-5}$ ) as the average of the six aspects.

$$TII_{1-5} = \frac{5*TII_{comb} + TII_{R&D}}{6}$$

In cases where one of the sources does not provide a score for a specific sector, the sectorial score of the other source is used. More specifically, R&D score is not provided for sectors 84-88, since the R&D for these sectors is not conducted by business enterprises, but other types of institutions Galindo-Rueda & Verger (2016, p. 8). Additionally, multifactor score is not provided for sectors 97-99, since they account for household production, and are not applicable for multiple measurements Calvino et al. (2018 p. 8)

Following in table 11 is an indicative list with the top 10 sectors based on our  $tii1-5$  metric. It includes sector codes, descriptions, and all the scores used as input and provided as output from our calculations. The complete table can be found in the Appendix (Table 2)

**Table 11.** List of top 10 Sectors with the largest tii1-5

Sector	Sector Label	tti_rnd	tti_multi	tti1-1	tti1-5
72	Scientific research and development	5	5	5,00	5,00
29	Manufacture of motor vehicles, trailers and semi-trailers	4	5	4,50	4,83
30	Manufacture of other transport equipment	4	5	4,50	4,83
62	Computer programming, consultancy and related activities	4	5	4,50	4,83
63	Information service activities	4	5	4,50	4,83
61	Telecommunications	2	5	3,50	4,50
69	Legal and accounting activities	2	5	3,50	4,50
70	Activities of head offices	2	5	3,50	4,50
71	Architectural and engineering activities	2	5	3,50	4,50

#### 4.2.3 ISCED & ISCED-F Data

Another source required to be quantified in order to be utilized is the educational aspect. ISCED classification provides a numerical hierarchy, which allows for an ordinal usage directly within our model. The parallel ISCED-F classification of educational fields, however, does not include any direct numerical comparison. As stated in 4.2.1, DII is

calculated for the complete list of skills and knowledge concepts. Given the fact that ISCED-F is the base for the knowledge concepts of ESCO (ESCO, n.d.), the only required action is the mapping of the knowledge concept groups with their DII, to the respective education field. In order for the intensity, however, to be incorporated into the PIAAC data, a transformation from ISCED-F 2013 to ISCED 1997/2011 is required, as this is the classification protocol used in the survey. We conduct our changes on a 2013 detailed level to 2011 broad level, following the delta guidelines of the two versions provided by UNESCO (2014, p. 13). As such, we are able to match all detailed knowledge concepts to the 1997 knowledge groups, and directly assess their DII. Following in Table 10 are the results on the 1-digit aggregation level, which is also the level reported in PIAAC results as well.

**Table 10.** Full list of 1-digit ISCED-97 fields, with their DII derived from ISCED-F 2013 mapping

<b>Skill Group</b>	<b>DII</b>	<b>Skill Name</b>
<b>00</b>	0.0000	General programmes
<b>01</b>	0.2960	Teacher training and education science
<b>02</b>	0.1672	Humanities, languages and arts
<b>03</b>	0.1741	Social sciences, business and law
<b>04</b>	0.4499	Science, mathematics and computing
<b>05</b>	0.2299	Engineering, manufacturing and construction
<b>06</b>	0.0412	Agriculture and veterinary
<b>07</b>	0.0912	Health and welfare
<b>08</b>	0.1051	Services

This concludes our external data classifications and calculations, and allows us to schematically represent the incorporation of data sources in file level, provided in figure 34.

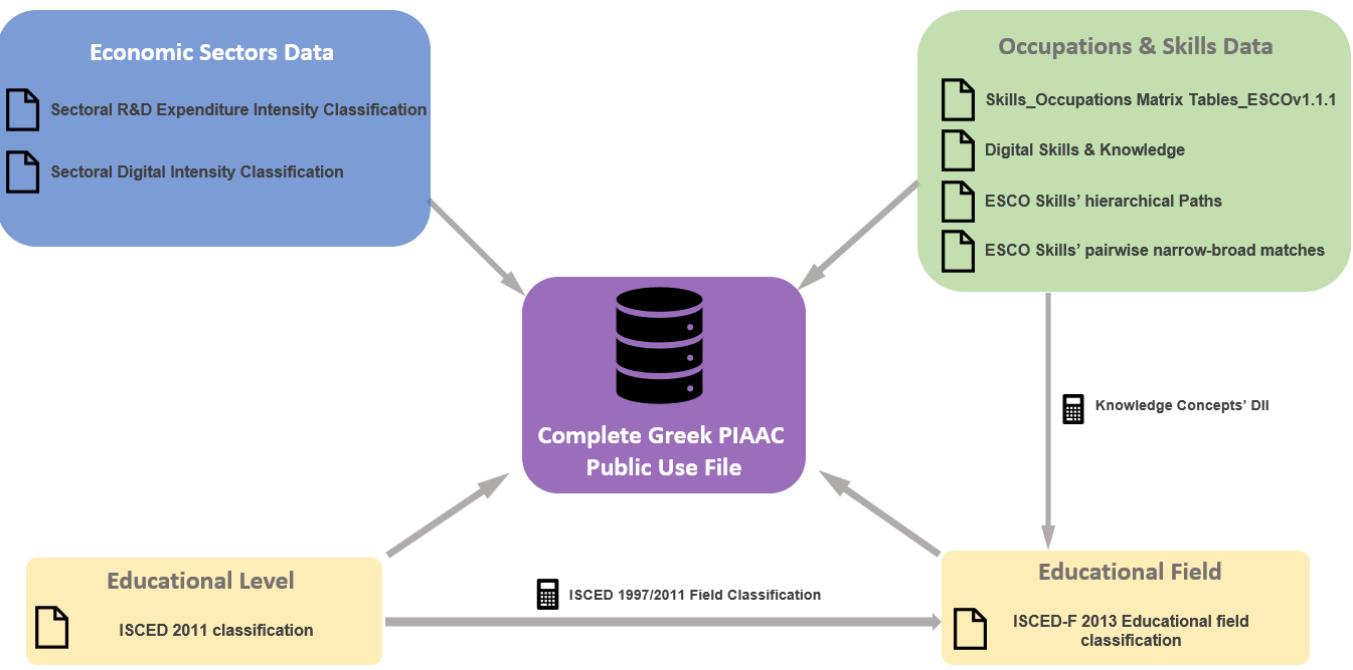


Fig. 34. Data Sources per Information Domain on a file level schematic representation

#### 4.2.4 PIAAC Data

Having examined all the external data sources, the calculations conducted, and their relationship with the PIAAC data that dictate their ingestion process to the main dataset body, we proceed to identify the variables of the survey variables and their conceptual grouping.

##### Sample filtering

In order to keep the sample usable and allow for maximum predictors' exploration and assessment, we will be filtering our dataset by applying the following criteria to our observations.

1. Completion of Computer-based assessment & PSTRE questionnaire
2. Current participation in any form of employment (paid, unpaid, temporary absence)
3. Sufficient responses in Background Questionnaire for PIAAC's derived synthetic indices to be calculated
4. Provided employment information (occupation & field)
5. Provided educational information (level & field)

### **Variables Selection**

We are grouping our independent variables in two conceptual and three analytical groups.

Conceptually, we identify the groups of

1. **Education & Employment**

The group includes the level & field of education, the occupational group & the employment sector, the recent participation in education (formal & informal).

2. **Occupational & personal activities, and behavioral stances**

The group includes data regarding the frequency a respondent conducts certain activities within his current occupation, his everyday life, as well as attitudes towards various topics that are considered to be correlated with peoples' code of conduct.

Analytically, we identify the groups of

### 1. Fundamental Variables

These are variables that are included in all analyses' groups; They cover the education level, recent participation in education and whether it was job-related. They also cover educational & occupational fields, as well as occupation groups. These last variables are expressed through their technological/digital intensity index, as per our calculations above.

### 2. Constituent Variables

The group includes the variables regarding activities & stances that are directly measured or derived within the questionnaire. The activities are in regards to work content and everyday life frequency of activities. They are either generic, or belong to one of the three test measured categories (literacy, numeracy, ICT usage)

### 3. Composit Variables

The group includes synthetic metrics created based on the above constituent variables, as constructed by OECD, based on a weighted maximum likelihood estimation (OECD, 2016. Chapter 20 p. 11 -12).

In table 12 we explore a small subset of the actual variables, their description, and the analytical group they belong to. The complete list can be found in table 3 of the Appendix.

**Table 12.** Indicative subset of variables used as predictors during PSTRE Score analyses

Variable	Description	Fundamental	Constituent	Composit
B_Q01a	Education - Highest qualification - Level	X		
F_Q02a	Skill use work - How often - Sharing work-related info		X	
G_Q04	Skill use work - ICT - Experience with computer in job		X	
H_Q03b	Skill use everyday life - Numeracy - How often - Calculating costs or budgets		X	
I_Q04b	About yourself - Learning strategies - Relate new ideas into real life		X	
NFE12	Participated in non-formal education in 12 months preceding survey (derived)	X		
isced_dii	Digital Intensity Index of Educational field	X		
ti1-5	Occupational Industry technological Index (R&D importance of 1/6)	X		
digi4	Occupational group Digital Intensity index on ISCO 4level	X		
LEARNATWORK	Index of learning at work (derived)			X
READYTOLEARN	Index of readiness to learn (derived)			X
ICTHOME	Index of use of ICT skills at home (derived)			X
INFLUENCE	Index of use of influencing skills at work (derived)			X
NUMWORK	Index of use of numeracy skills at work (basic and advanced - derived)			X
PLANNING	Index of use of planning skills at work (derived)			X
READHOME	Index of use of reading skills at home (prose and			X

	document texts - derived)			
<b>TASKDISC</b>	Index of use of task discretion at work (derived)			<b>X</b>
<b>WRITHOME</b>	Index of use of writing skills at home (derived)			<b>X</b>

## **PIAAC Data Manipulation & Complex Modeling Handling**

Given its Large-Scale Survey nature, PIAAC is using a combination of complex modeling methods. More specifically, it employs (1) item calibration through IRT scaling, (2) Population Modeling with latent regressions and Plausible Value generation, and (3) Replication Weighting for country variability & statistics in comparison purposes (OECD, 2016. Chapter 17 p. 2-3). For computational performance & simplification purposes, we make specific variable modifications & calculations choices stated and defended below.

### Target Value Selection

Within OECD, PIAAC made a choice in order to ensure maximum participation in the survey and testing process, to provide a subset of questions & questionnaire modules to participants. As such, ten Plausible values (PVs) were calculated, providing results of population modeling with expected scores for each proficiency level. The most comprehensive approach would require the repetition of every analysis for all PVs and the creation of average statistics. However, this causes computational implications, especially for more complex analysis models, and renders unusable all visualization techniques - critical for understanding and interpreting input data and output results. As such, we proceed

to use one of the PVs, a proposed efficient alternative producing unbiased results. This is especially when compared with alternative approaches, and in contrast with a common pitfall of using the average of PVs as a scalar score that heavily underestimates errors and results in bias ( Khorramdel et al. , 2020 p. 43). We only lack accounting for the imputation error, resulting in a slight underestimation of complete population total errors. (OECD, 2009 p. 128-130). An important note regarding the topic is that background questions were partially used as criteria for computing the Score PVs. This result in an endogenous bias towards those criteria, given that respondents with common educational, occupational & demographic attributes were given a higher chance of providing similar cognitive answers. Given the multidimensionality of the background questions and the simultaneous inclusion of commonly responded answers' similarity, it is considered a sufficiently objective approach.

### Sample weighing process

Additionally, in order to provide maximum representativeness, each observation is assigned specific weights. Those consist of a total weight (SPFWT0) and 15-80 replicate weights, based on stratification processes of each country. Greece has the maximum number of replication weights, (SPFWT 1-80), while using paired jackknife two-stage stratification. Replicate weights are useful for international comparisons, in order to adjust for the differences in stratification processes. However, given that our scope is within country analysis, it is only of use to weigh our sample based on the total weight of SPFWT0. Sample weights makes it impossible to directly conduct analyses based on models that do not account for observation weights by default. As a result, analyses especially based on coding languages (such as python) rather than statistical analysis tools (such as STATA) that automatically account for the statistical implications of the data provided - but provide limited descriptive & inferential statistics -, are conducted without weighing the samples. (Jim & Aljauwfi, 2020; Chyl & Molac, 2022). While this is an approach usable as a proof of

concept for the models included, it is not representative of the population the data are supposed to represent, and heavily susceptible to selection bias. In order to find a middle ground, we conduct an observation-level data replication based on a normalized weight factor. More specifically, we divide each observation's weight with the minimum weight of the sample, ending up with a normalized weight where the least frequent sub-population group is met only once. In order to mitigate the 'floor' rounding error implication (Sanjeev, 2021) we round to the closest integer on the 0.5 threshold. The weighing normalization is formally expressed through the below mathematical representation.

$$\text{Normalized Weight} = \lfloor \frac{Wi}{\min(wi)} \rfloor$$

After having calculated the integer approximation of observations' weights, we proceed to expand our dataset by replicating them as their weight indicates. The impact of the normalization and rounding of the sample will be assessed later on.

### Variables modification

Another complexity mitigation method is applied by modifying provided dataset variables, in order to account for the adaptive test routing (ie. respondents answering specific background questions based on prior answers, and the implications it has on derived variables). In this direction, the following modifications take place:

- B\_Q01a3 highest completed formal education level values that indicate degree acquired abroad is imputed to B\_Q01a variable, to replace value '15' that indicates foreign qualification regardless of educational level.

- B\_Q01b (educational field) null values have been replaced with “General Programs” value ‘1’, when educational level was lower or equal to ISCED 3 (Upper Secondary)
- ISIC2C / ISCO2C cases where classification was not provided, but 4-digit level was, the 2-digit groups were derived and imputed to the respective variables
- B\_Q05c (job-related recent participation in formal education) nulls indicating no recent participation at all, filled with 0

### Input dataset assessment

Following, Table 13 specifies the number of observations and projected population of the dataset during different stages of the data manipulation.

**Table 13.** Observations' number and projected Population per Pre-processing Stage

Pre-processing Stage		
Initial Dataset	# observations	4925
	Projected population	7.061.669
Data Filtering	# observations	538
	Projected population	732741
Data Normalization	Normalized projected population	733080
	Normalized # observations (rounded population projection)	6517

Based on the above table, the ICT relevant, currently employed population that sufficiently participated in the PIAAC survey as per the criteria set within the paper, represents 10.4% of the total Greek population aged 16-65 years old. While not a large percentage, even the raw number of observations is enough to provide statistically significant results by models. Also, by comparing the Projected population before and after the weighing application only distorts the total weight by 340 (projected) observations, or by 0.04%. As such we consider it not of statistical importance and we treat the dataset as unbiased towards the population it represents.

## Implemented Models

In order to examine the quality of our data as determinants for digital skills, defined as our experimental research question previously in the paper, we will implement multiple models.

### Univariable Linear Regression

We conduct Linear Regressions for each variable of the total selected features independently, in order to assess their individual explainability. We then conduct a significance filtering ( p- value > 0.05) and examine the remaining variables.

## Multivariable Linear Regression

Having the results of the univariable regressions, we proceed to conduct pairwise collinearity checks among our variables. We impose a relatively high collinearity threshold of 0.8, filtering out the variable with the lowest R-squared value.

Having split our independent variables to Fundamental, Constituent and Composite, we proceed to perform three multivariable analyses based on the following three group combinations

**Table 14.** Conceptual variable Groups of conducted analyses

Group	Variables
Group 1	Fundamental + Constituent + Composit
Group 2	Fundamental + Composit
Group 3	Fundamental + Constituent

Following this, we conduct stepwise feature selection by removing the variable with the highest p-value, and reassess independent variables' significance, until the model is solely based on significant independent variables. Following this we conduct VIF tests after the significance iterations are complete in order to rule out any multicollinearity occurrence, setting a modest VIF threshold of 10. We prioritize p value filtering within the stepwise

repetitions before VIF, because we prioritize the discovery of main determinants of the target variable over multicollinearity limitation.

All our OLS regressions are conducted using HC3 covariance type, which allows for heteroskedasticity robust error calculations. Additionally, all data are normalized before the implementation of all models

Agnostically to the previous findings, we also conduct lasso regression, parametrically towards the alpha penalty value. Since Lasso works as a feature selection method, we ingest all available independent variables, and allow for the model to apply the estimated weights to each of them. Data are also normalized before the models are trained.

### XGBoost

Lastly, following Chyl & Molac, 2022, we employ a gradient boosting framework library, XGBoost, in order to implement an applicable machine learning regression model. Despite the fact that our analysis is of inferential, rather than predictive nature, we take measures to limit overfitting to our data. Ensuring robust results, we provide a split of train-test, the former of which is further split in a 5-fold cross validation process during training. For performance efficiency, we do not conduct hyper-parameter tuning, but rather train for a reassuringly large number of boosting rounds (100000) with a 50 rounds early stopping filter.

XGBoost is the only alternative computation method we use that accounts for non-linear relationships. We use SHAP library in order to better visualize the result for each independent variable separately.

# Chapter 5

## Results

### 5.1 Univariate Linear Regression Analysis

After conducting our univariate regressions on all selected variables and filtering for significance on 0.05, we discuss here two subsets of those variables.

- i. The ten variable switch the highest explainability power, measured through adjusted  $R^2$ .
- ii. Variables with negative coefficients

These are presented in tables 15 and 16 respectively.

The complete list of variables and their main evaluation metrics can be found in the Appendix, Table 4.

**Table 15.** Top ten variables in descending explainability (*adj. R*<sup>2</sup>) order

Description	Variable	adj. R	Coef	p
Education - Highest qualification - Level	B_Q01a	0.066889	0.160515	0.000
Skill use everyday life - ICT - Internet - How often - Conduct transactions	H_Q05d	0.050675	0.091027	0.000
Skill use work - Literacy - Read diagrams maps or schematics	G_Q01h	0.04513	0.079342	0.000
Index of use of ICT skills at home (derived)	ICTHOME	0.042744	0.092634	0.000
Skill use everyday life - Literacy - Read letters memos or mails	H_Q01b	0.041198	0.147116	0.000
Skill use everyday life - Literacy - Read diagrams maps or schematics	H_Q01h	0.03585	0.06649	0.000
Skill use everyday life - ICT - Computer - How often - Word	H_Q05f	0.033531	0.074957	0.000
Skill use everyday life - ICT - Internet - How often - For mail	H_Q05a	0.027357	0.131177	0.000
Index of use of reading skills at home (prose and document texts - derived)	READHOME	0.025717	0.086414	0.000
Skill use everyday life - Numeracy - How often - Use or calculate fractions or percentages	H_Q03c	0.025399	0.058483	0.000

Based on the above, we can make some preliminary observations. Educational level (B\_Q01a) is the variable with the largest explainability of the Score's Variance. However, even the variable with the largest explainability has a considerably low  $R^2$  score of 6%. This is a clear indication that the PSTRE performance of respondents cannot be suitably examined through the lens of a single dimension and under a linear relationship scope.

It is observed that everyday life has a substantially higher participation in the top variables (6 variables belonging to the H\_ group 'Skill use everyday life - ' and 2 'xxxHOME' synthetic indices) vs job-content tasks which are represented by a single variable.

In terms of proficiency types, ICT and Literacy are equally represented by 3 constituent and one composite variable each. The composite variables are also regarding to the constituents met in the top variables. Diagrams and schematics reading seems to have a consistent significance in both work and personal life (while their collinearity has not yet been assessed). It is important to note that none of the digital intensity indices is included in the list. Assessing the table of variables with negative coefficients, we find that their explanatory power is considerably low, with an adj. r-squared score of less than 0.01 in all cases but one. The exception is the expected variable of physical work within occupation.

**Table 16.** Variables with negative coefficient in descending explainability (*adj. R*<sup>2</sup>) order

Description	Variable	adj. R	Coef	P >  z
Skill use work - How often - Working physically for long period	F_Q06b	0.017424	-0.04204	0.0000
Skill use work - How often - Selling	F_Q02d	0.008882	-0.02993	0.0000
Skill use work - Literacy - Fill in forms	G_Q02d	0.008335	-0.04203	0.0000
About yourself - Learning strategies - Looking for additional info	I_Q04m	0.007952	-0.09971	0.0000
Index of readiness to learn (derived)	READYTOLEARN	0.006794	-0.04304	0.0000
About yourself - Health - State	I_Q08	0.006493	-0.04247	0.0000
About yourself - Learning strategies - Figure out how different ideas fit together	I_Q04l	0.006194	-0.06205	0.0000
Skill use work - Time cooperating with co-workers	F_Q01b	0.004058	-0.03382	0.0000
About yourself - Learning strategies - Get to the bottom of difficult things	I_Q04j	0.003722	-0.05181	0.0000
Skill use work - Need more training	F_Q07b	0.0037	-0.03591	0.0000
Skill use work - Not challenged enough	F_Q07a	0.002431	-0.04942	0.0000
Occupational Domain Technical Intensity (R&D significance 1/6)	tti1-5	0.002208	-0.0226	0.0002
Skill use work - How often - Planning own activities	F_Q03a	0.001741	-0.02484	0.0001
Skill use work - ICT - Computer - Lack of skills affect career	G_Q08	0.001715	-0.03904	0.0005
Skill use everyday life - Literacy - Read manuals or reference materials	H_Q01f	0.001566	-0.01642	0.0009

Despite the low r-squared value, we will discuss the negative trend of two variable groups in brief. For learning strategies, four out of six constituents and the composite 'readiness to learn' variables are included in this subset. This is heavily counter-intuitive, since learning adaptability is considered one of the most important skills for the workforce, especially in a technology heavy environment, and low levels of adaptability are treated as worrisome evidence (Jandrić & Randelović, 2018). Additionally, we observe a negative correlation of people who need more training to cope with the technical activities of their work, or feel their lack of technical skills has affected their career. However, we are met with the paradox that 'not challenged enough' as per technical skills utilization within job content is also associated with negative results in PSTRE. When measured in terms of work productivity, the results regarding over-under qualification are solely based on the comparison basis - it being the work or the qualification level. (European Commission et al., 2019). In any case, both these variable groups could use some additional deep dive.

Examining all statistically significant univariate correlations visually, we plot how their coefficient is related to their explanatory power in figure 35. The points in the 2-dimensional space have a V-like shape, indicating an increasing explanatory Power on coefficients further away from zero. Positive correlations show a better fit, with the top-right point depicting B\_Q01a (ISCO educational level) having a significantly better position in both axes compared to any other variable, but still having a very low adjusted r-squared score.

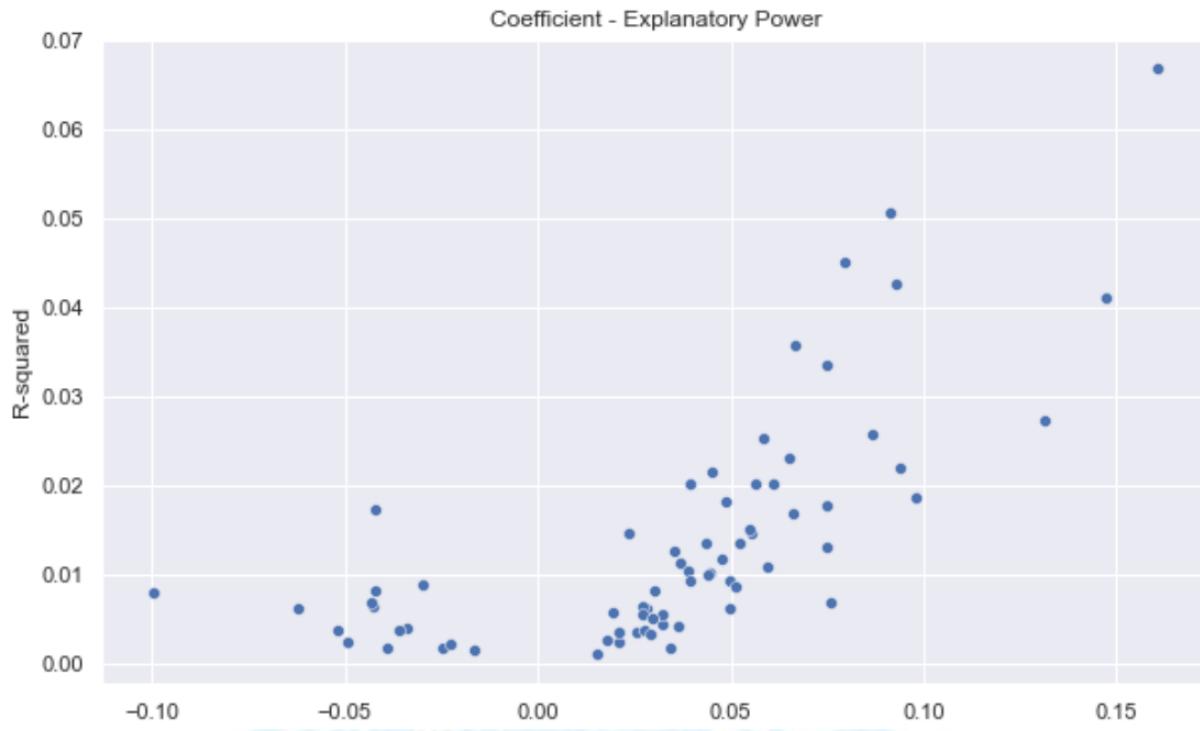


Fig. 35. Correlation of Variable coefficient to adj. R-squared for univariable regressions

## 5.2 Multivariate Linear Regression Analysis

Following the results of our univariate analysis, we proceed to examine the largest explainability that can be achieved by the combinatory employment of all available independent variables within our prediction model. In order to provide better results, we treat collinearity effects in a pair-wise manner before testing our dataset within the model. After following the methodological steps explained in the previous section, we end up with 7 variable pairs to assess for removal from independent variables, as shown in table 17.

**Table 17.** Collinear Variables compared pairs & feature removal

Variable 1	Variable 2	R-sq 1	R-sq 2	Removed
READWORK	G_Q01d	0.008695	0.003571	G_Q01d
WRITWORK	G_Q02c	0.000175	0.000162	G_Q02c
READYTOLEARN	I_Q04I	0.006794	0.006194	I_Q04I
B_Q05c	FE12	0.000087	-0.000128	FE12
NFE12JR	NFE12	0.00575	0.020302	NFE12JR
ti1-5	ti1-1	0.002208	0.000476	ti1-1
digi4	digi2	0.008134	0.005161	digi2

All of the pairs are expected, since they consist of activities and the respective composite index in which they participate, (non) formal education participation during the last year, and the responding ‘job-related’ variables, and occupation the two industry & occupation digital intensity indices provided by us in the dataset.

We can now proceed to multivariable regression modeling. Following the stepwise feature selection explained in the methodology, and after comparing all three variable groups within this process, Group 1 provides the highest adjusted R squared value. Table 18 provides the statistics of the chosen model for each of the three groups, while detailed results from the ten most significant variables of Group 1 model can be found in table 19. The complete list of variable statistics can be found in table 5 of the Appendix.

**Table 18.** Comparative Explainability Summary across Variable Groups

Group	Group 1	Group 2	Group 3
Adj. R-squared	0.416	0.160	0.402

**Table 19.** Detailed Key Model Statistics for OLS on Group 1 Top Variables

## OLS Regression Results

Dep. Variable:		y	R-squared:	0.422
Model:		OLS	Adj. R-squared:	0.416
Method:		Least Squares	F-statistic:	77.77
			Prob (F-statistic):	0.00
			Log-Likelihood:	32182.
No. Observations:		6517	AIC:	-6.422e+04
Df Residuals:		6447	BIC:	-6.375e+04
Df Model:		69		
Covariance Type:		HC3		

	Description	Variable	P >  z	std error	Coef
1	Index of use of numeracy skills at work (basic and advanced - derived)	NUMWORK	0.00	0.011575	0.158989
2	About yourself - Learning strategies - Relate new ideas into real life	I_Q04b	0.00	0.01461	0.157327
3	Skill use everyday life - Literacy - Write letters memos or mails	H_Q02a	0.00	0.012756	-0.15391
4	Skill use work - ICT - Internet - How often - For mail	G_Q05a	0.00	0.009363	-0.12759
5	Index of use of writing skills at home (derived)	WRITHOME	0.00	0.011819	0.125369
6	Index of readiness to learn (derived)	READYTOLEARN	0.00	0.012274	-0.11646
7	About yourself - Learning strategies - Looking for additional info	I_Q04m	0.00	0.016856	-0.11609
8	Education - Highest qualification - Level	B_Q01a	0.00	0.007726	0.11341
9	Index of use of numeracy skills at home (basic and advanced - derived)	NUMHOME	0.00	0.012164	0.11306
10	Skill use work - Literacy - Write letters memos or mails	G_Q02a	0.00	0.009313	0.110218

Examining table 19, it is observed that when all available information is taken into consideration, educational level (B\_Q01a) falls in significance compared to other variables. Since data are normalized, coefficients are directly comparable as metrics of significance in the prediction. Numeracy skills at work are the most impactful predictor of PSTRE test performance. While intuitively expected in the sense that problem solving is associated with mathematical thinking, it is surprising to note that the only directly ICT-related variable among the most significant in the model (Q\_05a) is in the 4th place, and most importantly with a negative correlation coefficient. By examining the process of variable elimination, we observe that both ICT-related composite variables (ICTWORK, ICHOME) are removed during an iterative step. Our primary goal is to identify the most impactful determinants, and thus we have proceeded to remove any non-significant variable in the model. However, in order to have a conceptual analysis of ICT participation, we will exhibit a full model without significance filtering, conducting an f-test comparison between the two models. The results of the full model are exhibited in table 20.

**Table 20.** Detailed Model Statistics for OLS on Group 1 Top Variables (without significance testing)

#### OLS Regression Results

Dep. Variable:	y	R-squared:	0.440
Model:	OLS	Adj. R-squared:	0.432
Method:	Least Squares	F-statistic:	71.26
		Prob (F-statistic):	0.00
		Log-Likelihood:	32287.
No. Observations:	6517	AIC:	-6.438e+04
Df Residuals:	6418	BIC:	-6.371e+04
Df Model:	98		
Covariance Type:	HC3		

	Description	Variable	Coef	P>  z	Std error
1	About yourself - Learning strategies - Relate new ideas into real life	I_Q04b	0.167181	0.0000	0.015853

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>Std error</b>
2	Skill use everyday life - Literacy - Write letters memos or mails	H_Q02a	-0.156728	0.0000	0.014181
3	Index of use of writing skills at home (derived)	WRITHOME	0.136293	0.0000	0.011799
4	Index of readiness to learn (derived)	READYTOLEARN	-0.134132	0.0000	0.017754
5	About yourself - Learning strategies - Looking for additional info	I_Q04m	-0.128778	0.0000	0.017244
6	Skill use work - ICT - Internet - How often - For mail	G_Q05a	-0.123147	0.0000	0.011315
7	Skill use everyday life - Literacy - Read letters memos or mails	H_Q01b	0.123125	0.0000	0.020972
8	Index of use of ICT skills at home (derived)	ICTHOME	-0.11736	0.0003	0.032169
9	Index of use of reading skills at home (prose and document texts - derived)	READHOME	-0.113597	0.0210	0.049204
10	Skill use work - How often - Planning own activities	F_Q03a	-0.103233	0.0000	0.010478

After conducting an f-test comparison, the f-test returns a value of 3.274793085363633, with a p value of 1.2725213725236473e-08, and df of restriction 28.0 As such the null hypothesis is rejected and we consider the full model as a better fit. Once again, we examine the ten variables with the highest absolute coefficients. We identify the re-introduction of ICT composite variables (ICTHOME). However, G\_Q05a has now fallen in the significance ranking. Additionally, both variables keep on having negative coefficients.

It is assumed that another variable of the model acts as a mediator, which is why further analysis and feature selection could potentially provide better results in this regard; A forward stepwise regression or a parametric model examining more potential combinations. The limited explanatory power of the model, the declining relative importance of education

as a predictor for PSTRE shows the difficulty in relying solely on linear relationships, as well as identifying the best predictors without brute force algorithms that would pass through the majority of potential combinations. Lasso linear regression with parametric alphas set from 0 to 1 with a 0.1 step validates that no actionable redundancy can be detected, returning an optimal alpha value equal to 0, indicating plain linear regression.

We examine the possibility to reduce the dimensional complexity and reduce dimensions using conceptual groupings. We conduct factor analysis on eligible constituent variables, and examine their distribution. along 4 factors. We have made a conceptual spit of our variables based on the proficiency domain that they are relevant to.

- i. Literacy
- ii. Numeracy
- iii. ICT
- iv. Broader Domain (rest job content & life stances)

We report the loadings of each variable per factor, split based on their contextual basis (Appendix, figures 1-4). Despite the data suitability for factoring (bartlett\_sphericity test statistically insignificant, Kaiser–Meyer–Olkin score = 0.78), the vast majority of the variables have their main loading towards the first factor. With the exception of some broader variables weighted towards the fourth sector, there is not a clear sign of populating the two remaining sectors. As such, we do not proceed to conduct the factoring.

As such, the most efficient model produced by our approaches is the multivariable model with no significance testing, incorporating all composite & constituent variables. Consistently within our linear models we observe that writing in everyday life has a high positive correlation with PSTRE scores, despite the significant negative impact of its constituent 'writing memos & emails' variable.

## 5.3 XGBoost

As mentioned in the methodological part, we also conduct an XGBoost regression model on our dataset. Despite the large number of boosting rounds, our training is completed after only 135 rounds, stopping early due to 50 rounds of consistent performance. The models are not directly comparable. However, we provide in table 21 the benchmark of the two in two key statistics. RMSE, also set as objective function for our XGBoost model, and the explanatory power of the models (adjusted R-squared).

**Table 21.** Multivariable linear Regression and XGBoost key metrics comparison

	R-squared	RMSE
<b>OLS</b>	0.432	0.0022
<b>XGBoost</b>	0.998	0.0000001

It is obvious that XGBoost is a vastly better fit for the imported data, both in terms of objective function, as well as variance interpretation. The R-squared value of the model is a result of a 5-fold cross validation process during training, as well as calculated on a hold-out testing sample of the dataset, in order to prevent overfitting. However, this is of minor importance since the usage of the model is inferential rather than predictive. We can now examine the contribution of the variables to the result. We employ SHAP values, a framework for explainable AI models. Figure 36 includes a summary visual of SHAP values for the 30 most significant variables in the model. The X axis indicates the significance of impact to the model, and the color the value of the variable. At the same time, the width of the plot indicates the number of the observations with a given impact on the model.

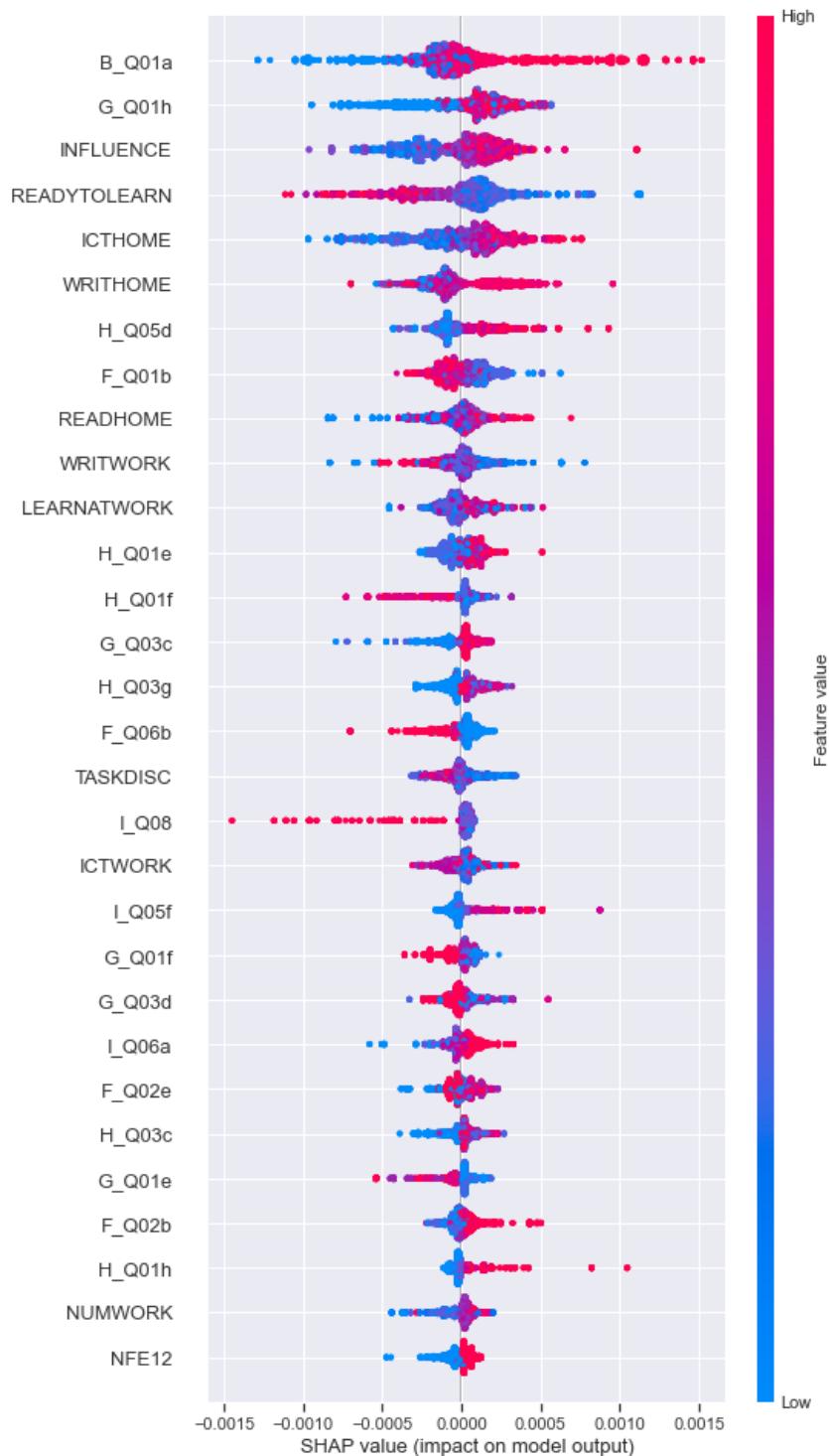


Fig. 36. XGBoost model variable contribution visualization

The most prominent observation is that the educational attainment level (B\_Q01a) is once again the most prominent. Certain responses of the dataset, as depicted in the above figure, have the highest impact on the model compared to any other variable. An interesting finding,

however, is that the majority of responses has a low contribution. This can be observed as the widest part of the row is much closer to the x axis center compared to the few following variables. At the same time, red points start to appear significantly even with a negative impact on the model (leftmost to the point 0 of the x axis). This is contradictory to the rest four most impactful variables, which have a clearer distinction on the value-impact distinction. Based on this, we can drive the following conclusion. The educational level can have a high impact on the digital skills of the examined sample, but it requires combinatory existence of additional attributes of a person. Putting it in different words, a high education attainment is a relatively necessary, but certainly not sufficient condition. Regarding the rest of the significant variables, we find once again diagrams & schematics reading- at work, a part of literacy (G\_Q01h), as well as the composite index of ICT usage at home. It is interesting that consistently, the everyday usage of technology poses a more important factor compared to the usage at work. That is, regardless off the correlation trend (negative or positive), which is an unexpected behavior among the different models. ICT transactional activities at work is the only work related ICT variable in the most impactful ones. However, the impact of ICT skills' lack on work encloses the largest negative correlation to the model compared to all variables. We validate once again our counter-intuitive result of negative association of readiness to learn with technological skills, while I\_Q04b, the only positively correlated learning variable is not present in our xgboost significant variables' list. A new composite variable emerges to the top impactful, influence at work. It has a clear distinction of large to small values towards the non-impact on the model, and high concentration on moderate positive impact. Once again, none of the technical intensity indices is included in the most significant variables of the model. Writing is once again prevalent in the significant variables' list, with both composite indices considered highly significant. However, they have apposite implications between each other. Writing at home is positively correlated, while manual writing at work has a negative correlation with PSTRE.

# Chapter 6

## Discussion, Limitations & Further Research

### 6.1 Discussion

Within our work we split our examination of the skills of the workforce to three distinct, but highly interrelated parts. We examined how theoretical economists approached historically the notion of skills, the education usage as an absolute synonymous to skills, as well as the interplay of education and technology implications for the workforce participation and wage growth. Within this context, we examined skill biased technological change, and its evolution, task biased technological change. We identified the lack of theoretical models to account for the importance of non-cognitive skills, in contrast to empirical labor economic research that has realized the significant impact of soft skills to the workforce skills' evaluation and attempted to incorporated it in its experiments. We also addressed criticism by interdisciplinary approaches, such as psychology and sociology, to the positivistic view that has prevailed the labor economic research community, and most importantly the labor and educational policies.

Following this, we examined how official European bodies assess labor force, as well as the available data revolving around it, focusing on PIAAC survey data and the European skills,

competences and occupations (ESCO) classification. We opened the black box to the indices used by European institutions to assess the technical equipment of countries' labor force and citizens, and the methodologies employed to form them. We pointed out the simplistic approach of using education and qualification interchangeably with skills within multiple pieces of policy analyses, mostly skills level and its utilization, and we identified multiple social biases embodied in the metrics in use. We deep dived in the respective institutions for the Greek labor force, and explored the existing KPIs and visualization techniques, as well as societal critique on the over-quantification of labor within the National Strategy.

In our experimental part, we proposed a methodological approach for the creation of digital intensity indices for occupational group levels based on ESCO occupation and skills' data, education field based on ISCED-f data, and occupational sectors based on ISIC data and OECD's industry technological intensity analyses. We incorporated those indices with PIAAC data for the Greek labor force, in order to conduct analyses on how multiple attributes of the respondents can determine their proficiency in solving problems in technological environments, a metric used as a proxy for digital skills' proficiency. We also constructed a formalized open access codebase utilizing the Python programming language, combining this critical pieces of data sources, streamlining multiple dataset manipulation and analytical processes suited for the PIAAC survey data. Utilizing the above, and after processing the provided dataset and accounting for the complexities of the sampling and surveying methods, we conducted a proof-of-concept analysis for the usefulness of the created code, by implementing univariable and multivariable linear regressions under multiple approaches, as well as non-linear machine learning models.

Our results validate the fact that any available variable, including educational attainment, is insufficient on its own to determine the digital proficiency of the Greek labor force, while only explaining up to 7% of the scores' variance. We conclude that the significance of variables is

highly susceptible to the design of the analysis, and thus different approaches result in different variables emerging as significant. In a consistent manner we realized that personal usage of ICT was statistically more significant compared to ICT usage at home, while under conditions, aspects of ICT usage were negatively correlated with the measured digital proficiency. Literacy proficiency deemed as significant, while willingness to learn was – counter intuitively - negatively correlated to the current digital knowledge of respondents across all modeling approaches. There is also high correlation among the three personal and professional attributes of literacy, numeracy and ICT. Focusing on education attainment, the multivariable linear models indicated that it is not the most significant determinant of digital proficiency. Regardless of the model approach, the maximum explanatory power of linear regression models only reached 43%. Our inclusion of XGBoost regressor that accounts for non-linear interactions we increase the explanatory power to 99%, even after benchmarking on an unknown test set. The observations based on the model once more validate the significance, but not sufficiency of education for the prediction of a PSTRE score, as well as the significance of personal ICT usage and writing. Across all models, it is evident that neither of the digital intensity indices is a significant predictor of digital proficiency, validating the high heterogeneity of workers & skill levels across educational fields, occupational groups, and industries.

The experimental analysis indicates that a simplistic approach of education alone, or independently examined alongside a limited set of parameters is not sufficient as a source of information for the evaluation of digital proficiency, let alone for shaping of educational and occupational policies. As per the sociotechnical critique discussed within the paper, the over-quantification of such data, especially with the limited linear and descriptive models enabled by the official statistical tools provided by OECD and implemented by many European institutions, heavily relies on scientific knowledge of previous periods, and disregards multiple recent experimental findings of empirical economics. As such, the current metrics

are useful for providing a vague indication of the direction and magnitude of correlations but should be treated with high caution for general population analysis.

Based on the above, we can identify analytical procedures, such as the DigComp framework and DESI metric, that take into account a wide range of attributes, and as such are resistant to endogenous biases of specific measures, as well as procedural biases, such as of data acquisition processes. On the other hand, composite indices such as Occupational tasks that are provided a standalone presentation as labor force evaluation, participation in high technology occupations & economies, and the ESI index calculated by Cedefop which includes components with contradictory measurements and attributes with limited explanatory power as evaluated by our models (eg. skills activation expressed through over/under qualification), should be under further evaluation for adaptation. Academic community needs to extend the empirical research to further improve the utilized measures, as well as clarifying the results' proper way of interpretation and impact on policy strategic design.

In summary, our work contributes to the academic community by synthesizing approaches towards skills by multiple scientific domains and policy making institutions, while creating a technological capability that allows for the exploration of new analytical methods for PIAAC data. Within this capability, we attempt to merge multiple pieces of data that have not been sufficiently utilized, by combining OECD's PIAAC data with produced knowledge regarding the classifications it is based upon. Finally, by introducing modern machine learning models to our analysis, we empower its usage to the academic community to further push the research in this direction for the Greek labor market – which has been hardly ever included in any Machine Learning-enabled research of the international literature.

## 6.2 Limitations

The present research is limited to an extensive, but not exhaustive historical exploration of the economic approaches towards labor analytics and skills as a notion. Despite the acknowledgement of their importance, soft skills are not thoroughly examined in terms of empirical measurement and evaluation methods that have been developed, nor towards their detailed ontological analysis and systematic taxonomy.

The non-exhaustive approach applies to the European institutions and their international counterparts as well. A more systematic comparison of the indices identified in the research with the results of the current analysis is in order, in ways that will be later on discussed.

In terms of the conducted analysis, the research is limited upon the data manipulation and simplification measurement choices that were made. The outcomes refer to a defined subset of the population based on the aforementioned filters, and the results are calculated using only one PSTRE Plausible Value, and the aggregated observation weight – rounded as per the process documented in the methodological chapter. Additionally, the models explored are subject to the methodological choices made during execution; namely, the choice of backwards feature selection, and the provision of all variables for exploratory reasons to the model, rather than application of domain expertise knowledge for the feature selection.

A big limitation of this work's scope is also the recency of the data gathered. With the cycle of Greece's participation conducted until 2015, the data are far from recent in order to provide an accurate picture within fast-paced changes in the labor environment. It is, such, a huge limitation with multiple scientific and societal implications, that Greece, alongside Lithuania, will be the only EU countries and PIAAC participants that will not be taking place in the Second Cycle of the survey, currently underway (OECD, 2023).

## 6.3 Further Research

The bibliographical scope of the paper was to conduct an extensive exploration of the academic historical, and policy current status of technological skills, available data, and their related notions. A more systematic incorporation of soft skills, as well as the provision of practical alternatives to the positivistic approach to skills examination – alongside the critique expressed within this research - could be of use, in order to further proceed the bibliographical documentation of the above.

Additionally, its policy goal was the documentation of the processes currently in place for the extraction of knowledge by the existing datasets currently utilized by European institutions, the development of a systematic analysis framework allowing for PIAAC data to be examined under the expanded lens of the analytical models available in python. Building on this, an empirical goal of the paper was to utilize the constructed codebase, so as to address the research question “What are the most impactful determinants of digital proficiency of the Greek labor force?”.

On the above, we propose exploratory improvements on all three building blocks of the analysis: i) data, ii) selection process, iii) analytical models. Source data for the creation of the digital intensity can be revisited and improved as in Chiarello, 2021. The population groups can be redefined, also utilizing the outcomes of the current research. Focusing on specific subpopulations for testing hypotheses included in the indices of the examine institutions (eg. women's technical participation, education drop-off), the creation of new variables for assessing such hypotheses (eg. over-qualified respondent variable), the correlation with new target variables (eg. income, labor participation percentages), or the

inclusion of controlling variables, for the assessment of hypotheses independently for different values of variables could benefit the research topic. Based on the findings of our research, the negative correlation of readiness to learn, and the occasional negative correlation of ICT usage subindices are of particular interest and should be examined in further detail, in order to understand conditions that lead to this outcome. The higher significance of 'at home' composite, and oftentimes constituent variables compared to their work-related counterparts is of particular interest, indicating an opportunity for further focusing on such metrics. Lastly, we propose the inclusion of modern Artificial Intelligence technologies in the analysis of our data. We believe that text analytics within bodies of knowledge for occupations is a great exploratory approach to combine an automated approach of introducing more qualitative information compared to the reduction of each respondent/occupation to a few-dimensional matrix to fit the human manual analytical capacity. The introduction of AI applications, which focus on correlation rather than causality, will allow for higher accuracy of the examined variables such as digital proficiency, facilitate the incorporation of multiple data dimensions, discouraging oversimplified approaches based on *a priori* beliefs. This will require the inclusion of explainable AI solutions, such as SHAP values, in order to be able to drive actionable conclusions for the re-application of the variables' significance.

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## Appendix

**Table 1.** Full List of ESCO skills & knowledge DII

Skill Name	DII	Skill URI
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accepting feedback	0.0000	<a href="http://data.europa.eu/esco/skill/8369011d-de43-4800-bcce-be12e19828a5">http://data.europa.eu/esco/skill/8369011d-de43-4800-bcce-be12e19828a5</a>
accessing and analysing digital data	0.9900	<a href="http://data.europa.eu/esco/skill/28d2ab6c-38a2-476e-85fe-7982fd242943">http://data.europa.eu/esco/skill/28d2ab6c-38a2-476e-85fe-7982fd242943</a>
accessing and analysing digital data	0.9722	<a href="http://data.europa.eu/esco/skill/4d6a48ae-352e-4823-bc3a-3f3e9e2cae86">http://data.europa.eu/esco/skill/4d6a48ae-352e-4823-bc3a-3f3e9e2cae86</a>
accompanying and welcoming people	0.0000	<a href="http://data.europa.eu/esco/skill/00d5d1d2-c521-4c58-9df5-2939c0ce9adb">http://data.europa.eu/esco/skill/00d5d1d2-c521-4c58-9df5-2939c0ce9adb</a>
accounting and taxation	0.3500	<a href="http://data.europa.eu/esco/isced-f/0411">http://data.europa.eu/esco/isced-f/0411</a>
advising and consulting	0.0029	<a href="http://data.europa.eu/esco/skill/24ad2ffb-dece-4704-8155-63ea9428d038">http://data.europa.eu/esco/skill/24ad2ffb-dece-4704-8155-63ea9428d038</a>
advising and consulting	0.0000	<a href="http://data.europa.eu/esco/skill/103af23e-d56c-47ab-b991-55c94dcdef50">http://data.europa.eu/esco/skill/103af23e-d56c-47ab-b991-55c94dcdef50</a>
advising on business or operational matters	0.0000	<a href="http://data.europa.eu/esco/skill/b036eb5c-6a48-45b9-b2c6-f42f9e336204">http://data.europa.eu/esco/skill/b036eb5c-6a48-45b9-b2c6-f42f9e336204</a>
advising on design or use of technologies	0.0000	<a href="http://data.europa.eu/esco/skill/eb6cc4ba-4bb8-4348-9a3b-dc419558f66a">http://data.europa.eu/esco/skill/eb6cc4ba-4bb8-4348-9a3b-dc419558f66a</a>
advising on educational or vocational matters	0.0000	<a href="http://data.europa.eu/esco/skill/8c298a9b-e9ea-4396-897d-9aba982df6a0">http://data.europa.eu/esco/skill/8c298a9b-e9ea-4396-897d-9aba982df6a0</a>
advising on environmental issues	0.0000	<a href="http://data.europa.eu/esco/skill/062a9fde-cd91-44f9-9a2f-9e2bc3b281fd">http://data.europa.eu/esco/skill/062a9fde-cd91-44f9-9a2f-9e2bc3b281fd</a>
advising on legal, regulatory or procedural matters	0.0000	<a href="http://data.europa.eu/esco/skill/efbb3d3b-a41c-4e0a-90a8-8e611eb1db9f">http://data.europa.eu/esco/skill/efbb3d3b-a41c-4e0a-90a8-8e611eb1db9f</a>
advising on products and services	0.0291	<a href="http://data.europa.eu/esco/skill/62afcddd-a2a6-4143-bafb-59c77e15a01c">http://data.europa.eu/esco/skill/62afcddd-a2a6-4143-bafb-59c77e15a01c</a>
advising on workplace health and safety issues	0.0000	<a href="http://data.europa.eu/esco/skill/08104c27-d4b2-4d40-ae97-dde65e71712f">http://data.europa.eu/esco/skill/08104c27-d4b2-4d40-ae97-dde65e71712f</a>
advocating for individual or community needs	0.1667	<a href="http://data.europa.eu/esco/skill/0a4c5823-8b09-4e6b-95b4-8036ef3b9c4c">http://data.europa.eu/esco/skill/0a4c5823-8b09-4e6b-95b4-8036ef3b9c4c</a>
agriculture	0.0515	<a href="http://data.europa.eu/esco/isced-f/081">http://data.europa.eu/esco/isced-f/081</a>
agriculture, forestry, fisheries and veterinary	0.0121	<a href="http://data.europa.eu/esco/isced-f/08">http://data.europa.eu/esco/isced-f/08</a>
agriculture, forestry, fisheries and veterinary not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/089">http://data.europa.eu/esco/isced-f/089</a>
agriculture, forestry, fisheries and veterinary not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/080">http://data.europa.eu/esco/isced-f/080</a>
allocating and controlling physical resources	0.0149	<a href="http://data.europa.eu/esco/skill/f73c2c9e-b097-4fc9-95d1-659ea0bd54a3">http://data.europa.eu/esco/skill/f73c2c9e-b097-4fc9-95d1-659ea0bd54a3</a>
allocating and controlling resources	0.0246	<a href="http://data.europa.eu/esco/skill/9827c329-3492-4e8d-852c-da0894228ff6">http://data.europa.eu/esco/skill/9827c329-3492-4e8d-852c-da0894228ff6</a>
allocating and controlling resources	0.0833	<a href="http://data.europa.eu/esco/skill/92fc9726-5b5e-439e-a33c-06a8c63fb9a">http://data.europa.eu/esco/skill/92fc9726-5b5e-439e-a33c-06a8c63fb9a</a>
analysing and evaluating information and data	0.2412	<a href="http://data.europa.eu/esco/skill/3753e796-121e-46a3-9c27-dee31ce92c80">http://data.europa.eu/esco/skill/3753e796-121e-46a3-9c27-dee31ce92c80</a>
analysing and evaluating information and data	0.4308	<a href="http://data.europa.eu/esco/skill/1f2950c0-ef1e-44b4-9a55-125ccd7b78af">http://data.europa.eu/esco/skill/1f2950c0-ef1e-44b4-9a55-125ccd7b78af</a>
analysing business operations	0.4698	<a href="http://data.europa.eu/esco/skill/ec528c47-65f4-4187-9dc1-5a8889f84a06">http://data.europa.eu/esco/skill/ec528c47-65f4-4187-9dc1-5a8889f84a06</a>
analysing financial and economic data	0.0000	<a href="http://data.europa.eu/esco/skill/d94e1143-3a3a-4f6a-a881-df93bf56cf23">http://data.europa.eu/esco/skill/d94e1143-3a3a-4f6a-a881-df93bf56cf23</a>
analysing scientific and medical data	0.2763	<a href="http://data.europa.eu/esco/skill/ba1f6201-b206-4459-b178-706db34a851d">http://data.europa.eu/esco/skill/ba1f6201-b206-4459-b178-706db34a851d</a>
applying civic skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/d6e97b91-b75d-45f5-8566-667798957b0f">http://data.europa.eu/esco/skill/d6e97b91-b75d-45f5-8566-667798957b0f</a>
applying cultural skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/6115ff80-3d84-4e87-8e2b-6ede7ee004b4">http://data.europa.eu/esco/skill/6115ff80-3d84-4e87-8e2b-6ede7ee004b4</a>
applying entrepreneurial and financial skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/6c6957bf-cf1f-4483-9c7e-1655f251b01a">http://data.europa.eu/esco/skill/6c6957bf-cf1f-4483-9c7e-1655f251b01a</a>
applying environmental skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/80ct002a-6586-4db7-9c9a-88325a9a5e1b">http://data.europa.eu/esco/skill/80ct002a-6586-4db7-9c9a-88325a9a5e1b</a>

applying general knowledge	0.0000	<a href="http://data.europa.eu/esco/skill/44ff6716-7d71-4a16-821b-61d10e9e290d">http://data.europa.eu/esco/skill/44ff6716-7d71-4a16-821b-61d10e9e290d</a>
applying health-related skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/3d54fec5-d9cb-45a0-bf8d-ffaf3790a5bb">http://data.europa.eu/esco/skill/3d54fec5-d9cb-45a0-bf8d-ffaf3790a5bb</a>
applying material to fill gaps in surfaces	0.0000	<a href="http://data.europa.eu/esco/skill/da230865-9d2a-42d9-a42e-37d89753109e">http://data.europa.eu/esco/skill/da230865-9d2a-42d9-a42e-37d89753109e</a>
applying protective or decorative solutions or coatings	0.0000	<a href="http://data.europa.eu/esco/skill/5ea47148-5289-49f2-80f8-bb1f54b37de0">http://data.europa.eu/esco/skill/5ea47148-5289-49f2-80f8-bb1f54b37de0</a>
applying textured or masonry coatings	0.0000	<a href="http://data.europa.eu/esco/skill/e6e784d0-38a2-4f0c-9fe9-d985a3269fd9">http://data.europa.eu/esco/skill/e6e784d0-38a2-4f0c-9fe9-d985a3269fd9</a>
architecture and construction	0.0814	<a href="http://data.europa.eu/esco/isced-f/073">http://data.europa.eu/esco/isced-f/073</a>
architecture and town planning	0.0000	<a href="http://data.europa.eu/esco/isced-f/0731">http://data.europa.eu/esco/isced-f/0731</a>
artistic and creative writing	0.0000	<a href="http://data.europa.eu/esco/skill/1072f444-8a7d-41c1-aa6f-d536f20d94bf">http://data.europa.eu/esco/skill/1072f444-8a7d-41c1-aa6f-d536f20d94bf</a>
arts	0.1254	<a href="http://data.europa.eu/esco/isced-f/021">http://data.europa.eu/esco/isced-f/021</a>
arts and humanities	0.0520	<a href="http://data.europa.eu/esco/isced-f/02">http://data.europa.eu/esco/isced-f/02</a>
arts and humanities not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/029">http://data.europa.eu/esco/isced-f/029</a>
arts and humanities not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/020">http://data.europa.eu/esco/isced-f/020</a>
assembling and fabricating products	0.0648	<a href="http://data.europa.eu/esco/skill/b8e142fe-e508-42b1-b037-efebcefac3a7">http://data.europa.eu/esco/skill/b8e142fe-e508-42b1-b037-efebcefac3a7</a>
assembling and fabricating products	0.0000	<a href="http://data.europa.eu/esco/skill/827de17d-3fc1-4ba5-b4e0-850c51e750c8">http://data.europa.eu/esco/skill/827de17d-3fc1-4ba5-b4e0-850c51e750c8</a>
assembling electrical and electronic products	0.5833	<a href="http://data.europa.eu/esco/skill/592525ab-b517-4c55-8c65-17e0f5d99205">http://data.europa.eu/esco/skill/592525ab-b517-4c55-8c65-17e0f5d99205</a>
assembling furniture	0.0000	<a href="http://data.europa.eu/esco/skill/62023d5b-22ea-442e-ac46-39eb83c986fb">http://data.europa.eu/esco/skill/62023d5b-22ea-442e-ac46-39eb83c986fb</a>
assembling mechanical products	0.0000	<a href="http://data.europa.eu/esco/skill/bd1242ec-6dd5-4c7d-bf79-8de6be3b3815">http://data.europa.eu/esco/skill/bd1242ec-6dd5-4c7d-bf79-8de6be3b3815</a>
assessing land or real estate	0.0000	<a href="http://data.europa.eu/esco/skill/3eef7ff2-3ade-41d4-b084-2bd2a3949e1c">http://data.europa.eu/esco/skill/3eef7ff2-3ade-41d4-b084-2bd2a3949e1c</a>
assigning work to others	0.0000	<a href="http://data.europa.eu/esco/skill/bffa732b-12ab-4214-a4b3-498598820b1c">http://data.europa.eu/esco/skill/bffa732b-12ab-4214-a4b3-498598820b1c</a>
assisting and caring	0.0325	<a href="http://data.europa.eu/esco/skill/c73521be-c039-4e22-b037-3b01b3f6f9d9">http://data.europa.eu/esco/skill/c73521be-c039-4e22-b037-3b01b3f6f9d9</a>
assisting and caring	0.0000	<a href="http://data.europa.eu/esco/skill/2486154b-e3fd-4938-8316-029f62afdc9">http://data.europa.eu/esco/skill/2486154b-e3fd-4938-8316-029f62afdc9</a>
assisting and caring	0.0000	<a href="http://data.europa.eu/esco/skill/b84813aa-6c44-4d58-a240-556c2060fb4e">http://data.europa.eu/esco/skill/b84813aa-6c44-4d58-a240-556c2060fb4e</a>
assisting and supporting co-workers	0.0000	<a href="http://data.europa.eu/esco/skill/173fbafb-d2e0-4b89-be1c-548b1cc47160">http://data.europa.eu/esco/skill/173fbafb-d2e0-4b89-be1c-548b1cc47160</a>
assisting people to access services	0.0000	<a href="http://data.europa.eu/esco/skill/29fbde52-e525-4653-96d0-acd59ccb28d8">http://data.europa.eu/esco/skill/29fbde52-e525-4653-96d0-acd59ccb28d8</a>
assisting people with mobility	0.0000	<a href="http://data.europa.eu/esco/skill/8826b057-0e80-4e3d-9efc-1e179d597f40">http://data.europa.eu/esco/skill/8826b057-0e80-4e3d-9efc-1e179d597f40</a>
assisting with personal needs	0.0000	<a href="http://data.europa.eu/esco/skill/77ee8fad-188f-44cf-88ba-4e495a52d604">http://data.europa.eu/esco/skill/77ee8fad-188f-44cf-88ba-4e495a52d604</a>
audio-visual techniques and media production	0.8775	<a href="http://data.europa.eu/esco/isced-f/0211">http://data.europa.eu/esco/isced-f/0211</a>
basic programmes and qualifications	0.0000	<a href="http://data.europa.eu/esco/isced-f/001">http://data.europa.eu/esco/isced-f/001</a>
biochemistry	0.0000	<a href="http://data.europa.eu/esco/isced-f/0512">http://data.europa.eu/esco/isced-f/0512</a>
biological and related sciences	0.0000	<a href="http://data.europa.eu/esco/isced-f/051">http://data.europa.eu/esco/isced-f/051</a>
biology	0.0000	<a href="http://data.europa.eu/esco/isced-f/0511">http://data.europa.eu/esco/isced-f/0511</a>
browsing, searching and filtering digital data	1.0000	<a href="http://data.europa.eu/esco/skill/258fea29-09db-4918-8235-0d7d529cd31c">http://data.europa.eu/esco/skill/258fea29-09db-4918-8235-0d7d529cd31c</a>
building and civil engineering	0.2442	<a href="http://data.europa.eu/esco/isced-f/0732">http://data.europa.eu/esco/isced-f/0732</a>
building and developing teams	0.0000	<a href="http://data.europa.eu/esco/skill/2d02d98c-20c4-4b46-bf44-e5f85a3f03ed">http://data.europa.eu/esco/skill/2d02d98c-20c4-4b46-bf44-e5f85a3f03ed</a>

building and developing teams	0.0000	<a href="http://data.europa.eu/esco/skill/dfae80db-cf29-41e1-a48c-2bee901afff1">http://data.europa.eu/esco/skill/dfae80db-cf29-41e1-a48c-2bee901afff1</a>
building and repairing structures	0.0375	<a href="http://data.europa.eu/esco/skill/18da3b88-1cd5-4ef3-83d6-664e52afdbaa">http://data.europa.eu/esco/skill/18da3b88-1cd5-4ef3-83d6-664e52afdbaa</a>
building and repairing structures	0.0000	<a href="http://data.europa.eu/esco/skill/58beed15-8cf0-4bea-a24a-ad595768bba6">http://data.europa.eu/esco/skill/58beed15-8cf0-4bea-a24a-ad595768bba6</a>
business and administration	0.2224	<a href="http://data.europa.eu/esco/isced-f/041">http://data.europa.eu/esco/isced-f/041</a>
business and administration not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/0419">http://data.europa.eu/esco/isced-f/0419</a>
business, administration and law	0.0652	<a href="http://data.europa.eu/esco/isced-f/04">http://data.europa.eu/esco/isced-f/04</a>
business, administration and law not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/049">http://data.europa.eu/esco/isced-f/049</a>
business, administration and law not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/040">http://data.europa.eu/esco/isced-f/040</a>
calculating and estimating	0.0201	<a href="http://data.europa.eu/esco/skill/e173eaf8-c99b-405a-b0ac-0e02ce3c268d">http://data.europa.eu/esco/skill/e173eaf8-c99b-405a-b0ac-0e02ce3c268d</a>
calculating and estimating	0.0000	<a href="http://data.europa.eu/esco/skill/47b0d855-ea3c-45e9-8dcf-0e12e62261c4">http://data.europa.eu/esco/skill/47b0d855-ea3c-45e9-8dcf-0e12e62261c4</a>
care of the elderly and of disabled adults	0.4667	<a href="http://data.europa.eu/esco/isced-f/0921">http://data.europa.eu/esco/isced-f/0921</a>
caring for children	0.0000	<a href="http://data.europa.eu/esco/skill/969845ce-6895-44a8-a3d2-b8c2d8b5de21">http://data.europa.eu/esco/skill/969845ce-6895-44a8-a3d2-b8c2d8b5de21</a>
carrying out forensic and police investigations	0.0400	<a href="http://data.europa.eu/esco/skill/c4376e35-add7-43a0-8b2e-f5741f0df8fe">http://data.europa.eu/esco/skill/c4376e35-add7-43a0-8b2e-f5741f0df8fe</a>
chemical engineering and processes	0.1400	<a href="http://data.europa.eu/esco/isced-f/0711">http://data.europa.eu/esco/isced-f/0711</a>
chemistry	0.0000	<a href="http://data.europa.eu/esco/isced-f/0531">http://data.europa.eu/esco/isced-f/0531</a>
child care and youth services	0.0000	<a href="http://data.europa.eu/esco/isced-f/0922">http://data.europa.eu/esco/isced-f/0922</a>
classical languages	0.0000	<a href="http://data.europa.eu/esco/skill/e434e71a-f068-44ed-8059-d1af9eb592d7">http://data.europa.eu/esco/skill/e434e71a-f068-44ed-8059-d1af9eb592d7</a>
cleaning	0.0000	<a href="http://data.europa.eu/esco/skill/821ect8f-3c2a-4b89-a9f1-b2aa7fb0b625">http://data.europa.eu/esco/skill/821ect8f-3c2a-4b89-a9f1-b2aa7fb0b625</a>
cleaning	0.0000	<a href="http://data.europa.eu/esco/skill/2bf2c727-ee42-4fc5-a4d7-2cd62b880433">http://data.europa.eu/esco/skill/2bf2c727-ee42-4fc5-a4d7-2cd62b880433</a>
cleaning interior and exterior of buildings	0.0000	<a href="http://data.europa.eu/esco/skill/d69e45d3-1f3f-4e6a-8933-82e949277811">http://data.europa.eu/esco/skill/d69e45d3-1f3f-4e6a-8933-82e949277811</a>
cleaning outdoor spaces	0.0000	<a href="http://data.europa.eu/esco/skill/3b86c15f-3f66-4e50-abf5-544f2a942a0b">http://data.europa.eu/esco/skill/3b86c15f-3f66-4e50-abf5-544f2a942a0b</a>
cleaning tools, equipment, workpieces and vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/7a8c9402-0550-4966-9ff6-0d65b0f6b1fb">http://data.europa.eu/esco/skill/7a8c9402-0550-4966-9ff6-0d65b0f6b1fb</a>
coaching and mentoring	0.0000	<a href="http://data.europa.eu/esco/skill/e2bdf081-333a-414f-b8ac-93c76290f167">http://data.europa.eu/esco/skill/e2bdf081-333a-414f-b8ac-93c76290f167</a>
collaborating and liaising	0.0000	<a href="http://data.europa.eu/esco/skill/af84405b-896d-4ed3-9462-077ea9a2a188">http://data.europa.eu/esco/skill/af84405b-896d-4ed3-9462-077ea9a2a188</a>
collaborating in teams and networks	0.0000	<a href="http://data.europa.eu/esco/skill/036afa6e-cdde-4b38-a53a-8e7910a840e1">http://data.europa.eu/esco/skill/036afa6e-cdde-4b38-a53a-8e7910a840e1</a>
collecting and preparing specimens or materials for testing	0.0000	<a href="http://data.europa.eu/esco/skill/f1612d7a-0338-4b0f-a2a4-86b5168e2596">http://data.europa.eu/esco/skill/f1612d7a-0338-4b0f-a2a4-86b5168e2596</a>
communicating	0.0000	<a href="http://data.europa.eu/esco/skill/6f142deb-03a9-4cd7-94ce-e0f023ae2169">http://data.europa.eu/esco/skill/6f142deb-03a9-4cd7-94ce-e0f023ae2169</a>
communicating with colleagues and clients	0.0000	<a href="http://data.europa.eu/esco/skill/a19c5139-1250-4a60-9c31-a3243cca06cc">http://data.europa.eu/esco/skill/a19c5139-1250-4a60-9c31-a3243cca06cc</a>
communication, collaboration and creativity	0.1131	<a href="http://data.europa.eu/esco/skill/dc06de9f-dd3a-4f28-b58f-b01b5ae72ab8">http://data.europa.eu/esco/skill/dc06de9f-dd3a-4f28-b58f-b01b5ae72ab8</a>
communication, collaboration and creativity	0.0000	<a href="http://data.europa.eu/esco/skill/85b379e7-e0b7-48b8-baa7-631f50a7cdd5">http://data.europa.eu/esco/skill/85b379e7-e0b7-48b8-baa7-631f50a7cdd5</a>
communication, collaboration and creativity	0.0000	<a href="http://data.europa.eu/esco/skill/ab877a24-335d-4676-b366-c5c06651481a">http://data.europa.eu/esco/skill/ab877a24-335d-4676-b366-c5c06651481a</a>
community sanitation	0.0000	<a href="http://data.europa.eu/esco/isced-f/1021">http://data.europa.eu/esco/isced-f/1021</a>

complying with environmental protection laws and standards	0.0444	<a href="http://data.europa.eu/esco/skill/8064ae65-5d1b-44e1-9aaf-246a4285a9a6">http://data.europa.eu/esco/skill/8064ae65-5d1b-44e1-9aaf-246a4285a9a6</a>
complying with health and safety procedures	0.0069	<a href="http://data.europa.eu/esco/skill/5bcec244-3efe-45ac-8891-0ab4a91e9c48">http://data.europa.eu/esco/skill/5bcec244-3efe-45ac-8891-0ab4a91e9c48</a>
complying with operational procedures	0.2314	<a href="http://data.europa.eu/esco/skill/802deca0-b880-4d1a-b366-e13b27621baf">http://data.europa.eu/esco/skill/802deca0-b880-4d1a-b366-e13b27621baf</a>
composing music	0.4000	<a href="http://data.europa.eu/esco/skill/d12a1be6-d916-436d-8274-ad97b5f24415">http://data.europa.eu/esco/skill/d12a1be6-d916-436d-8274-ad97b5f24415</a>
computer use	1.0000	<a href="http://data.europa.eu/esco/isced-f/0611">http://data.europa.eu/esco/isced-f/0611</a>
conducting academic or market research	0.2800	<a href="http://data.europa.eu/esco/skill/7eafec38-621a-4b6e-9298-bfe70ec0b253">http://data.europa.eu/esco/skill/7eafec38-621a-4b6e-9298-bfe70ec0b253</a>
conducting gaming activities	0.2692	<a href="http://data.europa.eu/esco/skill/4781b6b1-07bc-44be-8c2d-de0fa5db4250">http://data.europa.eu/esco/skill/4781b6b1-07bc-44be-8c2d-de0fa5db4250</a>
conducting studies, investigations and examinations	0.1498	<a href="http://data.europa.eu/esco/skill/c5b71c57-6f78-4c54-b332-ec75848f1095">http://data.europa.eu/esco/skill/c5b71c57-6f78-4c54-b332-ec75848f1095</a>
conducting studies, investigations and examinations	0.0385	<a href="http://data.europa.eu/esco/skill/8fde007e-ea4c-48c2-84c5-752834acd31d">http://data.europa.eu/esco/skill/8fde007e-ea4c-48c2-84c5-752834acd31d</a>
constructing	0.0094	<a href="http://data.europa.eu/esco/skill/2ae39fc8-0f1b-4284-9e73-3f2739471f63">http://data.europa.eu/esco/skill/2ae39fc8-0f1b-4284-9e73-3f2739471f63</a>
constructing	0.0000	<a href="http://data.europa.eu/esco/skill/57a45369-afc1-4f5a-b157-6f18de506bab">http://data.europa.eu/esco/skill/57a45369-afc1-4f5a-b157-6f18de506bab</a>
constructing	0.0000	<a href="http://data.europa.eu/esco/skill/59c46f34-bff4-4859-adf4-3839c2a73821">http://data.europa.eu/esco/skill/59c46f34-bff4-4859-adf4-3839c2a73821</a>
core skills and competences	0.3333	<a href="http://data.europa.eu/esco/skill/b94686e3-cce5-47a2-a8d8-402a0d0ed44e">http://data.europa.eu/esco/skill/b94686e3-cce5-47a2-a8d8-402a0d0ed44e</a>
counselling	0.0673	<a href="http://data.europa.eu/esco/skill/6107b01a-3dac-4a03-ac9c-1044e4af0307">http://data.europa.eu/esco/skill/6107b01a-3dac-4a03-ac9c-1044e4af0307</a>
counselling	0.0000	<a href="http://data.europa.eu/esco/skill/0ac31705-79ff-4409-a818-c9d0a6388e84">http://data.europa.eu/esco/skill/0ac31705-79ff-4409-a818-c9d0a6388e84</a>
counselling on personal, family or social issues	0.0000	<a href="http://data.europa.eu/esco/skill/d6a8a2a4-4e21-4ea6-b267-b5c63e687cf">http://data.europa.eu/esco/skill/d6a8a2a4-4e21-4ea6-b267-b5c63e687cf</a>
creating artistic designs or performances	0.3063	<a href="http://data.europa.eu/esco/skill/ab99d9a7-62eb-407b-92f2-bf7992a82004">http://data.europa.eu/esco/skill/ab99d9a7-62eb-407b-92f2-bf7992a82004</a>
creating artistic, visual or instructive materials	0.2190	<a href="http://data.europa.eu/esco/skill/c85f95ae-34fb-487b-b3d5-10803eee619d">http://data.europa.eu/esco/skill/c85f95ae-34fb-487b-b3d5-10803eee619d</a>
creating artistic, visual or instructive materials	0.0000	<a href="http://data.europa.eu/esco/skill/775be776-b6ce-4322-a96f-11b2df84ce07">http://data.europa.eu/esco/skill/775be776-b6ce-4322-a96f-11b2df84ce07</a>
creating visual displays and decorations	0.5109	<a href="http://data.europa.eu/esco/skill/a556a3db-cd48-42a5-825c-f95f6f5ccbfe">http://data.europa.eu/esco/skill/a556a3db-cd48-42a5-825c-f95f6f5ccbfe</a>
crop and livestock production	0.2059	<a href="http://data.europa.eu/esco/isced-f/0811">http://data.europa.eu/esco/isced-f/0811</a>
cultivating land and crops	0.0000	<a href="http://data.europa.eu/esco/skill/b7c82b1b-cff9-4641-a62f-e4e28395eade">http://data.europa.eu/esco/skill/b7c82b1b-cff9-4641-a62f-e4e28395eade</a>
cutting materials and drilling holes	0.0000	<a href="http://data.europa.eu/esco/skill/72fe5d9f-4ec8-4fc4-b1d3-0dd83be0aa1a">http://data.europa.eu/esco/skill/72fe5d9f-4ec8-4fc4-b1d3-0dd83be0aa1a</a>
database and network design and administration	0.9901	<a href="http://data.europa.eu/esco/isced-f/0612">http://data.europa.eu/esco/isced-f/0612</a>
dealing with problems	0.0000	<a href="http://data.europa.eu/esco/skill/13d301d0-98cb-414f-a8f9-a3f059228133">http://data.europa.eu/esco/skill/13d301d0-98cb-414f-a8f9-a3f059228133</a>
demonstrating willingness to learn	0.0299	<a href="http://data.europa.eu/esco/skill/f5c9eef3-0495-4747-9519-d71a58d252bd">http://data.europa.eu/esco/skill/f5c9eef3-0495-4747-9519-d71a58d252bd</a>
dental studies	0.0000	<a href="http://data.europa.eu/esco/isced-f/0911">http://data.europa.eu/esco/isced-f/0911</a>
designing electrical or electronic systems or equipment	0.7712	<a href="http://data.europa.eu/esco/skill/39fa260c-4f85-48e3-83ce-e292e696c233">http://data.europa.eu/esco/skill/39fa260c-4f85-48e3-83ce-e292e696c233</a>
designing ict systems or applications	0.9902	<a href="http://data.europa.eu/esco/skill/b590d4e5-7c62-4b4a-abc2-c270b482e0ce">http://data.europa.eu/esco/skill/b590d4e5-7c62-4b4a-abc2-c270b482e0ce</a>
designing industrial materials, systems or products	0.6306	<a href="http://data.europa.eu/esco/skill/c34b06c4-d164-4e49-a784-89d47de42ec2">http://data.europa.eu/esco/skill/c34b06c4-d164-4e49-a784-89d47de42ec2</a>
designing structures or facilities	0.3684	<a href="http://data.europa.eu/esco/skill/b2c688b0-9106-466d-8b88-eafdf6e608e7d">http://data.europa.eu/esco/skill/b2c688b0-9106-466d-8b88-eafdf6e608e7d</a>
designing systems and products	0.5585	<a href="http://data.europa.eu/esco/skill/0a295163-3e17-47ad-99ac-2b507ce30adb">http://data.europa.eu/esco/skill/0a295163-3e17-47ad-99ac-2b507ce30adb</a>

designing systems and products	0.5904	<a href="http://data.europa.eu/esco/skill/883eab8c-d8a6-4e8b-9b11-7d9001e172ab">http://data.europa.eu/esco/skill/883eab8c-d8a6-4e8b-9b11-7d9001e172ab</a>
determining values of goods or services	0.0000	<a href="http://data.europa.eu/esco/skill/f55fac09-92a2-4a88-9a96-ee9fb5b18519">http://data.europa.eu/esco/skill/f55fac09-92a2-4a88-9a96-ee9fb5b18519</a>
developing contingency and emergency response plans	0.3684	<a href="http://data.europa.eu/esco/skill/164510d1-1216-4dc0-b9d1-a7f6af19e469">http://data.europa.eu/esco/skill/164510d1-1216-4dc0-b9d1-a7f6af19e469</a>
developing educational programmes	0.3889	<a href="http://data.europa.eu/esco/skill/7e0b93e0-0de7-4607-b07f-27a6828d3ff0">http://data.europa.eu/esco/skill/7e0b93e0-0de7-4607-b07f-27a6828d3ff0</a>
developing financial, business or marketing plans	0.4336	<a href="http://data.europa.eu/esco/skill/37272760-957a-4c34-b4f3-780ee285334d">http://data.europa.eu/esco/skill/37272760-957a-4c34-b4f3-780ee285334d</a>
developing health programmes	0.0000	<a href="http://data.europa.eu/esco/skill/db54693e-bcb0-4dae-8885-a43d510fb71f">http://data.europa.eu/esco/skill/db54693e-bcb0-4dae-8885-a43d510fb71f</a>
developing instructive or promotional materials	0.0588	<a href="http://data.europa.eu/esco/skill/d1815c8a-7755-4fe3-bacf-68bb0b6a0b55">http://data.europa.eu/esco/skill/d1815c8a-7755-4fe3-bacf-68bb0b6a0b55</a>
developing objectives and strategies	0.1886	<a href="http://data.europa.eu/esco/skill/6f89dcbe-4315-4533-8801-3aadf9190b86">http://data.europa.eu/esco/skill/6f89dcbe-4315-4533-8801-3aadf9190b86</a>
developing objectives and strategies	0.0000	<a href="http://data.europa.eu/esco/skill/6ee936b0-4e0c-4e04-97c7-1f4ee9230d67">http://data.europa.eu/esco/skill/6ee936b0-4e0c-4e04-97c7-1f4ee9230d67</a>
developing operational policies and procedures	0.3182	<a href="http://data.europa.eu/esco/skill/c23e0a2f-f04b-45bc-b0dd-20571f6b502c">http://data.europa.eu/esco/skill/c23e0a2f-f04b-45bc-b0dd-20571f6b502c</a>
developing policies and legislation	0.0000	<a href="http://data.europa.eu/esco/skill/8ed41305-4abf-4b54-9f8f-0e043d26feba">http://data.europa.eu/esco/skill/8ed41305-4abf-4b54-9f8f-0e043d26feba</a>
developing professional relationships or networks	0.0000	<a href="http://data.europa.eu/esco/skill/8a3b45dc-8299-4b67-99db-6542dat79ac3">http://data.europa.eu/esco/skill/8a3b45dc-8299-4b67-99db-6542dat79ac3</a>
developing recipes or menus	0.0000	<a href="http://data.europa.eu/esco/skill/32c854c1-6f1f-4f1c-8e4c-368a68a10db3">http://data.europa.eu/esco/skill/32c854c1-6f1f-4f1c-8e4c-368a68a10db3</a>
developing solutions	0.5283	<a href="http://data.europa.eu/esco/skill/aca5081a-ceb0-4028-9cc5-1daaf4f86f9">http://data.europa.eu/esco/skill/aca5081a-ceb0-4028-9cc5-1daaf4f86f9</a>
diagnosing health conditions	0.0648	<a href="http://data.europa.eu/esco/skill/d700aa7a-0ed8-4967-a32c-4cb6075ab3b9">http://data.europa.eu/esco/skill/d700aa7a-0ed8-4967-a32c-4cb6075ab3b9</a>
directing operational activities	0.1061	<a href="http://data.europa.eu/esco/skill/87dff904-fb74-4d59-972e-1c2387579d94">http://data.europa.eu/esco/skill/87dff904-fb74-4d59-972e-1c2387579d94</a>
directing, supervising and coordinating projects	0.1707	<a href="http://data.europa.eu/esco/skill/190f64e1-b7b6-4c53-b20b-80f9215ef6ca">http://data.europa.eu/esco/skill/190f64e1-b7b6-4c53-b20b-80f9215ef6ca</a>
disposing of non-hazardous waste or debris	0.0000	<a href="http://data.europa.eu/esco/skill/61d1dab2-6007-4b7c-9380-cd88207fa30f">http://data.europa.eu/esco/skill/61d1dab2-6007-4b7c-9380-cd88207fa30f</a>
documenting and recording information	0.1242	<a href="http://data.europa.eu/esco/skill/325a3d29-a235-4182-9128-782c0f4b2dcc">http://data.europa.eu/esco/skill/325a3d29-a235-4182-9128-782c0f4b2dcc</a>
documenting and recording information	0.6563	<a href="http://data.europa.eu/esco/skill/1034004c-0347-4765-8794-b65d2c92b379">http://data.europa.eu/esco/skill/1034004c-0347-4765-8794-b65d2c92b379</a>
documenting technical designs, procedures, problems or activities	0.2333	<a href="http://data.europa.eu/esco/skill/95bf4552-6d5b-41dc-b990-53ace372f705">http://data.europa.eu/esco/skill/95bf4552-6d5b-41dc-b990-53ace372f705</a>
domestic services	0.0000	<a href="http://data.europa.eu/esco/isced-f/1011">http://data.europa.eu/esco/isced-f/1011</a>
driving heavy vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/c54a0a94-9d45-4697-b7cb-f7eaef839031">http://data.europa.eu/esco/skill/c54a0a94-9d45-4697-b7cb-f7eaef839031</a>
driving light vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/dbbbe31a-9b8c-4459-a830-84363648f52c">http://data.europa.eu/esco/skill/dbbbe31a-9b8c-4459-a830-84363648f52c</a>
driving vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/663d82aa-4c0d-46bc-90f5-03770f068bb1">http://data.europa.eu/esco/skill/663d82aa-4c0d-46bc-90f5-03770f068bb1</a>
driving vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/f7c70392-a261-42e9-86a6-fccf3709ac81">http://data.europa.eu/esco/skill/f7c70392-a261-42e9-86a6-fccf3709ac81</a>
earth sciences	0.3256	<a href="http://data.europa.eu/esco/isced-f/0532">http://data.europa.eu/esco/isced-f/0532</a>
economics	0.0000	<a href="http://data.europa.eu/esco/isced-f/0311">http://data.europa.eu/esco/isced-f/0311</a>
education	0.4665	<a href="http://data.europa.eu/esco/isced-f/01">http://data.europa.eu/esco/isced-f/01</a>
education	0.1094	<a href="http://data.europa.eu/esco/isced-f/011">http://data.europa.eu/esco/isced-f/011</a>
education science	0.6563	<a href="http://data.europa.eu/esco/isced-f/0111">http://data.europa.eu/esco/isced-f/0111</a>
electricity and energy	0.2059	<a href="http://data.europa.eu/esco/isced-f/0713">http://data.europa.eu/esco/isced-f/0713</a>
electronics and automation	0.8390	<a href="http://data.europa.eu/esco/isced-f/0714">http://data.europa.eu/esco/isced-f/0714</a>

engaging with others to identify needs	0.0000	<a href="http://data.europa.eu/esco/skill/d46193e0-be7d-4a90-91cc-4caba78e19d0">http://data.europa.eu/esco/skill/d46193e0-be7d-4a90-91cc-4caba78e19d0</a>
engineering and engineering trades	0.3879	<a href="http://data.europa.eu/esco/isced-f/071">http://data.europa.eu/esco/isced-f/071</a>
engineering and engineering trades not elsewhere classified	0.4667	<a href="http://data.europa.eu/esco/isced-f/0719">http://data.europa.eu/esco/isced-f/0719</a>
engineering and engineering trades not further defined	0.8750	<a href="http://data.europa.eu/esco/isced-f/0710">http://data.europa.eu/esco/isced-f/0710</a>
engineering, manufacturing and construction	0.1256	<a href="http://data.europa.eu/esco/isced-f/07">http://data.europa.eu/esco/isced-f/07</a>
engineering, manufacturing and construction not elsewhere classified	0.2500	<a href="http://data.europa.eu/esco/isced-f/079">http://data.europa.eu/esco/isced-f/079</a>
engineering, manufacturing and construction not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/070">http://data.europa.eu/esco/isced-f/070</a>
ensuring compliance with legislation	0.0000	<a href="http://data.europa.eu/esco/skill/35dc2a23-cdc3-4291-930f-927ba2911949">http://data.europa.eu/esco/skill/35dc2a23-cdc3-4291-930f-927ba2911949</a>
entering and transforming information	0.7857	<a href="http://data.europa.eu/esco/skill/9bdf8a77-8524-43da-bac6-d15d22e1b7ed">http://data.europa.eu/esco/skill/9bdf8a77-8524-43da-bac6-d15d22e1b7ed</a>
environment	0.0000	<a href="http://data.europa.eu/esco/isced-f/052">http://data.europa.eu/esco/isced-f/052</a>
environmental protection technology	0.3333	<a href="http://data.europa.eu/esco/isced-f/0712">http://data.europa.eu/esco/isced-f/0712</a>
environmental sciences	0.0000	<a href="http://data.europa.eu/esco/isced-f/0521">http://data.europa.eu/esco/isced-f/0521</a>
estimating resource needs	0.0606	<a href="http://data.europa.eu/esco/skill/b917784a-d7c9-437c-be6e-0de41067fa62">http://data.europa.eu/esco/skill/b917784a-d7c9-437c-be6e-0de41067fa62</a>
evaluating systems, programmes, equipment and products	0.1277	<a href="http://data.europa.eu/esco/skill/f2cf57fe-d4cb-4b4a-831d-73171cc73909">http://data.europa.eu/esco/skill/f2cf57fe-d4cb-4b4a-831d-73171cc73909</a>
executing financial transactions	0.0227	<a href="http://data.europa.eu/esco/skill/c20ac175-3aab-4aaa-9b9e-784c2dfb59cd">http://data.europa.eu/esco/skill/c20ac175-3aab-4aaa-9b9e-784c2dfb59cd</a>
fabricating food and related products	0.0000	<a href="http://data.europa.eu/esco/skill/f289347f-a76d-4d03-a648-74b53ed1e636">http://data.europa.eu/esco/skill/f289347f-a76d-4d03-a648-74b53ed1e636</a>
fabricating garments and textile products	0.0000	<a href="http://data.europa.eu/esco/skill/528c2f16-139f-4a5b-8880-a6f02ed33f2a">http://data.europa.eu/esco/skill/528c2f16-139f-4a5b-8880-a6f02ed33f2a</a>
fabricating medical and prosthetic devices	0.0000	<a href="http://data.europa.eu/esco/skill/37f2f637-1f54-4ea1-b677-5ca6cac24993">http://data.europa.eu/esco/skill/37f2f637-1f54-4ea1-b677-5ca6cac24993</a>
fabricating precision instruments or jewellery	0.0000	<a href="http://data.europa.eu/esco/skill/2ad2ee1c-afc9-402f-91ab-c9c0911b209d">http://data.europa.eu/esco/skill/2ad2ee1c-afc9-402f-91ab-c9c0911b209d</a>
fabricating tobacco products	0.0000	<a href="http://data.europa.eu/esco/skill/3eacd9a9-fe4a-49ba-a085-c798097cf8d4">http://data.europa.eu/esco/skill/3eacd9a9-fe4a-49ba-a085-c798097cf8d4</a>
fashion, interior and industrial design	0.0000	<a href="http://data.europa.eu/esco/isced-f/0212">http://data.europa.eu/esco/isced-f/0212</a>
feeding and grooming animals	0.0000	<a href="http://data.europa.eu/esco/skill/42f18b92-1c20-46ed-bde0-9bc64ff1e475">http://data.europa.eu/esco/skill/42f18b92-1c20-46ed-bde0-9bc64ff1e475</a>
field unknown	0.0000	<a href="http://data.europa.eu/esco/isced-f/99">http://data.europa.eu/esco/isced-f/99</a>
field unknown	0.0000	<a href="http://data.europa.eu/esco/isced-f/999">http://data.europa.eu/esco/isced-f/999</a>
finance, banking and insurance	0.0000	<a href="http://data.europa.eu/esco/isced-f/0412">http://data.europa.eu/esco/isced-f/0412</a>
fine arts	0.0000	<a href="http://data.europa.eu/esco/isced-f/0213">http://data.europa.eu/esco/isced-f/0213</a>
finishing interior or exterior of structures	0.0000	<a href="http://data.europa.eu/esco/skill/d5f302db-adff-4bae-b7d4-37293b397193">http://data.europa.eu/esco/skill/d5f302db-adff-4bae-b7d4-37293b397193</a>
fisheries	0.0333	<a href="http://data.europa.eu/esco/isced-f/083">http://data.europa.eu/esco/isced-f/083</a>
fisheries	0.0333	<a href="http://data.europa.eu/esco/isced-f/0831">http://data.europa.eu/esco/isced-f/0831</a>
fitting assistive devices	0.0000	<a href="http://data.europa.eu/esco/skill/50e42de7-4a5c-4f94-b160-765f547d840c">http://data.europa.eu/esco/skill/50e42de7-4a5c-4f94-b160-765f547d840c</a>
following ethical code of conduct	0.0000	<a href="http://data.europa.eu/esco/skill/925af2b5-2f4d-4cce-92cc-79e1ff887c7d">http://data.europa.eu/esco/skill/925af2b5-2f4d-4cce-92cc-79e1ff887c7d</a>
following instructions and procedures	0.0000	<a href="http://data.europa.eu/esco/skill/58bd927f-e4cc-4b61-a679-cb91b3f8075a">http://data.europa.eu/esco/skill/58bd927f-e4cc-4b61-a679-cb91b3f8075a</a>
food processing	0.0000	<a href="http://data.europa.eu/esco/isced-f/0721">http://data.europa.eu/esco/isced-f/0721</a>

forestry	0.0000	<a href="http://data.europa.eu/esco/isced-f/082">http://data.europa.eu/esco/isced-f/082</a>
forestry	0.0000	<a href="http://data.europa.eu/esco/isced-f/0821">http://data.europa.eu/esco/isced-f/0821</a>
gathering information from physical or electronic sources	0.5983	<a href="http://data.europa.eu/esco/skill/29dcc31e-a8d6-4a62-b3c1-2de81e966e39">http://data.europa.eu/esco/skill/29dcc31e-a8d6-4a62-b3c1-2de81e966e39</a>
generic programmes and qualifications	0.0000	<a href="http://data.europa.eu/esco/isced-f/00">http://data.europa.eu/esco/isced-f/00</a>
generic programmes and qualifications not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/009">http://data.europa.eu/esco/isced-f/009</a>
generic programmes and qualifications not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/000">http://data.europa.eu/esco/isced-f/000</a>
giving feedback	0.0000	<a href="http://data.europa.eu/esco/skill/23cfb269-eec1-4011-8e57-c86203ce9fd7">http://data.europa.eu/esco/skill/23cfb269-eec1-4011-8e57-c86203ce9fd7</a>
giving instructions	0.0000	<a href="http://data.europa.eu/esco/skill/9a540c0f-81c0-4687-a14b-e9196d9af6c0">http://data.europa.eu/esco/skill/9a540c0f-81c0-4687-a14b-e9196d9af6c0</a>
hair and beauty services	0.0000	<a href="http://data.europa.eu/esco/isced-f/1012">http://data.europa.eu/esco/isced-f/1012</a>
hammering, nailing and riveting	0.0000	<a href="http://data.europa.eu/esco/skill/b82b2bad-41dd-40af-8242-e7d59a2ce786">http://data.europa.eu/esco/skill/b82b2bad-41dd-40af-8242-e7d59a2ce786</a>
handicrafts	0.0000	<a href="http://data.europa.eu/esco/isced-f/0214">http://data.europa.eu/esco/isced-f/0214</a>
handling and disposing of hazardous materials	0.0000	<a href="http://data.europa.eu/esco/skill/8bde58aa-9d5b-422b-801c-ff9186dd648e">http://data.europa.eu/esco/skill/8bde58aa-9d5b-422b-801c-ff9186dd648e</a>
handling and disposing of waste and hazardous materials	0.0000	<a href="http://data.europa.eu/esco/skill/15dfca7a-5dde-4199-bad3-c00600387258">http://data.europa.eu/esco/skill/15dfca7a-5dde-4199-bad3-c00600387258</a>
handling and disposing of waste and hazardous materials	0.0000	<a href="http://data.europa.eu/esco/skill/f8c676de-c871-424f-9a65-77059d07910a">http://data.europa.eu/esco/skill/f8c676de-c871-424f-9a65-77059d07910a</a>
handling and moving	0.0173	<a href="http://data.europa.eu/esco/skill/03e0b95b-67d1-457a-b3f7-06c407cf6bec">http://data.europa.eu/esco/skill/03e0b95b-67d1-457a-b3f7-06c407cf6bec</a>
handling and moving	0.0000	<a href="http://data.europa.eu/esco/skill/ff565308-8f29-4f1d-a342-9a29bd8b7446">http://data.europa.eu/esco/skill/ff565308-8f29-4f1d-a342-9a29bd8b7446</a>
handling and moving	0.0000	<a href="http://data.europa.eu/esco/skill/ca5b2cf4-0f3e-4c47-b496-12d812a7e5d9">http://data.europa.eu/esco/skill/ca5b2cf4-0f3e-4c47-b496-12d812a7e5d9</a>
handling animals	0.0125	<a href="http://data.europa.eu/esco/skill/e5419bb1-38c7-458a-b263-b7e73e02bc7e">http://data.europa.eu/esco/skill/e5419bb1-38c7-458a-b263-b7e73e02bc7e</a>
handling animals	0.0000	<a href="http://data.europa.eu/esco/skill/9d0d6866-cd91-490b-9e3a-d0914ad95a2e">http://data.europa.eu/esco/skill/9d0d6866-cd91-490b-9e3a-d0914ad95a2e</a>
health	0.0495	<a href="http://data.europa.eu/esco/isced-f/091">http://data.europa.eu/esco/isced-f/091</a>
health and welfare	0.0286	<a href="http://data.europa.eu/esco/isced-f/09">http://data.europa.eu/esco/isced-f/09</a>
health and welfare not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/099">http://data.europa.eu/esco/isced-f/099</a>
health and welfare not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/090">http://data.europa.eu/esco/isced-f/090</a>
history and archaeology	0.0400	<a href="http://data.europa.eu/esco/isced-f/0222">http://data.europa.eu/esco/isced-f/0222</a>
horticulture	0.0000	<a href="http://data.europa.eu/esco/isced-f/0812">http://data.europa.eu/esco/isced-f/0812</a>
hotel, restaurants and catering	0.0000	<a href="http://data.europa.eu/esco/isced-f/1013">http://data.europa.eu/esco/isced-f/1013</a>
humanities (except languages)	0.0233	<a href="http://data.europa.eu/esco/isced-f/022">http://data.europa.eu/esco/isced-f/022</a>
hunting, trapping and slaughtering animals	0.0000	<a href="http://data.europa.eu/esco/skill/3afcf547-cefc-493a-8abb-aaa8b7088e4f">http://data.europa.eu/esco/skill/3afcf547-cefc-493a-8abb-aaa8b7088e4f</a>
hygiene and occupational health services	0.0000	<a href="http://data.europa.eu/esco/isced-f/102">http://data.europa.eu/esco/isced-f/102</a>
identifying opportunities	0.0000	<a href="http://data.europa.eu/esco/skill/cbe1b24e-00f3-4b17-94e9-1fcd34a11c3e">http://data.europa.eu/esco/skill/cbe1b24e-00f3-4b17-94e9-1fcd34a11c3e</a>
implementing new procedures or processes	0.0000	<a href="http://data.europa.eu/esco/skill/a6c3bda0-c759-495e-b2c5-062b3abe2097">http://data.europa.eu/esco/skill/a6c3bda0-c759-495e-b2c5-062b3abe2097</a>
information and communication technologies (ict)	0.3986	<a href="http://data.europa.eu/esco/isced-f/06">http://data.europa.eu/esco/isced-f/06</a>

information and communication technologies (icts)	0.7973	<a href="http://data.europa.eu/esco/isced-f/061">http://data.europa.eu/esco/isced-f/061</a>
information and communication technologies not elsewhere classified	1.0000	<a href="http://data.europa.eu/esco/isced-f/0619">http://data.europa.eu/esco/isced-f/0619</a>
information skills	0.2318	<a href="http://data.europa.eu/esco/skill/0a2d70ee-d435-4965-9e96-702b2fb65740">http://data.europa.eu/esco/skill/0a2d70ee-d435-4965-9e96-702b2fb65740</a>
information skills	0.0000	<a href="http://data.europa.eu/esco/skill/82c084ea-15e9-4d55-98dc-edef0f767baee">http://data.europa.eu/esco/skill/82c084ea-15e9-4d55-98dc-edef0f767baee</a>
information skills	0.0000	<a href="http://data.europa.eu/esco/skill/cd9c487e-09ad-4b82-854b-118feb01f2ed">http://data.europa.eu/esco/skill/cd9c487e-09ad-4b82-854b-118feb01f2ed</a>
inspecting food safety and quality	0.0000	<a href="http://data.europa.eu/esco/skill/1893b4bc-0eb2-41de-96e3-9c8f1f1eac41">http://data.europa.eu/esco/skill/1893b4bc-0eb2-41de-96e3-9c8f1f1eac41</a>
installing and assembling building fixtures	0.0000	<a href="http://data.europa.eu/esco/skill/58edb789-d085-4e7d-8b6e-b70913bebfca">http://data.europa.eu/esco/skill/58edb789-d085-4e7d-8b6e-b70913bebfca</a>
installing and assembling rigging equipment	0.0000	<a href="http://data.europa.eu/esco/skill/8eb65708-6a1c-4a11-8b51-ed9331962142">http://data.europa.eu/esco/skill/8eb65708-6a1c-4a11-8b51-ed9331962142</a>
installing and repairing electrical, electronic and precision equipment	0.7000	<a href="http://data.europa.eu/esco/skill/a7065828-10aa-4aba-b7d4-f23a30df5060">http://data.europa.eu/esco/skill/a7065828-10aa-4aba-b7d4-f23a30df5060</a>
installing concrete components	0.0000	<a href="http://data.europa.eu/esco/skill/d9be4ab0-f7d9-4b27-bd01-6cf1d43d1865">http://data.europa.eu/esco/skill/d9be4ab0-f7d9-4b27-bd01-6cf1d43d1865</a>
installing floor and wall coverings	0.0000	<a href="http://data.europa.eu/esco/skill/8984a92c-416e-498f-abd3-a9dd819e5c03">http://data.europa.eu/esco/skill/8984a92c-416e-498f-abd3-a9dd819e5c03</a>
installing heating, ventilation and air conditioning equipment	0.0000	<a href="http://data.europa.eu/esco/skill/b85caa4a-f04b-4331-80df-11404fd71225">http://data.europa.eu/esco/skill/b85caa4a-f04b-4331-80df-11404fd71225</a>
installing insulation materials	0.0000	<a href="http://data.europa.eu/esco/skill/0edd863d-b02d-4714-a1a2-835d6dd23c55">http://data.europa.eu/esco/skill/0edd863d-b02d-4714-a1a2-835d6dd23c55</a>
installing interior or exterior infrastructure	0.0000	<a href="http://data.europa.eu/esco/skill/9f6f5c32-2770-4257-bd66-adc29442ff20">http://data.europa.eu/esco/skill/9f6f5c32-2770-4257-bd66-adc29442ff20</a>
installing interior or exterior infrastructure	0.0000	<a href="http://data.europa.eu/esco/skill/2c7252b7-59b8-40eb-ac7c-17f78a94f7e7">http://data.europa.eu/esco/skill/2c7252b7-59b8-40eb-ac7c-17f78a94f7e7</a>
installing plumbing or piping equipment or systems	0.0000	<a href="http://data.europa.eu/esco/skill/583b1fb5-be8d-41f0-aa81-0b6bef4793c2">http://data.europa.eu/esco/skill/583b1fb5-be8d-41f0-aa81-0b6bef4793c2</a>
installing roofing	0.0000	<a href="http://data.europa.eu/esco/skill/5d1d2d04-5510-4918-a437-7f57d570483a">http://data.europa.eu/esco/skill/5d1d2d04-5510-4918-a437-7f57d570483a</a>
installing structural masonry materials	0.0000	<a href="http://data.europa.eu/esco/skill/97ff8a90-ec21-4f13-9b58-22cc9fc47221">http://data.europa.eu/esco/skill/97ff8a90-ec21-4f13-9b58-22cc9fc47221</a>
installing wooden and metal components	0.3376	<a href="http://data.europa.eu/esco/skill/6d0cad66-82dd-4854-a03a-68232942c68d">http://data.europa.eu/esco/skill/6d0cad66-82dd-4854-a03a-68232942c68d</a>
installing, maintaining and repairing electrical, electronic and precision equipment	0.4308	<a href="http://data.europa.eu/esco/skill/7b942071-f688-4600-8d9f-ad4c0306abc7">http://data.europa.eu/esco/skill/7b942071-f688-4600-8d9f-ad4c0306abc7</a>
installing, maintaining and repairing electrical, electronic and precision equipment	0.0000	<a href="http://data.europa.eu/esco/skill/a6b0802f-4c20-4123-8a84-d6c8631fdb1">http://data.europa.eu/esco/skill/a6b0802f-4c20-4123-8a84-d6c8631fdb1</a>
installing, maintaining and repairing mechanical equipment	0.0000	<a href="http://data.europa.eu/esco/skill/02208098-ee91-4df0-8581-5c1a04d8fe0a">http://data.europa.eu/esco/skill/02208098-ee91-4df0-8581-5c1a04d8fe0a</a>
installing, maintaining and repairing mechanical equipment	0.0000	<a href="http://data.europa.eu/esco/skill/03efa398-a1cc-4589-9c10-84bf10f8d42d">http://data.europa.eu/esco/skill/03efa398-a1cc-4589-9c10-84bf10f8d42d</a>
inter-disciplinary programmes and qualifications involving agriculture, forestry, fisheries and veterinary	0.0000	<a href="http://data.europa.eu/esco/isced-f/088">http://data.europa.eu/esco/isced-f/088</a>
inter-disciplinary programmes and qualifications involving arts and humanities	0.0000	<a href="http://data.europa.eu/esco/isced-f/028">http://data.europa.eu/esco/isced-f/028</a>
inter-disciplinary programmes and qualifications involving business, administration and law	0.0000	<a href="http://data.europa.eu/esco/isced-f/048">http://data.europa.eu/esco/isced-f/048</a>
inter-disciplinary programmes and qualifications involving education	0.8235	<a href="http://data.europa.eu/esco/isced-f/018">http://data.europa.eu/esco/isced-f/018</a>
inter-disciplinary programmes and qualifications involving education	0.8235	<a href="http://data.europa.eu/esco/isced-f/0188">http://data.europa.eu/esco/isced-f/0188</a>

inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction	0.0000	<a href="http://data.europa.eu/esco/isced-f/078">http://data.europa.eu/esco/isced-f/078</a>
inter-disciplinary programmes and qualifications involving health and welfare	0.0000	<a href="http://data.europa.eu/esco/isced-f/098">http://data.europa.eu/esco/isced-f/098</a>
inter-disciplinary programmes and qualifications involving information and communication technologies (icts)	0.0000	<a href="http://data.europa.eu/esco/isced-f/068">http://data.europa.eu/esco/isced-f/068</a>
inter-disciplinary programmes and qualifications involving natural sciences, mathematics and statistics	0.0000	<a href="http://data.europa.eu/esco/isced-f/058">http://data.europa.eu/esco/isced-f/058</a>
inter-disciplinary programmes and qualifications involving services	0.0000	<a href="http://data.europa.eu/esco/isced-f/108">http://data.europa.eu/esco/isced-f/108</a>
inter-disciplinary programmes and qualifications involving social sciences, journalism and information	0.0000	<a href="http://data.europa.eu/esco/isced-f/038">http://data.europa.eu/esco/isced-f/038</a>
inter-disciplinary programmes and qualifications involving social sciences, journalism and information	0.0000	<a href="http://data.europa.eu/esco/isced-f/0388">http://data.europa.eu/esco/isced-f/0388</a>
interpreting technical documentation and diagrams	0.3256	<a href="http://data.europa.eu/esco/skill/316df5b7-31c4-4f4e-ae69-aad1b873b995">http://data.europa.eu/esco/skill/316df5b7-31c4-4f4e-ae69-aad1b873b995</a>
interviewing	0.0000	<a href="http://data.europa.eu/esco/skill/07f47dea-587c-40c0-990a-6c092cc3e6a4">http://data.europa.eu/esco/skill/07f47dea-587c-40c0-990a-6c092cc3e6a4</a>
joining parts using soldering, welding or brazing techniques	0.0000	<a href="http://data.europa.eu/esco/skill/24a39c1b-b8cc-4210-8b74-b388a90e8f59">http://data.europa.eu/esco/skill/24a39c1b-b8cc-4210-8b74-b388a90e8f59</a>
journalism and information	0.2134	<a href="http://data.europa.eu/esco/isced-f/032">http://data.europa.eu/esco/isced-f/032</a>
journalism and reporting	0.0000	<a href="http://data.europa.eu/esco/isced-f/0321">http://data.europa.eu/esco/isced-f/0321</a>
knowledge	0.1153	<a href="http://data.europa.eu/esco/skill/c46fcbb45-5c14-4ffa-abed-5a43f104bb22">http://data.europa.eu/esco/skill/c46fcbb45-5c14-4ffa-abed-5a43f104bb22</a>
language acquisition	0.3043	<a href="http://data.europa.eu/esco/isced-f/0231">http://data.europa.eu/esco/isced-f/0231</a>
language skills and knowledge	0.0000	<a href="http://data.europa.eu/esco/skill/e35a5936-091d-4e87-bafe-f264e55bd656">http://data.europa.eu/esco/skill/e35a5936-091d-4e87-bafe-f264e55bd656</a>
languages	0.0000	<a href="http://data.europa.eu/esco/skill/43f425aa-f45d-4bb4-a200-6f82fa211b66">http://data.europa.eu/esco/skill/43f425aa-f45d-4bb4-a200-6f82fa211b66</a>
languages	0.1636	<a href="http://data.europa.eu/esco/isced-f/023">http://data.europa.eu/esco/isced-f/023</a>
law	0.1037	<a href="http://data.europa.eu/esco/isced-f/042">http://data.europa.eu/esco/isced-f/042</a>
law	0.1037	<a href="http://data.europa.eu/esco/isced-f/0421">http://data.europa.eu/esco/isced-f/0421</a>
leading and motivating	0.0303	<a href="http://data.europa.eu/esco/skill/ce17a874-b476-491d-a7a7-5f05d32ad542">http://data.europa.eu/esco/skill/ce17a874-b476-491d-a7a7-5f05d32ad542</a>
leading and motivating	0.0303	<a href="http://data.europa.eu/esco/skill/b7e752ec-7b2e-46e6-ac24-8b1233609c31">http://data.europa.eu/esco/skill/b7e752ec-7b2e-46e6-ac24-8b1233609c31</a>
leading others	0.0000	<a href="http://data.europa.eu/esco/skill/fe5eabaa-63f6-4c44-b405-fc3ded8d56cb">http://data.europa.eu/esco/skill/fe5eabaa-63f6-4c44-b405-fc3ded8d56cb</a>
liaising and networking	0.0556	<a href="http://data.europa.eu/esco/skill/b76cd1e5-d5e7-464a-b7bb-4164d3616452">http://data.europa.eu/esco/skill/b76cd1e5-d5e7-464a-b7bb-4164d3616452</a>
liaising and networking	0.1111	<a href="http://data.europa.eu/esco/skill/848c0306-8cbe-4693-a275-d99807c0173c">http://data.europa.eu/esco/skill/848c0306-8cbe-4693-a275-d99807c0173c</a>
library, information and archival studies	0.8537	<a href="http://data.europa.eu/esco/isced-f/0322">http://data.europa.eu/esco/isced-f/0322</a>
life skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/4ef78abc-e983-4cc7-84a1-52532a0159dc">http://data.europa.eu/esco/skill/4ef78abc-e983-4cc7-84a1-52532a0159dc</a>
listening and asking questions	0.0000	<a href="http://data.europa.eu/esco/skill/d7d2a468-587b-4a03-a305-e0a399ba69e6">http://data.europa.eu/esco/skill/d7d2a468-587b-4a03-a305-e0a399ba69e6</a>
literacy and numeracy	0.0000	<a href="http://data.europa.eu/esco/isced-f/002">http://data.europa.eu/esco/isced-f/002</a>
literature and linguistics	0.3500	<a href="http://data.europa.eu/esco/isced-f/0232">http://data.europa.eu/esco/isced-f/0232</a>
loading and unloading goods and, materials	0.0000	<a href="http://data.europa.eu/esco/skill/682bb7ca-dbe9-4c33-9c7a-1ae56e28516e">http://data.europa.eu/esco/skill/682bb7ca-dbe9-4c33-9c7a-1ae56e28516e</a>

maintaining a positive attitude	0.0000	<a href="http://data.europa.eu/esco/skill/2b2c3254-7f6c-47e2-84f1-aece946fbfae">http://data.europa.eu/esco/skill/2b2c3254-7f6c-47e2-84f1-aece946fbfae</a>
maintaining and enforcing physical security	0.0000	<a href="http://data.europa.eu/esco/skill/e9eb9c23-c1f4-4ce9-83c9-2f6a211cc536">http://data.europa.eu/esco/skill/e9eb9c23-c1f4-4ce9-83c9-2f6a211cc536</a>
maintaining electrical, electronic and precision equipment	0.5923	<a href="http://data.europa.eu/esco/skill/ec0401f1-f690-46be-934b-f6f5611085f5">http://data.europa.eu/esco/skill/ec0401f1-f690-46be-934b-f6f5611085f5</a>
maintaining mechanical equipment and tools	0.0000	<a href="http://data.europa.eu/esco/skill/45ce91d6-574f-445e-a3d5-741f89bddb56">http://data.europa.eu/esco/skill/45ce91d6-574f-445e-a3d5-741f89bddb56</a>
maintaining mechanical machinery	0.0000	<a href="http://data.europa.eu/esco/skill/a9703c5e-7fef-40d8-8fed-e5b31cc76818">http://data.europa.eu/esco/skill/a9703c5e-7fef-40d8-8fed-e5b31cc76818</a>
maintaining operational records	0.1037	<a href="http://data.europa.eu/esco/skill/06fdd94c-292d-49e3-9c78-bbcbc2088232">http://data.europa.eu/esco/skill/06fdd94c-292d-49e3-9c78-bbcbc2088232</a>
maintaining or preparing medical documentation	0.0000	<a href="http://data.europa.eu/esco/skill/c1bd0ed6-053c-4703-981e-eaec5e57de18">http://data.europa.eu/esco/skill/c1bd0ed6-053c-4703-981e-eaec5e57de18</a>
making decisions	0.0000	<a href="http://data.europa.eu/esco/skill/bb99a123-88be-42a2-8758-f5a18e06ccc6">http://data.europa.eu/esco/skill/bb99a123-88be-42a2-8758-f5a18e06ccc6</a>
making decisions	0.0000	<a href="http://data.europa.eu/esco/skill/c7f96545-46c4-451a-b284-014f4baed5ed">http://data.europa.eu/esco/skill/c7f96545-46c4-451a-b284-014f4baed5ed</a>
making models	0.3182	<a href="http://data.europa.eu/esco/skill/74b7938e-f667-48ff-a26d-faed294ac6c9">http://data.europa.eu/esco/skill/74b7938e-f667-48ff-a26d-faed294ac6c9</a>
making moulds, casts, models and patterns	0.0795	<a href="http://data.europa.eu/esco/skill/1d9e5893-d6b2-47b1-80ba-5f1cdcbf5e9a">http://data.europa.eu/esco/skill/1d9e5893-d6b2-47b1-80ba-5f1cdcbf5e9a</a>
making patterns and templates	0.0000	<a href="http://data.europa.eu/esco/skill/0f8f9438-8529-41b8-bb7a-4d91121e3192">http://data.europa.eu/esco/skill/0f8f9438-8529-41b8-bb7a-4d91121e3192</a>
making production moulds and casts	0.0000	<a href="http://data.europa.eu/esco/skill/480a0b1b-aae9-4b39-9a4f-1c2b8ddcbc46">http://data.europa.eu/esco/skill/480a0b1b-aae9-4b39-9a4f-1c2b8ddcbc46</a>
management and administration	0.5749	<a href="http://data.europa.eu/esco/isced-f/0413">http://data.europa.eu/esco/isced-f/0413</a>
management skills	0.0815	<a href="http://data.europa.eu/esco/skill/869fc2ce-478f-4420-8766-e1f02cec4fb2">http://data.europa.eu/esco/skill/869fc2ce-478f-4420-8766-e1f02cec4fb2</a>
management skills	0.3256	<a href="http://data.europa.eu/esco/skill/c1a13ee0-b00d-4cfa-a22c-20d284e398b0">http://data.europa.eu/esco/skill/c1a13ee0-b00d-4cfa-a22c-20d284e398b0</a>
management skills	0.3256	<a href="http://data.europa.eu/esco/skill/1d4be2e3-ac64-426f-838d-1e7cb8600927">http://data.europa.eu/esco/skill/1d4be2e3-ac64-426f-838d-1e7cb8600927</a>
managing and administering human resources	0.0000	<a href="http://data.europa.eu/esco/skill/2258cde2-a95b-4b2c-b105-59e84b0a364b">http://data.europa.eu/esco/skill/2258cde2-a95b-4b2c-b105-59e84b0a364b</a>
managing budgets or finances	0.0000	<a href="http://data.europa.eu/esco/skill/193af349-b20e-4277-94bf-b184e92b8d6a">http://data.europa.eu/esco/skill/193af349-b20e-4277-94bf-b184e92b8d6a</a>
managing information	0.8294	<a href="http://data.europa.eu/esco/skill/dddd229b-61e1-480d-80d6-d9d9ee9b5f54">http://data.europa.eu/esco/skill/dddd229b-61e1-480d-80d6-d9d9ee9b5f54</a>
managing information	0.8294	<a href="http://data.europa.eu/esco/skill/32c017fd-28ab-4051-bf68-74de952c2f77">http://data.europa.eu/esco/skill/32c017fd-28ab-4051-bf68-74de952c2f77</a>
managing transport and logistics activities	0.0000	<a href="http://data.europa.eu/esco/skill/d6c8dacb-b0c0-4544-b0b7-69b24df41ba1">http://data.europa.eu/esco/skill/d6c8dacb-b0c0-4544-b0b7-69b24df41ba1</a>
managing, gathering and storing digital data	0.9977	<a href="http://data.europa.eu/esco/skill/6a7fc30d-af16-4cc5-a957-29d174bdb61c">http://data.europa.eu/esco/skill/6a7fc30d-af16-4cc5-a957-29d174bdb61c</a>
manipulating and controlling objects and equipment	0.0000	<a href="http://data.europa.eu/esco/skill/ccb6db6a-8538-431c-b740-5f241bdb71cf">http://data.europa.eu/esco/skill/ccb6db6a-8538-431c-b740-5f241bdb71cf</a>
manufacturing and processing	0.0340	<a href="http://data.europa.eu/esco/isced-f/072">http://data.europa.eu/esco/isced-f/072</a>
manufacturing and processing not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/0729">http://data.europa.eu/esco/isced-f/0729</a>
marketing and advertising	0.6300	<a href="http://data.europa.eu/esco/isced-f/0414">http://data.europa.eu/esco/isced-f/0414</a>
marking materials or objects for identification	0.0000	<a href="http://data.europa.eu/esco/skill/35045957-e9e4-44b1-801a-9a49f6efaece">http://data.europa.eu/esco/skill/35045957-e9e4-44b1-801a-9a49f6efaece</a>
mastering languages	0.0000	<a href="http://data.europa.eu/esco/skill/9adca63b-9c75-4804-8dab-d62872540a10">http://data.europa.eu/esco/skill/9adca63b-9c75-4804-8dab-d62872540a10</a>
materials (glass, paper, plastic and wood)	0.0000	<a href="http://data.europa.eu/esco/isced-f/0722">http://data.europa.eu/esco/isced-f/0722</a>
mathematics	0.3889	<a href="http://data.europa.eu/esco/isced-f/0541">http://data.europa.eu/esco/isced-f/0541</a>
mathematics and statistics	0.2669	<a href="http://data.europa.eu/esco/isced-t/054">http://data.europa.eu/esco/isced-t/054</a>

measuring dimensions and related properties	0.0000	<a href="http://data.europa.eu/esco/skill/23d7bd85-d8d5-4455-b64d-3b0998f2425d">http://data.europa.eu/esco/skill/23d7bd85-d8d5-4455-b64d-3b0998f2425d</a>
measuring physical properties	0.0000	<a href="http://data.europa.eu/esco/skill/8a57f720-70b3-41de-877c-7d723977dc88">http://data.europa.eu/esco/skill/8a57f720-70b3-41de-877c-7d723977dc88</a>
measuring physical properties	0.0000	<a href="http://data.europa.eu/esco/skill/347aa7ee-b640-41cc-ae7c-3c5eafda9fda">http://data.europa.eu/esco/skill/347aa7ee-b640-41cc-ae7c-3c5eafda9fda</a>
mechanics and metal trades	0.0979	<a href="http://data.europa.eu/esco/isced-f/0715">http://data.europa.eu/esco/isced-f/0715</a>
mediating and resolving disputes	0.0526	<a href="http://data.europa.eu/esco/skill/9c17f73f-345c-4c55-8b59-47b445941b7b">http://data.europa.eu/esco/skill/9c17f73f-345c-4c55-8b59-47b445941b7b</a>
medical diagnostic and treatment technology	0.4455	<a href="http://data.europa.eu/esco/isced-f/0914">http://data.europa.eu/esco/isced-f/0914</a>
medicine	0.0000	<a href="http://data.europa.eu/esco/isced-f/0912">http://data.europa.eu/esco/isced-f/0912</a>
military and defence	0.5385	<a href="http://data.europa.eu/esco/isced-f/1031">http://data.europa.eu/esco/isced-f/1031</a>
mining and extraction	0.0000	<a href="http://data.europa.eu/esco/isced-f/0724">http://data.europa.eu/esco/isced-f/0724</a>
monitoring and evaluating the performance of individuals	0.2165	<a href="http://data.europa.eu/esco/skill/c206d301-14b0-4bea-8028-a3749303a512">http://data.europa.eu/esco/skill/c206d301-14b0-4bea-8028-a3749303a512</a>
monitoring developments in area of expertise	0.3500	<a href="http://data.europa.eu/esco/skill/0101f8a4-4243-4e67-813b-3e2a6274f7e2">http://data.europa.eu/esco/skill/0101f8a4-4243-4e67-813b-3e2a6274f7e2</a>
monitoring developments in area of expertise	0.3500	<a href="http://data.europa.eu/esco/skill/e2a5e046-3357-493e-bbdc-8d0ef82005cc">http://data.europa.eu/esco/skill/e2a5e046-3357-493e-bbdc-8d0ef82005cc</a>
monitoring environmental conditions	0.4242	<a href="http://data.europa.eu/esco/skill/d519fadd-85bf-475f-bf14-c53a0290687d">http://data.europa.eu/esco/skill/d519fadd-85bf-475f-bf14-c53a0290687d</a>
monitoring financial and economic resources and activity	0.1795	<a href="http://data.europa.eu/esco/skill/5c2d5780-23ed-4372-bb8d-c1846ee404ae">http://data.europa.eu/esco/skill/5c2d5780-23ed-4372-bb8d-c1846ee404ae</a>
monitoring health conditions of humans and animals	0.0000	<a href="http://data.europa.eu/esco/skill/c5ff50d7-97d3-401e-90ac-e5ae756a52de">http://data.europa.eu/esco/skill/c5ff50d7-97d3-401e-90ac-e5ae756a52de</a>
monitoring operational activities	0.0700	<a href="http://data.europa.eu/esco/skill/15fa3879-ac0e-46e6-ae36-609bae9c19c3">http://data.europa.eu/esco/skill/15fa3879-ac0e-46e6-ae36-609bae9c19c3</a>
monitoring quality of products	0.0507	<a href="http://data.europa.eu/esco/skill/0b3930a2-8a13-4932-8a09-4c72ec8af464">http://data.europa.eu/esco/skill/0b3930a2-8a13-4932-8a09-4c72ec8af464</a>
monitoring safety or security	0.0000	<a href="http://data.europa.eu/esco/skill/0e0a44a8-654c-4e85-986a-fb4386114838">http://data.europa.eu/esco/skill/0e0a44a8-654c-4e85-986a-fb4386114838</a>
monitoring, inspecting and testing	0.1424	<a href="http://data.europa.eu/esco/skill/1e95cef2-9c35-4f9f-b6a9-cb458c3e5379">http://data.europa.eu/esco/skill/1e95cef2-9c35-4f9f-b6a9-cb458c3e5379</a>
monitoring, inspecting and testing	0.0213	<a href="http://data.europa.eu/esco/skill/54f7432d-a8b6-4ed4-a50e-9ec882320595">http://data.europa.eu/esco/skill/54f7432d-a8b6-4ed4-a50e-9ec882320595</a>
motor vehicles, ships and aircraft	0.1458	<a href="http://data.europa.eu/esco/isced-f/0716">http://data.europa.eu/esco/isced-f/0716</a>
moving and herding animals	0.0000	<a href="http://data.europa.eu/esco/skill/f0f8ceea-304e-42e8-80cf-ff1535eb7068">http://data.europa.eu/esco/skill/f0f8ceea-304e-42e8-80cf-ff1535eb7068</a>
moving and lifting	0.0044	<a href="http://data.europa.eu/esco/skill/1cc5ff0b-afaa-4993-9de7-ab0d77b6cca2">http://data.europa.eu/esco/skill/1cc5ff0b-afaa-4993-9de7-ab0d77b6cca2</a>
moving and lifting	0.0000	<a href="http://data.europa.eu/esco/skill/577ce84f-0d21-4f25-8307-99c53f6f8437">http://data.europa.eu/esco/skill/577ce84f-0d21-4f25-8307-99c53f6f8437</a>
moving or lifting materials, equipment, or supplies	0.0000	<a href="http://data.europa.eu/esco/skill/e852a2ed-c32e-4a39-bc4c-65a78ffe6bf2">http://data.europa.eu/esco/skill/e852a2ed-c32e-4a39-bc4c-65a78ffe6bf2</a>
music and performing arts	0.0000	<a href="http://data.europa.eu/esco/isced-f/0215">http://data.europa.eu/esco/isced-f/0215</a>
natural environments and wildlife	0.0000	<a href="http://data.europa.eu/esco/isced-f/0522">http://data.europa.eu/esco/isced-f/0522</a>
natural sciences, mathematics and statistics	0.0556	<a href="http://data.europa.eu/esco/isced-f/05">http://data.europa.eu/esco/isced-f/05</a>
natural sciences, mathematics and statistics not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/059">http://data.europa.eu/esco/isced-f/059</a>
natural sciences, mathematics and statistics not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/050">http://data.europa.eu/esco/isced-f/050</a>
negotiating	0.0132	<a href="http://data.europa.eu/esco/skill/323b3684-86ec-40fa-81b4-bc52694ef168">http://data.europa.eu/esco/skill/323b3684-86ec-40fa-81b4-bc52694ef168</a>
negotiating	0.0000	<a href="http://data.europa.eu/esco/skill/0f804e14-001d-4ec0-b3f7-eb6a23ad43cb">http://data.europa.eu/esco/skill/0f804e14-001d-4ec0-b3f7-eb6a23ad43cb</a>

negotiating and managing contracts and agreements	0.0000	<a href="http://data.europa.eu/esco/skill/0d80a782-99ff-4f49-abbe-c72524c6f390">http://data.europa.eu/esco/skill/0d80a782-99ff-4f49-abbe-c72524c6f390</a>
nursing and midwifery	0.0000	<a href="http://data.europa.eu/esco/isced-f/0913">http://data.europa.eu/esco/isced-f/0913</a>
obtaining information verbally	0.0000	<a href="http://data.europa.eu/esco/skill/6889a21c-837b-49a2-be61-bb601ab63f4">http://data.europa.eu/esco/skill/6889a21c-837b-49a2-be61-bb601ab63f4</a>
occupational health and safety	0.0000	<a href="http://data.europa.eu/esco/isced-f/1022">http://data.europa.eu/esco/isced-f/1022</a>
operating agricultural or forestry equipment	0.2188	<a href="http://data.europa.eu/esco/skill/64acded2-d944-4f85-a703-cfe9375f706a">http://data.europa.eu/esco/skill/64acded2-d944-4f85-a703-cfe9375f706a</a>
operating aircraft	0.0000	<a href="http://data.europa.eu/esco/skill/d9b1387a-7cad-4b77-8481-7798a3b41714">http://data.europa.eu/esco/skill/d9b1387a-7cad-4b77-8481-7798a3b41714</a>
operating aircraft	0.0000	<a href="http://data.europa.eu/esco/skill/44c81158-f789-41ad-a988-e8af0884a443">http://data.europa.eu/esco/skill/44c81158-f789-41ad-a988-e8af0884a443</a>
operating audio-visual equipment	0.8270	<a href="http://data.europa.eu/esco/skill/8ddcb295-707e-459c-ba6a-66ffb37835c5">http://data.europa.eu/esco/skill/8ddcb295-707e-459c-ba6a-66ffb37835c5</a>
operating communications equipment	0.9333	<a href="http://data.europa.eu/esco/skill/0a88a13f-693a-4dde-b44c-22e6f98fabc6">http://data.europa.eu/esco/skill/0a88a13f-693a-4dde-b44c-22e6f98fabc6</a>
operating cutting, grinding and smoothing machinery	0.0972	<a href="http://data.europa.eu/esco/skill/a7956044-f468-4bc1-a83c-a8821b903a09">http://data.europa.eu/esco/skill/a7956044-f468-4bc1-a83c-a8821b903a09</a>
operating earthmoving equipment	0.0000	<a href="http://data.europa.eu/esco/skill/19990cb0-e9d5-41c7-9638-88700b47271e">http://data.europa.eu/esco/skill/19990cb0-e9d5-41c7-9638-88700b47271e</a>
operating energy production or distribution equipment	0.0000	<a href="http://data.europa.eu/esco/skill/8bf9699c-f964-4e4b-ac3d-55aface09cbc">http://data.europa.eu/esco/skill/8bf9699c-f964-4e4b-ac3d-55aface09cbc</a>
operating food processing machinery	0.0000	<a href="http://data.europa.eu/esco/skill/ceca8bbe-cd58-49b4-8ef4-9a34a5ac0f75">http://data.europa.eu/esco/skill/ceca8bbe-cd58-49b4-8ef4-9a34a5ac0f75</a>
operating kilns, furnaces and drying equipment	0.0000	<a href="http://data.europa.eu/esco/skill/bdf2aa76-360d-429d-a967-bdb691f241fa">http://data.europa.eu/esco/skill/bdf2aa76-360d-429d-a967-bdb691f241fa</a>
operating lifting or moving equipment	0.0000	<a href="http://data.europa.eu/esco/skill/a60b664f-bb07-4dd1-8dfa-134a0827f8da">http://data.europa.eu/esco/skill/a60b664f-bb07-4dd1-8dfa-134a0827f8da</a>
operating machinery for the extraction and processing of raw materials	0.0000	<a href="http://data.europa.eu/esco/skill/2198d7a0-6eca-4795-b877-98a19064e61a">http://data.europa.eu/esco/skill/2198d7a0-6eca-4795-b877-98a19064e61a</a>
operating machinery for the extraction and processing of raw materials	0.0000	<a href="http://data.europa.eu/esco/skill/3f1f77a5-9c2d-4b71-afb3-0328d8ccb05e">http://data.europa.eu/esco/skill/3f1f77a5-9c2d-4b71-afb3-0328d8ccb05e</a>
operating machinery for the manufacture and treatment of textiles, fur and leather products	0.0000	<a href="http://data.europa.eu/esco/skill/a0ad9ea8-9620-4aba-a836-cbdd16e12880">http://data.europa.eu/esco/skill/a0ad9ea8-9620-4aba-a836-cbdd16e12880</a>
operating machinery for the manufacture of products	0.1167	<a href="http://data.europa.eu/esco/skill/2b8a86c4-d063-44d5-863f-a9659024cef">http://data.europa.eu/esco/skill/2b8a86c4-d063-44d5-863f-a9659024cef</a>
operating machinery for the manufacture of products	0.0000	<a href="http://data.europa.eu/esco/skill/18f2a44e-28ef-4ae3-8ea2-347e33bd9a4b">http://data.europa.eu/esco/skill/18f2a44e-28ef-4ae3-8ea2-347e33bd9a4b</a>
operating medical equipment	0.5283	<a href="http://data.europa.eu/esco/skill/872c0ddb-f056-4f51-afac-fc3d6fae0f5b">http://data.europa.eu/esco/skill/872c0ddb-f056-4f51-afac-fc3d6fae0f5b</a>
operating metal processing and finishing machinery	0.0000	<a href="http://data.europa.eu/esco/skill/151bd6ca-74be-47bb-9dab-9c7387114006">http://data.europa.eu/esco/skill/151bd6ca-74be-47bb-9dab-9c7387114006</a>
operating metal, plastic or rubber forming equipment	0.0000	<a href="http://data.europa.eu/esco/skill/39d83364-c86f-4942-96d1-e5df582face9">http://data.europa.eu/esco/skill/39d83364-c86f-4942-96d1-e5df582face9</a>
operating mining, drilling and mineral processing machinery	0.0000	<a href="http://data.europa.eu/esco/skill/a96b31dd-d72a-4c89-8947-524f14a16f82">http://data.europa.eu/esco/skill/a96b31dd-d72a-4c89-8947-524f14a16f82</a>
operating mixing and separating machinery	0.0000	<a href="http://data.europa.eu/esco/skill/8d80f33a-ab38-429b-a4ed-3b1a6f8f3b4a">http://data.europa.eu/esco/skill/8d80f33a-ab38-429b-a4ed-3b1a6f8f3b4a</a>
operating mobile plant	0.0547	<a href="http://data.europa.eu/esco/skill/da94d48b-5036-48e1-ad96-d85cba6ed29c">http://data.europa.eu/esco/skill/da94d48b-5036-48e1-ad96-d85cba6ed29c</a>
operating packaging machinery	0.4375	<a href="http://data.europa.eu/esco/skill/7ec00c15-c9bb-4b74-9b8b-681424e9ea2c">http://data.europa.eu/esco/skill/7ec00c15-c9bb-4b74-9b8b-681424e9ea2c</a>
operating painting or coating machinery	0.0000	<a href="http://data.europa.eu/esco/skill/418e58f5-c50c-4147-baa0-83aeb43b796a">http://data.europa.eu/esco/skill/418e58f5-c50c-4147-baa0-83aeb43b796a</a>
operating petroleum, chemical or water processing systems or equipment	0.0000	<a href="http://data.europa.eu/esco/skill/d3b2c894-33fb-47c4-aff0-27935a082bf6">http://data.europa.eu/esco/skill/d3b2c894-33fb-47c4-aff0-27935a082bf6</a>

operating precision industrial equipment	0.4118	<a href="http://data.europa.eu/esco/skill/bf4196e4-839c-4f5f-b13b-eeed07ede160">http://data.europa.eu/esco/skill/bf4196e4-839c-4f5f-b13b-eeed07ede160</a>
operating print and photographic production equipment	0.5158	<a href="http://data.europa.eu/esco/skill/dcb9c446-bb08-44de-89b6-851ac2903eaf">http://data.europa.eu/esco/skill/dcb9c446-bb08-44de-89b6-851ac2903eaf</a>
operating pumping systems or equipment	0.0000	<a href="http://data.europa.eu/esco/skill/79f3d574-fcf2-445e-a087-cc774f19b861">http://data.europa.eu/esco/skill/79f3d574-fcf2-445e-a087-cc774f19b861</a>
operating rail vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/8e77453d-3665-4d00-b887-2e9adb29cd15">http://data.europa.eu/esco/skill/8e77453d-3665-4d00-b887-2e9adb29cd15</a>
operating scientific and laboratory equipment	0.5526	<a href="http://data.europa.eu/esco/skill/7ca69606-5ffc-4668-ae53-713c1f1612e6">http://data.europa.eu/esco/skill/7ca69606-5ffc-4668-ae53-713c1f1612e6</a>
operating watercraft	0.0217	<a href="http://data.europa.eu/esco/skill/8427894f-2622-4b97-9366-72234a5fab50">http://data.europa.eu/esco/skill/8427894f-2622-4b97-9366-72234a5fab50</a>
operating watercraft	0.0217	<a href="http://data.europa.eu/esco/skill/36c9717b-e53a-4d16-b7df-b6555eff43f8">http://data.europa.eu/esco/skill/36c9717b-e53a-4d16-b7df-b6555eff43f8</a>
operating wood processing and papermaking machinery	0.0000	<a href="http://data.europa.eu/esco/skill/06769591-b8cf-46b2-b1d3-6602b1cf440e">http://data.europa.eu/esco/skill/06769591-b8cf-46b2-b1d3-6602b1cf440e</a>
organising, planning and scheduling work and activities	0.0710	<a href="http://data.europa.eu/esco/skill/5c26881e-2759-4a38-b136-5e0f6071b524">http://data.europa.eu/esco/skill/5c26881e-2759-4a38-b136-5e0f6071b524</a>
organising, planning and scheduling work and activities	0.0000	<a href="http://data.europa.eu/esco/skill/0779d482-4154-4fb9-9a22-d9fd89c39d67">http://data.europa.eu/esco/skill/0779d482-4154-4fb9-9a22-d9fd89c39d67</a>
packaging objects	0.0000	<a href="http://data.europa.eu/esco/skill/8da6cd59-61e1-43c4-8dfc-bc69d283ccc7">http://data.europa.eu/esco/skill/8da6cd59-61e1-43c4-8dfc-bc69d283ccc7</a>
performing administrative activities	0.0671	<a href="http://data.europa.eu/esco/skill/f306bf2a-271d-4059-ba7b-e83849cb8960">http://data.europa.eu/esco/skill/f306bf2a-271d-4059-ba7b-e83849cb8960</a>
performing administrative activities	0.0000	<a href="http://data.europa.eu/esco/skill/b309d4f5-56f5-41c6-b712-92d1ed85b965">http://data.europa.eu/esco/skill/b309d4f5-56f5-41c6-b712-92d1ed85b965</a>
performing and entertaining	0.0673	<a href="http://data.europa.eu/esco/skill/ac88053e-c9b5-43cf-ace1-f506bcfdc8cb">http://data.europa.eu/esco/skill/ac88053e-c9b5-43cf-ace1-f506bcfdc8cb</a>
performing and entertaining	0.0000	<a href="http://data.europa.eu/esco/skill/3bf93195-5239-4f73-94a6-349be598d462">http://data.europa.eu/esco/skill/3bf93195-5239-4f73-94a6-349be598d462</a>
performing artistic or cultural activities	0.0000	<a href="http://data.europa.eu/esco/skill/395e42b8-f637-4e7e-96d8-9c1976c05d92">http://data.europa.eu/esco/skill/395e42b8-f637-4e7e-96d8-9c1976c05d92</a>
performing calculations	0.0196	<a href="http://data.europa.eu/esco/skill/f5f15f9c-6334-4728-8dc5-3a20a00dfc37">http://data.europa.eu/esco/skill/f5f15f9c-6334-4728-8dc5-3a20a00dfc37</a>
performing general clerical and administrative tasks	0.2456	<a href="http://data.europa.eu/esco/skill/906211b3-afed-4a2b-b5e1-33f2885fee85">http://data.europa.eu/esco/skill/906211b3-afed-4a2b-b5e1-33f2885fee85</a>
performing risk analysis and management	0.3836	<a href="http://data.europa.eu/esco/skill/7e153e1d-2b12-43ad-89f3-0cf82ebc4a30">http://data.europa.eu/esco/skill/7e153e1d-2b12-43ad-89f3-0cf82ebc4a30</a>
performing surgical procedures	0.0000	<a href="http://data.europa.eu/esco/skill/e001ce62-78e7-4821-a7df-a08457c295ab">http://data.europa.eu/esco/skill/e001ce62-78e7-4821-a7df-a08457c295ab</a>
personal services	0.0000	<a href="http://data.europa.eu/esco/isced-f/101">http://data.europa.eu/esco/isced-f/101</a>
personal skills and development	0.0000	<a href="http://data.europa.eu/esco/isced-f/003">http://data.europa.eu/esco/isced-f/003</a>
personal skills and development	0.0000	<a href="http://data.europa.eu/esco/isced-f/0031">http://data.europa.eu/esco/isced-f/0031</a>
pharmacy	0.0000	<a href="http://data.europa.eu/esco/isced-f/0916">http://data.europa.eu/esco/isced-f/0916</a>
philosophy and ethics	0.1000	<a href="http://data.europa.eu/esco/isced-f/0223">http://data.europa.eu/esco/isced-f/0223</a>
physical and manual skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/12022223-8c30-418a-8f83-658396c9fec2">http://data.europa.eu/esco/skill/12022223-8c30-418a-8f83-658396c9fec2</a>
physical sciences	0.1223	<a href="http://data.europa.eu/esco/isced-f/053">http://data.europa.eu/esco/isced-f/053</a>
physics	0.2857	<a href="http://data.europa.eu/esco/isced-f/0533">http://data.europa.eu/esco/isced-f/0533</a>
planning and organising	0.0000	<a href="http://data.europa.eu/esco/skill/66fdc34c-2326-4baa-b8ff-7a1d1015fe3a">http://data.europa.eu/esco/skill/66fdc34c-2326-4baa-b8ff-7a1d1015fe3a</a>
planning events and programmes	0.0400	<a href="http://data.europa.eu/esco/skill/cfd5ab8f-ef8a-4877-8243-ddf17ac74604">http://data.europa.eu/esco/skill/cfd5ab8f-ef8a-4877-8243-ddf17ac74604</a>
planning production processes	0.1094	<a href="http://data.europa.eu/esco/skill/e6eeb84c-ad99-42e2-b883-e6ce338aef59">http://data.europa.eu/esco/skill/e6eeb84c-ad99-42e2-b883-e6ce338aef59</a>
planting, pruning and harvesting trees, crops and other plants	0.0000	<a href="http://data.europa.eu/esco/skill/888f286e-272f-4e54-8a3b-9fa391870618">http://data.europa.eu/esco/skill/888f286e-272f-4e54-8a3b-9fa391870618</a>
political sciences and civics	0.0000	<a href="http://data.europa.eu/esco/isced-f/0312">http://data.europa.eu/esco/isced-f/0312</a>

positioning materials, tools or equipment	0.0000	<a href="http://data.europa.eu/esco/skill/1e924921-b7ff-4326-a698-c8275bbcf60d">http://data.europa.eu/esco/skill/1e924921-b7ff-4326-a698-c8275bbcf60d</a>
positioning materials, tools or equipment	0.0000	<a href="http://data.europa.eu/esco/skill/30b280e7-2468-440b-a78f-f1e7f515d60a">http://data.europa.eu/esco/skill/30b280e7-2468-440b-a78f-f1e7f515d60a</a>
practising sports	0.0000	<a href="http://data.europa.eu/esco/skill/f4346da3-f6b2-4389-8a67-7c443b7e1609">http://data.europa.eu/esco/skill/f4346da3-f6b2-4389-8a67-7c443b7e1609</a>
preparing and serving food and drinks	0.0000	<a href="http://data.europa.eu/esco/skill/b85711bc-32d6-42af-ae0f-e2e566d0dfca">http://data.europa.eu/esco/skill/b85711bc-32d6-42af-ae0f-e2e566d0dfca</a>
preparing and serving food and drinks	0.0000	<a href="http://data.europa.eu/esco/skill/b593afe4-4179-4a83-9f05-21c8d32d8113">http://data.europa.eu/esco/skill/b593afe4-4179-4a83-9f05-21c8d32d8113</a>
preparing documentation for contracts, applications, or permits	0.0000	<a href="http://data.europa.eu/esco/skill/1bc1cf2a-a7f6-4769-a13b-cc26a2214498">http://data.europa.eu/esco/skill/1bc1cf2a-a7f6-4769-a13b-cc26a2214498</a>
preparing financial documents, records, reports, or budgets	0.0000	<a href="http://data.europa.eu/esco/skill/b32ef8a5-e3f7-40ef-8b40-913c003e1f4e">http://data.europa.eu/esco/skill/b32ef8a5-e3f7-40ef-8b40-913c003e1f4e</a>
preparing food and drinks	0.0000	<a href="http://data.europa.eu/esco/skill/89f8435a-ebc1-42b6-bf5c-496999e99776">http://data.europa.eu/esco/skill/89f8435a-ebc1-42b6-bf5c-496999e99776</a>
preparing industrial materials for processing or use	0.0000	<a href="http://data.europa.eu/esco/skill/8066edda-60e7-4e41-966b-4be09b049ab3">http://data.europa.eu/esco/skill/8066edda-60e7-4e41-966b-4be09b049ab3</a>
preparing mixtures or solutions	0.1400	<a href="http://data.europa.eu/esco/skill/bf4822d3-1f66-499d-afc9-151a9ba33e58">http://data.europa.eu/esco/skill/bf4822d3-1f66-499d-afc9-151a9ba33e58</a>
prescribing and ordering medical tests, treatments or devices	0.0000	<a href="http://data.europa.eu/esco/skill/b88bdd4-210e-405f-bbdf-729bb66605a0">http://data.europa.eu/esco/skill/b88bdd4-210e-405f-bbdf-729bb66605a0</a>
presenting general information	0.0000	<a href="http://data.europa.eu/esco/skill/cdb2aecd-9dca-48td-8d56-t0aace3ab5a9">http://data.europa.eu/esco/skill/cdb2aecd-9dca-48td-8d56-t0aace3ab5a9</a>
presenting information	0.0972	<a href="http://data.europa.eu/esco/skill/3f641516-9846-4a7f-a7f4-e1274eef6688">http://data.europa.eu/esco/skill/3f641516-9846-4a7f-a7f4-e1274eef6688</a>
presenting information	0.0000	<a href="http://data.europa.eu/esco/skill/de884168-32e7-4500-a227-3f0966f962b6">http://data.europa.eu/esco/skill/de884168-32e7-4500-a227-3f0966f962b6</a>
presenting information in legal proceedings	0.0000	<a href="http://data.europa.eu/esco/skill/ad326fa7-f2e9-4421-8426-bc0c2e167143">http://data.europa.eu/esco/skill/ad326fa7-f2e9-4421-8426-bc0c2e167143</a>
presenting research or technical information	0.3889	<a href="http://data.europa.eu/esco/skill/8f9f8b20-ff26-4392-b04f-695dcde5b90a">http://data.europa.eu/esco/skill/8f9f8b20-ff26-4392-b04f-695dcde5b90a</a>
processing information	0.4613	<a href="http://data.europa.eu/esco/skill/587e1cd6-a376-4c8f-8369-187c128d72a3">http://data.europa.eu/esco/skill/587e1cd6-a376-4c8f-8369-187c128d72a3</a>
processing information	0.0000	<a href="http://data.europa.eu/esco/skill/70ac2c90-656a-4fa3-886c-5b9305db2087">http://data.europa.eu/esco/skill/70ac2c90-656a-4fa3-886c-5b9305db2087</a>
processing information, ideas and concepts	0.0000	<a href="http://data.europa.eu/esco/skill/fff1d675-c36a-4c12-9cd4-407f21ccd06a">http://data.europa.eu/esco/skill/fff1d675-c36a-4c12-9cd4-407f21ccd06a</a>
programming computer systems	1.0000	<a href="http://data.europa.eu/esco/skill/d6e4373a-ef2c-4b64-9dc6-4140846f6609">http://data.europa.eu/esco/skill/d6e4373a-ef2c-4b64-9dc6-4140846f6609</a>
programming computer systems	1.0000	<a href="http://data.europa.eu/esco/skill/a8c3186b-c791-4d57-8f4f-4d12c7a5c6a7">http://data.europa.eu/esco/skill/a8c3186b-c791-4d57-8f4f-4d12c7a5c6a7</a>
promoting products, services, or programs	0.3146	<a href="http://data.europa.eu/esco/skill/efb60300-0d55-4b2c-8038-8409587a4727">http://data.europa.eu/esco/skill/efb60300-0d55-4b2c-8038-8409587a4727</a>
promoting, selling and purchasing	0.0787	<a href="http://data.europa.eu/esco/skill/b99283cd-b908-4100-baa5-112692ac22b8">http://data.europa.eu/esco/skill/b99283cd-b908-4100-baa5-112692ac22b8</a>
promoting, selling and purchasing	0.0000	<a href="http://data.europa.eu/esco/skill/fb01d224-882a-4346-99e2-bfd56f52d09c">http://data.europa.eu/esco/skill/fb01d224-882a-4346-99e2-bfd56f52d09c</a>
protecting and enforcing	0.0874	<a href="http://data.europa.eu/esco/skill/048812ba-45ff-4801-b04f-b20c03432809">http://data.europa.eu/esco/skill/048812ba-45ff-4801-b04f-b20c03432809</a>
protecting and enforcing	0.0000	<a href="http://data.europa.eu/esco/skill/fe317a4c-e4e0-45ee-8b0d-204a68014f9e">http://data.europa.eu/esco/skill/fe317a4c-e4e0-45ee-8b0d-204a68014f9e</a>
protecting ict devices	0.9938	<a href="http://data.europa.eu/esco/skill/185c56ee-098f-46a1-af87-56337085da6f">http://data.europa.eu/esco/skill/185c56ee-098f-46a1-af87-56337085da6f</a>
protecting privacy and personal data	0.1250	<a href="http://data.europa.eu/esco/skill/2b6e15f5-dfa0-4e7c-9687-5665b07e56a4">http://data.europa.eu/esco/skill/2b6e15f5-dfa0-4e7c-9687-5665b07e56a4</a>
protection of persons and property	0.1795	<a href="http://data.europa.eu/esco/isced-f/1032">http://data.europa.eu/esco/isced-f/1032</a>
providing financial advice	0.0000	<a href="http://data.europa.eu/esco/skill/34691a8a-ec8e-4eaa-b6e7-f4dbf144c644">http://data.europa.eu/esco/skill/34691a8a-ec8e-4eaa-b6e7-f4dbf144c644</a>
providing general assistance to people	0.0337	<a href="http://data.europa.eu/esco/skill/119a2f5c-3c3e-4b0d-9813-06a553c8860c">http://data.europa.eu/esco/skill/119a2f5c-3c3e-4b0d-9813-06a553c8860c</a>
providing general personal care	0.0000	<a href="http://data.europa.eu/esco/skill/e7a48651-3f68-4762-bf93-57cc1af47016">http://data.europa.eu/esco/skill/e7a48651-3f68-4762-bf93-57cc1af47016</a>
providing health care or medical treatments	0.0102	<a href="http://data.europa.eu/esco/skill/7a163630-7536-4748-a259-aa820d3be44b">http://data.europa.eu/esco/skill/7a163630-7536-4748-a259-aa820d3be44b</a>

providing health care or medical treatments	0.0000	<a href="http://data.europa.eu/esco/skill/0a400212-8693-4b1f-b0ca-d1f82c321916">http://data.europa.eu/esco/skill/0a400212-8693-4b1f-b0ca-d1f82c321916</a>
providing information and support to the public and clients	0.0627	<a href="http://data.europa.eu/esco/skill/e1746275-6d4e-4b02-b526-eeebf3052b6d">http://data.europa.eu/esco/skill/e1746275-6d4e-4b02-b526-eeebf3052b6d</a>
providing information and support to the public and clients	0.0000	<a href="http://data.europa.eu/esco/skill/7de7e3f6-d222-4f08-b3f0-e2deff7ef798">http://data.europa.eu/esco/skill/7de7e3f6-d222-4f08-b3f0-e2deff7ef798</a>
providing information to the public and clients	0.2800	<a href="http://data.europa.eu/esco/skill/d54970ba-d9f2-41ec-a852-bbd1e5796823">http://data.europa.eu/esco/skill/d54970ba-d9f2-41ec-a852-bbd1e5796823</a>
providing medical advice	0.0000	<a href="http://data.europa.eu/esco/skill/c75655c3-ed29-441e-b403-4dd65bc891a5">http://data.europa.eu/esco/skill/c75655c3-ed29-441e-b403-4dd65bc891a5</a>
providing medical, dental and nursing care	0.0714	<a href="http://data.europa.eu/esco/skill/73e602a0-f80f-4f56-8e21-3db4fd08709d">http://data.europa.eu/esco/skill/73e602a0-f80f-4f56-8e21-3db4fd08709d</a>
providing personal care	0.0000	<a href="http://data.europa.eu/esco/skill/fbb861f7-2386-4d17-84f7-6e340a8e6cd9">http://data.europa.eu/esco/skill/fbb861f7-2386-4d17-84f7-6e340a8e6cd9</a>
providing physical therapies	0.0000	<a href="http://data.europa.eu/esco/skill/3926ec7d-64cd-4410-8283-493a1afdd57b">http://data.europa.eu/esco/skill/3926ec7d-64cd-4410-8283-493a1afdd57b</a>
providing psychological and occupational therapies	0.0000	<a href="http://data.europa.eu/esco/skill/4bbdc5eb-b710-4b76-816d-04926f7ac4a1">http://data.europa.eu/esco/skill/4bbdc5eb-b710-4b76-816d-04926f7ac4a1</a>
providing support to resolve problems	0.2692	<a href="http://data.europa.eu/esco/skill/f9db77be-eb63-4937-a0d0-b581733e7d2a">http://data.europa.eu/esco/skill/f9db77be-eb63-4937-a0d0-b581733e7d2a</a>
providing therapy or veterinary treatment for animals	0.1000	<a href="http://data.europa.eu/esco/skill/7194cdea-bca7-4c4a-8d49-3cb54b89d5a0">http://data.europa.eu/esco/skill/7194cdea-bca7-4c4a-8d49-3cb54b89d5a0</a>
psychology	0.0000	<a href="http://data.europa.eu/esco/isced-f/0313">http://data.europa.eu/esco/isced-f/0313</a>
purchasing goods or services	0.0000	<a href="http://data.europa.eu/esco/skill/663e753c-2fc4-4bf6-9a06-a6ab2d705238">http://data.europa.eu/esco/skill/663e753c-2fc4-4bf6-9a06-a6ab2d705238</a>
recording legal information	0.0000	<a href="http://data.europa.eu/esco/skill/b975836b-d9b9-4724-88da-9a82b856e74b">http://data.europa.eu/esco/skill/b975836b-d9b9-4724-88da-9a82b856e74b</a>
recruiting and hiring	0.0000	<a href="http://data.europa.eu/esco/skill/73dba04a-7c18-439f-8757-b5f60532ba74">http://data.europa.eu/esco/skill/73dba04a-7c18-439f-8757-b5f60532ba74</a>
recruiting and hiring	0.0000	<a href="http://data.europa.eu/esco/skill/77e41477-4ecf-425b-8163-b18a5a54e593">http://data.europa.eu/esco/skill/77e41477-4ecf-425b-8163-b18a5a54e593</a>
religion and theology	0.0000	<a href="http://data.europa.eu/esco/isced-f/0221">http://data.europa.eu/esco/isced-f/0221</a>
repairing and installing mechanical equipment	0.0000	<a href="http://data.europa.eu/esco/skill/0b8d15c9-7b4f-4163-b863-fe5b756d3e7f">http://data.europa.eu/esco/skill/0b8d15c9-7b4f-4163-b863-fe5b756d3e7f</a>
reporting incidents and defects	0.0000	<a href="http://data.europa.eu/esco/skill/20136935-e6a1-417b-81df-9b94d4c2c371">http://data.europa.eu/esco/skill/20136935-e6a1-417b-81df-9b94d4c2c371</a>
resolving computer problems	1.0000	<a href="http://data.europa.eu/esco/skill/0b9968af-72de-470a-98e1-2d19577443fb">http://data.europa.eu/esco/skill/0b9968af-72de-470a-98e1-2d19577443fb</a>
responding to complaints	0.0000	<a href="http://data.europa.eu/esco/skill/81f29457-6d0d-4f46-9e0a-7295c7c6f090">http://data.europa.eu/esco/skill/81f29457-6d0d-4f46-9e0a-7295c7c6f090</a>
responding to physical circumstances	0.0000	<a href="http://data.europa.eu/esco/skill/e52389a2-1a05-45b0-8db3-4bda0f0c0b48">http://data.europa.eu/esco/skill/e52389a2-1a05-45b0-8db3-4bda0f0c0b48</a>
secretarial and office work	0.0000	<a href="http://data.europa.eu/esco/isced-f/0415">http://data.europa.eu/esco/isced-f/0415</a>
security services	0.1795	<a href="http://data.europa.eu/esco/isced-f/103">http://data.europa.eu/esco/isced-f/103</a>
self-management skills and competences	0.0075	<a href="http://data.europa.eu/esco/skill/021a23e1-907e-4627-b05a-555f889cbb65">http://data.europa.eu/esco/skill/021a23e1-907e-4627-b05a-555f889cbb65</a>
selling products or services	0.0000	<a href="http://data.europa.eu/esco/skill/e06f2d35-a160-46c2-89f1-9cae9c93c8b8">http://data.europa.eu/esco/skill/e06f2d35-a160-46c2-89f1-9cae9c93c8b8</a>
services	0.1368	<a href="http://data.europa.eu/esco/isced-f/10">http://data.europa.eu/esco/isced-f/10</a>
services not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/109">http://data.europa.eu/esco/isced-f/109</a>
services not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/100">http://data.europa.eu/esco/isced-f/100</a>
serving food and drinks	0.0000	<a href="http://data.europa.eu/esco/skill/1bb32451-7ca4-4fa2-a2c0-2083c426d76c">http://data.europa.eu/esco/skill/1bb32451-7ca4-4fa2-a2c0-2083c426d76c</a>
setting up and protecting computer systems	0.7485	<a href="http://data.europa.eu/esco/skill/75c1ab73-5b00-48a0-818e-93487ebdd7e1">http://data.europa.eu/esco/skill/75c1ab73-5b00-48a0-818e-93487ebdd7e1</a>
setting up computer systems	1.0000	<a href="http://data.europa.eu/esco/skill/f839b1da-78b6-4466-86f4-a5798821ea20">http://data.europa.eu/esco/skill/f839b1da-78b6-4466-86f4-a5798821ea20</a>
shaping materials to create products	0.0000	<a href="http://data.europa.eu/esco/skill/424cce4d-71c9-47d9-93d6-4068403139f0">http://data.europa.eu/esco/skill/424cce4d-71c9-47d9-93d6-4068403139f0</a>

skills	0.1989	<a href="http://data.europa.eu/esco/skill/335228d2-297d-4e0e-a6ee-bc6a8dc110d9">http://data.europa.eu/esco/skill/335228d2-297d-4e0e-a6ee-bc6a8dc110d9</a>
smoothing surfaces of objects or equipment	0.0000	<a href="http://data.europa.eu/esco/skill/51ffd92f-7ff4-4c38-83d4-7350fcfd6968">http://data.europa.eu/esco/skill/51ffd92f-7ff4-4c38-83d4-7350fcfd6968</a>
social and behavioural sciences	0.0000	<a href="http://data.europa.eu/esco/isced-f/031">http://data.europa.eu/esco/isced-f/031</a>
social and behavioural sciences not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/0319">http://data.europa.eu/esco/isced-f/0319</a>
social and communication skills and competences	0.0154	<a href="http://data.europa.eu/esco/skill/552c4f35-a2d1-49c2-8fda-afe26695c44a">http://data.europa.eu/esco/skill/552c4f35-a2d1-49c2-8fda-afe26695c44a</a>
social sciences, journalism and information	0.0427	<a href="http://data.europa.eu/esco/isced-f/03">http://data.europa.eu/esco/isced-f/03</a>
social sciences, journalism and information not elsewhere classified	0.0000	<a href="http://data.europa.eu/esco/isced-f/039">http://data.europa.eu/esco/isced-f/039</a>
social sciences, journalism and information not further defined	0.0000	<a href="http://data.europa.eu/esco/isced-f/030">http://data.europa.eu/esco/isced-f/030</a>
social work and counselling	0.0000	<a href="http://data.europa.eu/esco/isced-f/0923">http://data.europa.eu/esco/isced-f/0923</a>
sociology and cultural studies	0.0000	<a href="http://data.europa.eu/esco/isced-f/0314">http://data.europa.eu/esco/isced-f/0314</a>
software and applications development and analysis	0.9963	<a href="http://data.europa.eu/esco/isced-t/0613">http://data.europa.eu/esco/isced-t/0613</a>
solving problems	0.1761	<a href="http://data.europa.eu/esco/skill/be7443ff-0747-43b8-8720-8e87fd34e692">http://data.europa.eu/esco/skill/be7443ff-0747-43b8-8720-8e87fd34e692</a>
solving problems	0.0000	<a href="http://data.europa.eu/esco/skill/4feed491-dc09-4218-814a-0146e13ef4fe">http://data.europa.eu/esco/skill/4feed491-dc09-4218-814a-0146e13ef4fe</a>
sorting and packaging goods and materials	0.0292	<a href="http://data.europa.eu/esco/skill/f2840c73-9693-4cc0-8dc1-c44942263d5d">http://data.europa.eu/esco/skill/f2840c73-9693-4cc0-8dc1-c44942263d5d</a>
sorting and packaging goods and materials	0.0000	<a href="http://data.europa.eu/esco/skill/e5e3b8d7-a96d-41f4-acb6-563b0f7f2994">http://data.europa.eu/esco/skill/e5e3b8d7-a96d-41f4-acb6-563b0f7f2994</a>
sorting materials or products	0.1167	<a href="http://data.europa.eu/esco/skill/485b2e3b-f883-46d8-901f-ab521d4f8e58">http://data.europa.eu/esco/skill/485b2e3b-f883-46d8-901f-ab521d4f8e58</a>
sports	0.0000	<a href="http://data.europa.eu/esco/isced-f/1014">http://data.europa.eu/esco/isced-f/1014</a>
statistics	0.4118	<a href="http://data.europa.eu/esco/isced-f/0542">http://data.europa.eu/esco/isced-f/0542</a>
storing goods and materials	0.0222	<a href="http://data.europa.eu/esco/skill/e963cf1f-dc3c-48b2-a0fa-274f5e7f50f6">http://data.europa.eu/esco/skill/e963cf1f-dc3c-48b2-a0fa-274f5e7f50f6</a>
styling hair and providing beauty treatments	0.0000	<a href="http://data.europa.eu/esco/skill/5f92ff3e-288b-44aa-864d-5ebb1adb7925">http://data.europa.eu/esco/skill/5f92ff3e-288b-44aa-864d-5ebb1adb7925</a>
supervising a team or group	0.2143	<a href="http://data.europa.eu/esco/skill/aab9f44d-fe0e-46d8-a470-11ce82a64846">http://data.europa.eu/esco/skill/aab9f44d-fe0e-46d8-a470-11ce82a64846</a>
supervising people	0.1077	<a href="http://data.europa.eu/esco/skill/7a00c77c-4a1c-4fd6-a83f-004bda65d81a">http://data.europa.eu/esco/skill/7a00c77c-4a1c-4fd6-a83f-004bda65d81a</a>
supporting others	0.0770	<a href="http://data.europa.eu/esco/skill/82463bb1-85d1-4e99-a4ce-08508fc3b2a3">http://data.europa.eu/esco/skill/82463bb1-85d1-4e99-a4ce-08508fc3b2a3</a>
taking a proactive approach	0.0000	<a href="http://data.europa.eu/esco/skill/91860993-1a8b-4473-91f3-600aa1924bd0">http://data.europa.eu/esco/skill/91860993-1a8b-4473-91f3-600aa1924bd0</a>
teacher training with subject specialisation	0.0000	<a href="http://data.europa.eu/esco/isced-f/0114">http://data.europa.eu/esco/isced-f/0114</a>
teacher training without subject specialisation	0.0000	<a href="http://data.europa.eu/esco/isced-f/0113">http://data.europa.eu/esco/isced-f/0113</a>
teaching academic or vocational subjects	0.0795	<a href="http://data.europa.eu/esco/skill/335be43a-3267-400e-b5cb-c9e234dc7544">http://data.europa.eu/esco/skill/335be43a-3267-400e-b5cb-c9e234dc7544</a>
teaching and training	0.1765	<a href="http://data.europa.eu/esco/skill/5770f630-9b25-49f3-9d37-e93ec1799749">http://data.europa.eu/esco/skill/5770f630-9b25-49f3-9d37-e93ec1799749</a>
teaching and training	0.6364	<a href="http://data.europa.eu/esco/skill/caede8f1-6658-4d78-9eb4-2ad2c7ebf09b">http://data.europa.eu/esco/skill/caede8f1-6658-4d78-9eb4-2ad2c7ebf09b</a>
teaching safety procedures	0.0000	<a href="http://data.europa.eu/esco/skill/3374fb57-056f-49e0-9fc5-000465e13794">http://data.europa.eu/esco/skill/3374fb57-056f-49e0-9fc5-000465e13794</a>
technical or academic writing	0.3652	<a href="http://data.europa.eu/esco/skill/6e62e776-fbfa-486c-a6df-58cd239c86fe">http://data.europa.eu/esco/skill/6e62e776-fbfa-486c-a6df-58cd239c86fe</a>
tending and breeding animals	0.0000	<a href="http://data.europa.eu/esco/skill/edcf6ef-1a42-4e0a-97e2-2a2d61cac181">http://data.europa.eu/esco/skill/edcf6ef-1a42-4e0a-97e2-2a2d61cac181</a>

tending and breeding aquatic animals	0.0000	<a href="http://data.europa.eu/esco/skill/e52cd6e7-f8dc-4f6f-b988-5554423f53fb">http://data.europa.eu/esco/skill/e52cd6e7-f8dc-4f6f-b988-5554423f53fb</a>
tending plants and crops	0.0000	<a href="http://data.europa.eu/esco/skill/4364e0cd-66ad-4f0c-b96d-0ea6796067cb">http://data.europa.eu/esco/skill/4364e0cd-66ad-4f0c-b96d-0ea6796067cb</a>
tending plants and crops	0.0000	<a href="http://data.europa.eu/esco/skill/762f3830-baa8-4a7e-a5de-b49037d80885">http://data.europa.eu/esco/skill/762f3830-baa8-4a7e-a5de-b49037d80885</a>
testing and analysing substances	0.3962	<a href="http://data.europa.eu/esco/skill/d2e8f452-ac19-4eed-b984-8f55d2a5b763">http://data.europa.eu/esco/skill/d2e8f452-ac19-4eed-b984-8f55d2a5b763</a>
testing electrical and mechanical systems or equipment	0.4242	<a href="http://data.europa.eu/esco/skill/f7fc7bf8-f41d-44af-81e3-09b88e9779e6">http://data.europa.eu/esco/skill/f7fc7bf8-f41d-44af-81e3-09b88e9779e6</a>
testing vehicles	0.0000	<a href="http://data.europa.eu/esco/skill/47aa582a-3edb-45b5-9ef4-e87813ea327c">http://data.europa.eu/esco/skill/47aa582a-3edb-45b5-9ef4-e87813ea327c</a>
textiles (clothes, footwear and leather)	0.2039	<a href="http://data.europa.eu/esco/isced-f/0723">http://data.europa.eu/esco/isced-f/0723</a>
therapy and rehabilitation	0.0000	<a href="http://data.europa.eu/esco/isced-f/0915">http://data.europa.eu/esco/isced-f/0915</a>
thinking creatively and innovatively	0.0000	<a href="http://data.europa.eu/esco/skill/e84d080a-ff6d-41a7-b7b9-133e97c7bf00">http://data.europa.eu/esco/skill/e84d080a-ff6d-41a7-b7b9-133e97c7bf00</a>
thinking skills and competences	0.0000	<a href="http://data.europa.eu/esco/skill/8267ecb5-c976-4b6a-809b-4ceecb954967">http://data.europa.eu/esco/skill/8267ecb5-c976-4b6a-809b-4ceecb954967</a>
traditional and complementary medicine and therapy	0.0000	<a href="http://data.europa.eu/esco/isced-f/0917">http://data.europa.eu/esco/isced-f/0917</a>
training animals	0.0000	<a href="http://data.europa.eu/esco/skill/77a2918f-5969-4545-a632-d3e6a853b2c5">http://data.europa.eu/esco/skill/77a2918f-5969-4545-a632-d3e6a853b2c5</a>
training for pre-school teachers	0.0000	<a href="http://data.europa.eu/esco/isced-f/0112">http://data.europa.eu/esco/isced-f/0112</a>
training on health or medical topics	0.0000	<a href="http://data.europa.eu/esco/skill/ee2576c0-1af5-44b5-8c0c-2002541d1ccc">http://data.europa.eu/esco/skill/ee2576c0-1af5-44b5-8c0c-2002541d1ccc</a>
training on operational procedures	0.3431	<a href="http://data.europa.eu/esco/skill/6c4fa8c8-e9e1-49b5-897f-6b61fe649488">http://data.europa.eu/esco/skill/6c4fa8c8-e9e1-49b5-897f-6b61fe649488</a>
transforming and blending materials	0.0350	<a href="http://data.europa.eu/esco/skill/462f8805-3c0b-43c6-8bef-592b87939763">http://data.europa.eu/esco/skill/462f8805-3c0b-43c6-8bef-592b87939763</a>
transforming and blending materials	0.0000	<a href="http://data.europa.eu/esco/skill/c098d6c1-dfee-4b02-8ce5-c6d80c98e18b">http://data.europa.eu/esco/skill/c098d6c1-dfee-4b02-8ce5-c6d80c98e18b</a>
translating and interpreting	0.1795	<a href="http://data.europa.eu/esco/skill/64aeee4d-3791-4448-8ed8-9b49ad04f2fb">http://data.europa.eu/esco/skill/64aeee4d-3791-4448-8ed8-9b49ad04f2fb</a>
transport services	0.7778	<a href="http://data.europa.eu/esco/isced-f/104">http://data.europa.eu/esco/isced-f/104</a>
transport services	0.2893	<a href="http://data.europa.eu/esco/isced-f/1041">http://data.europa.eu/esco/isced-f/1041</a>
transversal skills and competences	0.0594	<a href="http://data.europa.eu/esco/skill/04a13491-b58c-4d33-8b59-8fad0d55fe9e">http://data.europa.eu/esco/skill/04a13491-b58c-4d33-8b59-8fad0d55fe9e</a>
travel, tourism and leisure	0.0000	<a href="http://data.europa.eu/esco/isced-f/1015">http://data.europa.eu/esco/isced-f/1015</a>
using computer aided design and drawing tools	1.0000	<a href="http://data.europa.eu/esco/skill/b1115b14-fa16-4c1e-be6c-91fd49a1808b">http://data.europa.eu/esco/skill/b1115b14-fa16-4c1e-be6c-91fd49a1808b</a>
using digital tools for collaboration and productivity	0.9854	<a href="http://data.europa.eu/esco/skill/98fb499f-9155-412d-a8a0-95ba97126fec">http://data.europa.eu/esco/skill/98fb499f-9155-412d-a8a0-95ba97126fec</a>
using digital tools for collaboration, content creation and problem solving	0.9952	<a href="http://data.europa.eu/esco/skill/cacc62f3-2df4-4cc3-9d5d-0d014db56bd9">http://data.europa.eu/esco/skill/cacc62f3-2df4-4cc3-9d5d-0d014db56bd9</a>
using digital tools for collaboration, content creation and problem solving	1.0000	<a href="http://data.europa.eu/esco/skill/f774131e-8f2d-43b6-8c20-7fe35fa0f0bd">http://data.europa.eu/esco/skill/f774131e-8f2d-43b6-8c20-7fe35fa0f0bd</a>
using digital tools for processing sound and images	0.9906	<a href="http://data.europa.eu/esco/skill/c53a55a1-8b2b-4d2c-b12d-626742a3833a">http://data.europa.eu/esco/skill/c53a55a1-8b2b-4d2c-b12d-626742a3833a</a>
using digital tools to control machinery	0.9497	<a href="http://data.europa.eu/esco/skill/842ebef2-d252-4bde-98fe-e0463f7009db">http://data.europa.eu/esco/skill/842ebef2-d252-4bde-98fe-e0463f7009db</a>
using digital tools to control machinery	0.9497	<a href="http://data.europa.eu/esco/skill/494b8057-daf5-46a0-b33b-416e0115c30a">http://data.europa.eu/esco/skill/494b8057-daf5-46a0-b33b-416e0115c30a</a>
using foreign languages	0.0000	<a href="http://data.europa.eu/esco/skill/03961960-e729-4768-ab0a-49886132f17a">http://data.europa.eu/esco/skill/03961960-e729-4768-ab0a-49886132f17a</a>
using hand tools	0.0000	<a href="http://data.europa.eu/esco/skill/d23b21ca-2ef5-4b5e-b37e-a5311dc2e292">http://data.europa.eu/esco/skill/d23b21ca-2ef5-4b5e-b37e-a5311dc2e292</a>
using hand tools	0.0000	<a href="http://data.europa.eu/esco/skill/74052f13-4cae-4600-a4d3-8103004683f3">http://data.europa.eu/esco/skill/74052f13-4cae-4600-a4d3-8103004683f3</a>
using more than one language	0.0598	<a href="http://data.europa.eu/esco/skill/8bbdf1f1-e943-45fc-af2f-1446cbd88245">http://data.europa.eu/esco/skill/8bbdf1f1-e943-45fc-af2f-1446cbd88245</a>

using more than one language	0.0000	<a href="http://data.europa.eu/esco/skill/0c92c33c-2859-4705-87ae-4fdd71d0f8f6">http://data.europa.eu/esco/skill/0c92c33c-2859-4705-87ae-4fdd71d0f8f6</a>
using precision hand tools	0.0000	<a href="http://data.europa.eu/esco/skill/57216e88-a0d3-4b8c-af6c-b8232b4f48c2">http://data.europa.eu/esco/skill/57216e88-a0d3-4b8c-af6c-b8232b4f48c2</a>
using precision instrumentation and equipment	0.6441	<a href="http://data.europa.eu/esco/skill/4d7fb3eb-554a-4cf1-a576-bf6e153bdba2">http://data.europa.eu/esco/skill/4d7fb3eb-554a-4cf1-a576-bf6e153bdba2</a>
using precision instrumentation and equipment	0.7368	<a href="http://data.europa.eu/esco/skill/57e6af87-8a6b-4ecb-88e5-7c80b582ddd7">http://data.europa.eu/esco/skill/57e6af87-8a6b-4ecb-88e5-7c80b582ddd7</a>
using precision measuring equipment	0.5185	<a href="http://data.europa.eu/esco/skill/c8f4aad2-ea23-49a2-9708-a6049c2d28ce">http://data.europa.eu/esco/skill/c8f4aad2-ea23-49a2-9708-a6049c2d28ce</a>
using word processing, publishing and presentation software	1.0000	<a href="http://data.europa.eu/esco/skill/446a36a5-2376-439f-b46b-4a214ba0acdf">http://data.europa.eu/esco/skill/446a36a5-2376-439f-b46b-4a214ba0acdf</a>
verifying identities and documentation	0.2917	<a href="http://data.europa.eu/esco/skill/e67fd42d-25f1-4124-b0be-3b1e3bfdd70c">http://data.europa.eu/esco/skill/e67fd42d-25f1-4124-b0be-3b1e3bfdd70c</a>
veterinary	0.0000	<a href="http://data.europa.eu/esco/isced-f/084">http://data.europa.eu/esco/isced-f/084</a>
veterinary	0.0000	<a href="http://data.europa.eu/esco/isced-f/0841">http://data.europa.eu/esco/isced-f/0841</a>
washing and maintaining textiles and clothing	0.0000	<a href="http://data.europa.eu/esco/skill/56c3ea4b-7cea-44da-969c-c21b07a55030">http://data.europa.eu/esco/skill/56c3ea4b-7cea-44da-969c-c21b07a55030</a>
washing and maintaining textiles and clothing	0.0000	<a href="http://data.europa.eu/esco/skill/22d15a65-7262-4a6d-b981-53671b95ad29">http://data.europa.eu/esco/skill/22d15a65-7262-4a6d-b981-53671b95ad29</a>
weighing	0.0000	<a href="http://data.europa.eu/esco/skill/5dbb69d2-9e1b-4e0f-b8c0-0bac709729cf">http://data.europa.eu/esco/skill/5dbb69d2-9e1b-4e0f-b8c0-0bac709729cf</a>
welfare	0.0933	<a href="http://data.europa.eu/esco/isced-f/092">http://data.europa.eu/esco/isced-f/092</a>
wholesale and retail sales	0.3559	<a href="http://data.europa.eu/esco/isced-f/0416">http://data.europa.eu/esco/isced-f/0416</a>
work skills	0.0909	<a href="http://data.europa.eu/esco/isced-f/0417">http://data.europa.eu/esco/isced-f/0417</a>
working efficiently	0.0000	<a href="http://data.europa.eu/esco/skill/14c41899-0224-4cbc-bd8c-e946ada2da87">http://data.europa.eu/esco/skill/14c41899-0224-4cbc-bd8c-e946ada2da87</a>
working in teams	0.0000	<a href="http://data.europa.eu/esco/skill/e4da156d-a6c4-4b29-935b-eff9c9553cf1">http://data.europa.eu/esco/skill/e4da156d-a6c4-4b29-935b-eff9c9553cf1</a>
working with computers	0.9472	<a href="http://data.europa.eu/esco/skill/243eb885-07c7-4b77-ab9c-827551d83dc4">http://data.europa.eu/esco/skill/243eb885-07c7-4b77-ab9c-827551d83dc4</a>
working with computers	1.0000	<a href="http://data.europa.eu/esco/skill/f5328159-dfe9-4f25-b8e7-a03fb0d3a991">http://data.europa.eu/esco/skill/f5328159-dfe9-4f25-b8e7-a03fb0d3a991</a>
working with computers	1.0000	<a href="http://data.europa.eu/esco/skill/39499028-35bf-4d69-9275-fb98902ed88b">http://data.europa.eu/esco/skill/39499028-35bf-4d69-9275-fb98902ed88b</a>
working with digital devices and applications	1.0000	<a href="http://data.europa.eu/esco/skill/3399045f-8078-4066-8b46-475b49b260ab">http://data.europa.eu/esco/skill/3399045f-8078-4066-8b46-475b49b260ab</a>
working with machinery and specialised equipment	0.1586	<a href="http://data.europa.eu/esco/skill/9b8bb484-dcba-49af-8ae0-cfe8b6e9ed45">http://data.europa.eu/esco/skill/9b8bb484-dcba-49af-8ae0-cfe8b6e9ed45</a>
working with machinery and specialised equipment	0.3182	<a href="http://data.europa.eu/esco/skill/cab71b2a-4b65-4e98-a7a9-0b20c39fc248">http://data.europa.eu/esco/skill/cab71b2a-4b65-4e98-a7a9-0b20c39fc248</a>
working with machinery and specialised equipment	0.3182	<a href="http://data.europa.eu/esco/skill/a4cf0e8a-54f6-4fd5-8650-1c82ea86cf2">http://data.europa.eu/esco/skill/a4cf0e8a-54f6-4fd5-8650-1c82ea86cf2</a>
working with numbers and measures	0.0000	<a href="http://data.europa.eu/esco/skill/edc72cfe-78a8-4531-b00f-92992a0bb8cb">http://data.europa.eu/esco/skill/edc72cfe-78a8-4531-b00f-92992a0bb8cb</a>
working with others	0.0000	<a href="http://data.europa.eu/esco/skill/548c3fbe-9eb1-4035-bc54-027fd5bc5315">http://data.europa.eu/esco/skill/548c3fbe-9eb1-4035-bc54-027fd5bc5315</a>
working with others	0.0000	<a href="http://data.europa.eu/esco/skill/91b0b918-942e-4661-b88c-70b9396529e5">http://data.europa.eu/esco/skill/91b0b918-942e-4661-b88c-70b9396529e5</a>
writing and composing	0.1913	<a href="http://data.europa.eu/esco/skill/2f661409-3e56-46ab-95d7-6ec7786fc1c0">http://data.europa.eu/esco/skill/2f661409-3e56-46ab-95d7-6ec7786fc1c0</a>
writing and composing	0.0000	<a href="http://data.europa.eu/esco/skill/afe3d82e-4a40-4aa4-a4e9-a6097c4a391e">http://data.europa.eu/esco/skill/afe3d82e-4a40-4aa4-a4e9-a6097c4a391e</a>

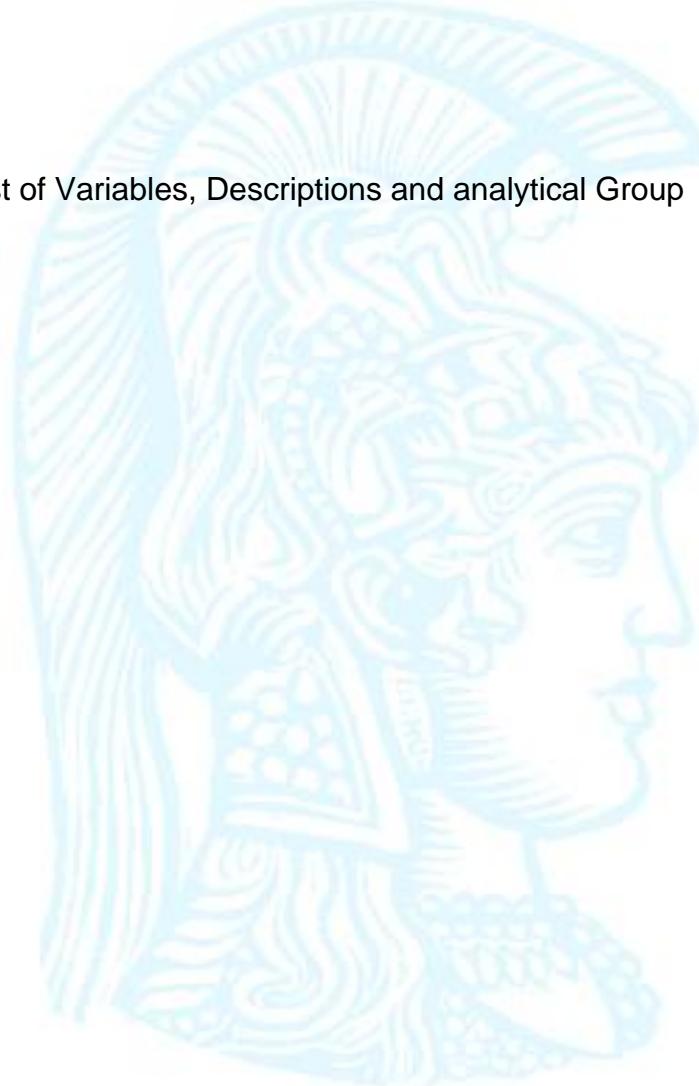
**Table 2.** Full List of ISIC Occupational Domain

Sector	Sector Label	tii_rnd	tii_multi	tii1-1	tii1-5
1	Crop and animal production, hunting and related service activities	1	1	1,00	1,00
2	Forestry and logging	1	1	1,00	1,00
3	Fishing and aquaculture	1	1	1,00	1,00
5	Mining of coal and lignite	2	1	1,50	1,17
6	Extraction of crude petroleum and natural gas	2	1	1,50	1,17
7	Mining of metal ores	2	1	1,50	1,17
8	Other mining and quarrying	2	1	1,50	1,17
9	Mining support service activities	2	1	1,50	1,17
10	Manufacture of food products	2	1	1,50	1,17
11	Manufacture of beverages	2	1	1,50	1,17
12	Manufacture of tobacco products	2	1	1,50	1,17
13	Manufacture of textiles	2	2	2,00	2,00
14	Manufacture of wearing apparel	2	2	2,00	2,00
15	Manufacture of leather and related products	2	2	2,00	2,00
16	Manufacture of wood and of products of wood and cork, except furniture	2	4	3,00	3,67
17	Manufacture of paper and paper products	2	4	3,00	3,67
18	Printing and reproduction of recorded media	2	4	3,00	3,67
19	Manufacture of coke and refined petroleum products	2	2	2,00	2,00
20	Manufacture of chemicals and chemical products	4	2	3,00	2,33
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	5	2	3,50	2,50
22	Manufacture of rubber and plastics products	3	2	2,50	2,17
23	Manufacture of other non-metallic mineral products	3	2	2,50	2,17
24	Manufacture of basic metals	3	2	2,50	2,17
25	Manufacture of fabricated metal products, except machinery and equipment	2	2	2,00	2,00
26	Manufacture of optical instruments and photographic equipment	5	4	4,50	4,17
27	Manufacture of electrical equipment	4	4	4,00	4,00
28	Manufacture of machinery and equipment n.e.c.	4	4	4,00	4,00
29	Manufacture of motor vehicles, trailers and semi-trailers	4	5	4,50	4,83
30	Manufacture of other transport equipment	4	5	4,50	4,83
31	Manufacture of furniture	2	4	3,00	3,67
32	Other manufacturing	3	4	3,50	3,83
33	Repair and installation of machinery and equipment	3	4	3,50	3,83
35	Electricity, gas, steam and air conditioning supply	1	1	1,00	1,00
36	Water collection, treatment and supply	1	1	1,00	1,00
37	Sewerage	1	1	1,00	1,00
38	Waste collection, treatment and disposal activities	1	1	1,00	1,00

39	Remediation activities and other waste management services	1	1	1,00	1,00
41	Construction of buildings	1	1	1,00	1,00
42	Civil engineering	1	1	1,00	1,00
43	Specialized construction activities	1	1	1,00	1,00
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	1	4	2,50	3,50
46	Wholesale trade, except of motor vehicles and motorcycles	1	4	2,50	3,50
47	Retail trade, except of motor vehicles and motorcycles	1	4	2,50	3,50
49	Land transport and transport via pipelines	1	1	1,00	1,00
50	Water transport	1	1	1,00	1,00
51	Air transport	1	1	1,00	1,00
51	Warehousing and support activities for transportation	1	1	1,00	1,00
52	Warehousing and support activities for transportation	1	1	1,00	1,00
53	Postal and courier activities	1	1	1,00	1,00
55	Accommodation	1	1	1,00	1,00
56	Food and beverage service activities	1	1	1,00	1,00
58	Publishing activities	4	4	4,00	4,00
59	Motion picture, video and television programme production, sound recording and music publishing activities	1	4	2,50	3,50
60	Programming and broadcasting activities	1	4	2,50	3,50
61	Telecommunications	2	5	3,50	4,50
62	Computer programming, consultancy and related activities	4	5	4,50	4,83
63	Information service activities	4	5	4,50	4,83
64	Financial service activities, except insurance and pension funding	1	5	3,00	4,33
65	Insurance, reinsurance and pension funding, except compulsory social security	1	5	3,00	4,33
66	Activities auxiliary to financial service and insurance activities	1	5	3,00	4,33
68	Real estate activities	1	1	1,00	1,00
69	Legal and accounting activities	2	5	3,50	4,50
70	Activities of head offices	2	5	3,50	4,50
71	Architectural and engineering activities	2	5	3,50	4,50
72	Scientific research and development	5	5	5,00	5,00
73	Advertising and market research	2	5	3,50	4,50
74	Other professional, scientific and technical activities	2	5	3,50	4,50
75	Veterinary activities	2	5	3,50	4,50
77	Rental and leasing activities	1	5	3,00	4,33
78	Employment activities	1	5	3,00	4,33
79	Travel agency, tour operator, reservation service and related activities	1	5	3,00	4,33
80	Security and investigation activities	1	5	3,00	4,33
81	Services to buildings and landscape activities	1	5	3,00	4,33
82	Office administrative, office support and other business support activities	1	5	3,00	4,33
84	Public administration and defence	4	4	4,00	4,00
85	Education	2	2	2,00	2,00
86	Human health activities	2	2	2,00	2,00
87	Residential care activities	2	2	2,00	2,00
88	Social work activities without accommodation	2	2	2,00	2,00
90	Creative, arts and entertainment activities	1	4	2,50	3,50
91	Libraries, archives, museums and other cultural activities	1	4	2,50	3,50
92	Gambling and betting activities	1	4	2,50	3,50

<b>93</b>	Sports activities and amusement and recreation activities	<b>1</b>	<b>4</b>	2,50	3,50
<b>94</b>	Activities of membership organizations	<b>1</b>	<b>5</b>	3,00	4,33
<b>95</b>	Repair of computers and personal and household goods	<b>1</b>	<b>5</b>	3,00	4,33
<b>96</b>	Other personal service activities	<b>1</b>	<b>5</b>	3,00	4,33
<b>97</b>	Activities of households as employers of domestic personnel	<b>1</b>	<b>1</b>	1,00	1,00
<b>98</b>	Undifferentiated goods- and services-producing activities of private households for own use	<b>1</b>	<b>1</b>	1,00	1,00
<b>99</b>	Activities of extraterritorial organizations and bodies	<b>1</b>	<b>1</b>	1,00	1,00

**Table 3.** Full List of Variables, Descriptions and analytical Group



Variable	Description	Fundamental	Constituent	Synthetic
B_Q01a	Education - Highest qualification - Level	X		
F_Q01b	Skill use work - Time cooperating with co-workers		X	
F_Q02a	Skill use work - How often - Sharing work-related info		X	
F_Q02b	Skill use work - How often - Teaching people		X	
F_Q02c	Skill use work - How often - Presentations		X	
F_Q02d	Skill use work - How often - Selling		X	
F_Q02e	Skill use work - How often - Advising people		X	
F_Q03a	Skill use work - How often - Planning own activities		X	
F_Q03b	Skill use work - How often - Planning others activities		X	
F_Q03c	Skill use work - How often - Organising own time		X	
F_Q04a	Skill use work - How often - Influencing people		X	
F_Q04b	Skill use work - How often - Negotiating with people		X	
F_Q05a	Skill use work - Problem solving - Simple problems		X	
F_Q05b	Skill use work - Problem solving - Complex problems		X	
F_Q06b	Skill use work - How often - Working physically for long period		X	
F_Q06c	Skill use work - How often - Using hands or fingers		X	
F_Q07a	Skill use work - Not challenged enough		X	
F_Q07b	Skill use work - Need more training		X	
G_Q01a	Skill use work - Literacy - Read directions or instructions		X	
G_Q01b	Skill use work - Literacy - Read letters memos or mails		X	
G_Q01c	Skill use work - Literacy - Read newspapers or magazines		X	

<b>Variable</b>	<b>Description</b>	<b>Fundamental</b>	<b>Constituent</b>	<b>Synthetic</b>
G_Q01e	Skill use work - Literacy - Read books		X	
G_Q01f	Skill use work - Literacy - Read manuals or reference materials		X	
G_Q01g	Skill use work - Literacy - Read financial statements		X	
G_Q01h	Skill use work - Literacy - Read diagrams maps or schematics		X	
G_Q02a	Skill use work - Literacy - Write letters memos or mails		X	
G_Q02b	Skill use work - Literacy - Write articles		X	
G_Q02d	Skill use work - Literacy - Fill in forms		X	
G_Q03b	Skill use work - Numeracy - How often - Calculating costs or budgets		X	
G_Q03c	Skill use work - Numeracy - How often - Use or calculate fractions or percentages		X	
G_Q03d	Skill use work - Numeracy - How often - Use a calculator		X	
G_Q03f	Skill use work - Numeracy - How often - Prepare charts graphs or tables		X	
G_Q03g	Skill use work - Numeracy - How often - Use simple algebra or formulas		X	
G_Q03h	Skill use work - Numeracy - How often - Use advanced math or statistics		X	
G_Q04	Skill use work - ICT - Experience with computer in job		X	
G_Q05a	Skill use work - ICT - Internet - How often - For mail		X	
G_Q05c	Skill use work - ICT - Internet - How often - Work related info		X	
G_Q05d	Skill use work - ICT - Internet - How often - Conduct transactions		X	
G_Q05e	Skill use work - ICT - Computer - How often -		X	

<b>Variable</b>	<b>Description</b>	<b>Fundamental</b>	<b>Constituent</b>	<b>Synthetic</b>
	Spreadsheets			
G_Q05f	Skill use work - ICT - Computer - How often - Word		X	
G_Q05g	Skill use work - ICT - Computer - How often - Programming language		X	
G_Q05h	Skill use work - ICT - Computer - How often - Real-time discussions		X	
G_Q06	Skill use work - ICT - Computer - Level of computer use		X	
G_Q07	Skill use work - ICT - Computer - Got the skills needed		X	
G_Q08	Skill use work - ICT - Computer - Lack of skills affect career		X	
H_Q01a	Skill use everyday life - Literacy - Read directions or instructions		X	
H_Q01b	Skill use everyday life - Literacy - Read letters memos or mails		X	
H_Q01c	Skill use everyday life - Literacy - Read newspapers or magazines		X	
H_Q01d	Skill use everyday life - Literacy - Read professional journals or publications		X	
H_Q01e	Skill use everyday life - Literacy - Read books		X	
H_Q01f	Skill use everyday life - Literacy - Read manuals or reference materials		X	
H_Q01g	Skill use everyday life - Literacy - Read financial statements		X	
H_Q01h	Skill use everyday life - Literacy - Read diagrams maps or schematics		X	
H_Q02a	Skill use everyday life - Literacy - Write letters memos or mails		X	
H_Q02b	Skill use everyday life - Literacy - Write articles		X	

<b>Variable</b>	<b>Description</b>	<b>Fundamental</b>	<b>Constituent</b>	<b>Synthetic</b>
H_Q02c	Skill use everyday life - Literacy - Write reports		X	
H_Q02d	Skill use everyday life - Literacy - Fill in forms		X	
H_Q03b	Skill use everyday life - Numeracy - How often - Calculating costs or budgets		X	
H_Q03c	Skill use everyday life - Numeracy - How often - Use or calculate fractions or percentages		X	
H_Q03d	Skill use everyday life - Numeracy - How often - Use a calculator		X	
H_Q03f	Skill use everyday life - Numeracy - How often - Prepare charts graphs or tables		X	
H_Q03g	Skill use everyday life - Numeracy - How often - Use simple algebra or formulas		X	
H_Q03h	Skill use everyday life - Numeracy - How often - Use advanced math or statistics		X	
H_Q05a	Skill use everyday life - ICT - Internet - How often - For mail		X	
H_Q05c	Skill use everyday life - ICT - Internet - How often - In order to better understand various issues		X	
H_Q05d	Skill use everyday life - ICT - Internet - How often - Conduct transactions		X	
H_Q05e	Skill use everyday life - ICT - Computer - How often - Spreadsheets		X	
H_Q05f	Skill use everyday life - ICT - Computer - How often - Word		X	
H_Q05g	Skill use everyday life - ICT - Computer - How often - Programming language		X	
H_Q05h	Skill use everyday life - ICT - Computer - How often - Real-time discussions		X	
I_Q04b	About yourself - Learning strategies - Relate new ideas into real life		X	

<b>Variable</b>	<b>Description</b>	<b>Fundamental</b>	<b>Constituent</b>	<b>Synthetic</b>
I_Q04d	About yourself - Learning strategies - Like learning new things		X	
I_Q04h	About yourself - Learning strategies - Attribute something new		X	
I_Q04j	About yourself - Learning strategies - Get to the bottom of difficult things		X	
I_Q04m	About yourself - Learning strategies - Looking for additional info		X	
I_Q05f	About yourself - Cultural engagement - Voluntary work for non-profit organizations		X	
I_Q06a	About yourself - Political efficacy - No influence on the government		X	
I_Q07a	About yourself - Social trust - Trust only few people		X	
I_Q07b	About yourself - Social trust - Other people take advantage of you		X	
I_Q08	About yourself - Health - State		X	
B_Q05c	Education - Formal qualification - Reason job related			
NFE12	Participated in non-formal education in 12 months preceding survey (derived)	X		
NFE12NJR	Participated in non-formal education for non job-related reasons in 12 months preceding survey (derived)	X		
ISIC2C	Industry classification of respondent's job at 2-digit level (ISIC rev 4), current job (derived)	X		
ISIC4_C	Current Job Industry - Respondent (ISIC rev 4) (coded)	X		
ISCO08_C	Current Job Occupation - Respondent (ISCO 2008) (coded)	X		
isced_dii		X		
ti1-5		X		

Variable	Description	Fundamental	Constituent	Synthetic
digi4		X		
LEARNATWORK	Index of learning at work (derived)			X
READYTOLEARN	Index of readiness to learn (derived)			X
ICTHOME	Index of use of ICT skills at home (derived)			X
ICTWORK	Index of use of ICT skills at work (derived)			X
INFLUENCE	Index of use of influencing skills at work (derived)			X
NUMHOME	Index of use of numeracy skills at home (basic and advanced - derived)			X
NUMWORK	Index of use of numeracy skills at work (basic and advanced - derived)			X
PLANNING	Index of use of planning skills at work (derived)			X
READHOME	Index of use of reading skills at home (prose and document texts - derived)			X
READWORK	Index of use of reading skills at work (prose and document texts - derived)			X
TASKDISC	Index of use of task discretion at work (derived)			X
WRITHOME	Index of use of writing skills at home (derived)			X
WRITWORK	Index of use of writing skills at work (derived)			X

**Table 4.** Full List of Univariable Regression Statistics with

	<b>Description</b>	<b>Variable</b>	<b>R</b>	<b>Std Error</b>	<b>Coef</b>	<b>P &gt;  z </b>
0	Education - Highest qualification - Level	B_Q01a	0.067	0.007568614	0.160515	0.0000
1	Skill use everyday life - ICT - Internet - How often - Conduct transactions	H_Q05d	0.051	0.00518296	0.091027	0.0000
2	Skill use work - Literacy - Read diagrams maps or schematics	G_Q01h	0.045	0.004490403	0.079342	0.0000
3	Index of use of ICT skills at home (derived)	ICTHOME	0.043	0.006727093	0.092634	0.0000
4	Skill use everyday life - Literacy - Read letters memos or mails	H_Q01b	0.041	0.008722638	0.147116	0.0000
5	Skill use everyday life - Literacy - Read diagrams maps or schematics	H_Q01h	0.036	0.004530754	0.06649	0.0000
6	Skill use everyday life - ICT - Computer - How often - Word	H_Q05f	0.034	0.005172737	0.074957	0.0000
7	Skill use everyday life - ICT - Internet - How often - For mail	H_Q05a	0.027	0.010942092	0.131177	0.0000
8	Index of use of reading skills at home (prose and document texts - derived)	READHOME	0.026	0.006559708	0.086414	0.0000
9	Skill use everyday life - Numeracy - How often - Use or calculate fractions or percentages	H_Q03c	0.025	0.00471193	0.058483	0.0000
10	Index of use of writing skills at home (derived)	WRITHOME	0.023	0.005696705	0.065218	0.0000
11	Skill use everyday life - Literacy - Read newspapers or magazines	H_Q01c	0.022	0.007325377	0.093798	0.0000
12	Educational Domain Digital Intensity	isced_dii	0.022	0.003970081	0.045283	0.0000

13	Participated in non-formal education in 12 months preceding survey (derived)	NFE12	0.020	0.003342302	0.039289	0.0000
14	Skill use work - How often - Teaching people	F_Q02b	0.020	0.004604709	0.056226	0.0000
15	Skill use work - Numeracy - How often - Use or calculate fractions or percentages	G_Q03c	0.020	0.005083781	0.06106	0.0000
16	About yourself - Political efficacy - No influence on the government	I_Q06a	0.019	0.008323924	0.098146	0.0000
17	Skill use everyday life - ICT - Computer - How often - Spreadsheets	H_Q05e	0.018	0.004628041	0.048573	0.0000
18	Index of use of influencing skills at work (derived)	INFLUENCE	0.018	0.006420952	0.074738	0.0000
19	Skill use work - How often - Working physically for long period	F_Q06b	0.017	0.004039709	-0.04204	0.0000
20	Index of use of numeracy skills at home (basic and advanced - derived)	NUMHOME	0.017	0.006117904	0.066259	0.0000
21	About yourself - Social trust - Trust only few people	I_Q07a	0.015	0.005434033	0.055105	0.0000
22	Participated in non-formal education for non job-related reasons in 12 months preceding survey (derived)	NFE12NJR	0.015	0.00198385	0.023375	0.0000
23	Skill use work - Literacy - Read newspapers or magazines	G_Q01c	0.015	0.005668553	0.055528	0.0000
24	Skill use work - Numeracy - How often - Prepare charts graphs or tables	G_Q03f	0.014	0.004526145	0.043425	0.0000
25	About yourself - Social trust - Other people take advantage of you	I_Q07b	0.014	0.00572871	0.052344	0.0000

26	Skill use everyday life - Literacy - Write letters memos or mails	H_Q02a	0.013	0.0085705	0.074814	0.0000
27	Skill use work - ICT - Internet - How often - Conduct transactions	G_Q05d	0.013	0.00381154	0.035468	0.0000
28	Index of use of numeracy skills at work (basic and advanced - derived)	NUMWORK	0.012	0.005399396	0.047422	0.0000
29	Skill use work - How often - Presentations	F_Q02c	0.011	0.004024935	0.036786	0.0000
30	Skill use work - Literacy - Read directions or instructions	G_Q01a	0.011	0.007224409	0.059333	0.0000
31	Skill use work - Numeracy - How often - Use simple algebra or formulas	G_Q03g	0.010	0.004727754	0.038978	0.0000
32	Skill use everyday life - Literacy - Read books	H_Q01e	0.010	0.005157628	0.044651	0.0000
33	Index of use of ICT skills at work (derived)	ICTWORK	0.010	0.005586662	0.043977	0.0000
34	Skill use everyday life - Literacy - Read professional journals or publications	H_Q01d	0.009	0.004850782	0.039408	0.0000
35	Skill use work - ICT - Computer - How often - Word	G_Q05f	0.009	0.006483634	0.049481	0.0000
36	Skill use work - How often - Selling	F_Q02d	0.009	0.003831245	-0.02993	0.0000
37	Index of use of reading skills at work (prose and document texts - derived)	READWORK	0.009	0.006545901	0.051284	0.0000
38	Skill use work - Literacy - Fill in forms	G_Q02d	0.008	0.005583161	-0.04203	0.0000
39	4-digit ISCO Group Digital Intensity	digi4	0.008	0.004388361	0.030414	0.0000

40	About yourself - Learning strategies - Looking for additional info	I_Q04m	0.008	0.013495604	-0.09971	0.0000
41	Skill use everyday life - ICT - Internet - How often - In order to better understand various issues	H_Q05c	0.007	0.010609459	0.075988	0.0000
42	Index of readiness to learn (derived)	READYTOLEARN	0.007	0.006559234	-0.04304	0.0000
43	Skill use everyday life - ICT - Computer - How often - Real-time discussions	H_Q05h	0.007	0.004421644	0.026979	0.0000
44	About yourself - Health - State	I_Q08	0.006	0.006335862	-0.04247	0.0000
45	Skill use work - How often - Planning others activities	F_Q03b	0.006	0.004310259	0.028421	0.0000
46	Skill use work - Literacy - Write letters memos or mails	G_Q02a	0.006	0.007384483	0.049825	0.0000
47	About yourself - Cultural engagement - Voluntary work for non-profit organisations	I_Q05f	0.006	0.004534662	0.026966	0.0000
48	Skill use work - ICT - Computer - How often - Spreadsheets	G_Q05e	0.006	0.005429727	0.032484	0.0000
49	Skill use work - How often - Negotiating with people	F_Q04b	0.004	0.006090266	0.032275	0.0000
50	Skill use work - How often - Influencing people	F_Q04a	0.004	0.006784409	0.036285	0.0000
51	Skill use work - Time cooperating with co-workers	F_Q01b	0.004	0.006730611	-0.03382	0.0000
52	Skill use everyday life - Literacy - Read directions or instructions	H_Q01a	0.004	0.005374858	0.027524	0.0000
53	About yourself - Learning strategies - Get to the bottom of difficult things	I_Q04j	0.004	0.010551741	-0.05181	0.0000

54	Skill use work - Need more training	F_Q07b	0.004	0.007141551	-0.03591	0.0000
55	Skill use everyday life - Numeracy - How often - Prepare charts graphs or tables	H_Q03f	0.004	0.004436179	0.020963	0.0000
56	Skill use everyday life - Literacy - Fill in forms	H_Q02d	0.003	0.006903469	0.029228	0.0000
57	Skill use everyday life - Numeracy - How often - Use simple algebra or formulas	H_Q03g	0.003	0.004334102	0.018077	0.0000
58	Skill use work - Not challenged enough	F_Q07a	0.002	0.011518229	-0.04942	0.0000
59	Skill use work - How often - Advising people	F_Q02e	0.002	0.005082176	0.02119	0.0000
60	Occupational Domain Technical Intensity (R&D significance 1/6)	tii1-5	0.002	0.005978528	-0.0226	0.0002
61	Skill use work - How often - Planning own activities	F_Q03a	0.002	0.006551819	-0.02484	0.0001
62	Skill use work - Literacy - Read letters memos or mails	G_Q01b	0.002	0.010602341	0.034516	0.0011
63	Skill use work - ICT - Computer - Lack of skills affect career	G_Q08	0.002	0.011293926	-0.03904	0.0005
64	Skill use everyday life - Literacy - Read manuals or reference materials	H_Q01f	0.002	0.004942361	-0.01642	0.0009
65	About yourself - Learning strategies - Relate new ideas into real life	I_Q04b	0.001	0.011437817	0.029808	0.0092
66	Index of learning at work (derived)	LEARNATWORK	0.001	0.00547064	0.015584	0.0044

**Table 5.** Full List of Group 1 Multivariable Regression Statistics

	Description	Variable	Coef	p	std error
0	Skill use work - Time cooperating with co-workers	F_Q01b	-0.03928	0.00	0.006633
1	Skill use work - How often - Sharing work-related info	F_Q02a	-0.10078	0.00	0.009636
2	Skill use work - How often - Teaching people	F_Q02b	0.049882	0.00	0.005869
3	Skill use work - How often - Presentations	F_Q02c	0.021397	0.00	0.004603
4	Skill use work - How often - Selling	F_Q02d	-0.03378	0.00	0.004324
5	Skill use work - How often - Advising people	F_Q02e	0.021263	0.00	0.005183
6	Skill use work - How often - Planning own activities	F_Q03a	-0.0958	0.00	0.008604
7	Skill use work - How often - Organising own time	F_Q03c	-0.05819	0.00	0.009643
8	Skill use work - How often - Negotiating with people	F_Q04b	0.027781	0.00	0.006639

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>p</b>	<b>std error</b>
9	Skill use work - Problem solving - Complex problems	F_Q05b	-0.02267	0.00	0.006926
10	Skill use work - How often - Working physically for long period	F_Q06b	-0.04148	0.00	0.004337
11	Skill use work - How often - Using hands or fingers	F_Q06c	0.053435	0.00	0.005606
12	Skill use work - Not challenged enough	F_Q07a	-0.04661	0.00	0.010754
13	Skill use work - Literacy - Read directions or instructions	G_Q01a	0.057081	0.00	0.007038
14	Skill use work - Literacy - Read letters memos or mails	G_Q01b	-0.05986	0.00	0.010249
15	Skill use work - Literacy - Read newspapers or magazines	G_Q01c	0.041947	0.00	0.006251
16	Skill use work - Literacy - Read books	G_Q01e	-0.05353	0.00	0.005104
17	Skill use work - Literacy - Read manuals or reference materials	G_Q01f	-0.05491	0.00	0.006625
18	Skill use work - Literacy - Read diagrams maps or schematics	G_Q01h	0.039543	0.00	0.005281
19	Skill use work - Literacy - Write letters memos or mails	G_Q02a	0.110218	0.00	0.009313
20	Skill use work - Numeracy - How often - Use a calculator	G_Q03d	-0.06328	0.00	0.010686
21	Skill use work - Numeracy - How often - Use simple algebra or formulas	G_Q03g	-0.04845	0.00	0.005855
22	Skill use work - Numeracy - How often - Use advanced math or statistics	G_Q03h	-0.07374	0.00	0.00567
23	Skill use work - ICT - Internet - How often - For mail	G_Q05a	-0.12759	0.00	0.009363
24	Skill use work - ICT - Internet - How often - Work related info	G_Q05c	-0.01912	0.01	0.007449
25	Skill use work - ICT - Internet - How often - Conduct transactions	G_Q05d	0.032512	0.00	0.003718
26	Skill use work - ICT - Computer - How often - Word	G_Q05f	-0.02282	0.00	0.007437
27	Skill use work - ICT - Computer - How often - Programming language	G_Q05g	-0.01761	0.00	0.00445

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>p</b>	<b>std error</b>
28	Skill use work - ICT - Computer - How often - Real-time discussions	G_Q05h	-0.02203	0.00	0.004043
29	Skill use work - ICT - Computer - Level of computer use	G_Q06	-0.0535	0.00	0.008733
30	Skill use work - ICT - Computer - Lack of skills affect career	G_Q08	-0.03491	0.00	0.009963
31	Skill use everyday life - Literacy - Read directions or instructions	H_Q01a	-0.02288	0.00	0.005319
32	Skill use everyday life - Literacy - Read letters memos or mails	H_Q01b	0.079776	0.00	0.011167
33	Skill use everyday life - Literacy - Read professional journals or publications	H_Q01d	0.006393	0.21	0.005093
34	Skill use everyday life - Literacy - Read books	H_Q01e	0.022776	0.00	0.004815
35	Skill use everyday life - Literacy - Read financial statements	H_Q01g	-0.00172	0.79	0.006317
36	Skill use everyday life - Literacy - Read diagrams maps or schematics	H_Q01h	0.035654	0.00	0.004754
37	Skill use everyday life - Literacy - Write letters memos or mails	H_Q02a	-0.15391	0.00	0.012756
38	Skill use everyday life - Literacy - Write articles	H_Q02b	-0.02329	0.00	0.004534
39	Skill use everyday life - Literacy - Write reports	H_Q02c	-0.02289	0.00	0.00597
40	Skill use everyday life - Literacy - Fill in forms	H_Q02d	-0.06379	0.00	0.009233
41	Skill use everyday life - Numeracy - How often - Calculating costs or budgets	H_Q03b	-0.01957	0.00	0.00625
42	Skill use everyday life - Numeracy - How often - Use a calculator	H_Q03d	-0.03581	0.00	0.008186
43	Skill use everyday life - Numeracy - How often - Prepare charts graphs or tables	H_Q03f	-0.02529	0.00	0.005156
44	Skill use everyday life - Numeracy - How often - Use simple algebra or formulas	H_Q03g	-0.03036	0.00	0.005917
45	Skill use everyday life - ICT - Internet - How often - In order to better understand various issues	H_Q05c	0.055909	0.00	0.011127

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>p</b>	<b>std error</b>
46	Skill use everyday life - ICT - Internet - How often - Conduct transactions	H_Q05d	0.027272	0.00	0.005068
47	Skill use everyday life - ICT - Computer - How often - Word	H_Q05f	0.04939	0.00	0.0053
48	Skill use everyday life - ICT - Computer - How often - Programming language	H_Q05g	0.021625	0.00	0.00523
49	Skill use everyday life - ICT - Computer - How often - Real-time discussions	H_Q05h	0.018775	0.00	0.004006
50	About yourself - Learning strategies - Relate new ideas into real life	I_Q04b	0.157327	0.00	0.01461
51	About yourself - Learning strategies - Like learning new things	I_Q04d	0.061626	0.00	0.017698
52	About yourself - Learning strategies - Attribute something new	I_Q04h	-0.07024	0.00	0.016009
53	About yourself - Learning strategies - Looking for additional info	I_Q04m	-0.11609	0.00	0.016856
54	About yourself - Political efficacy - No influence on the government	I_Q06a	0.083146	0.00	0.007879
55	About yourself - Social trust - Other people take advantage of you	I_Q07b	0.031339	0.00	0.00506
56	About yourself - Health - State	I_Q08	-0.05078	0.00	0.005966
57	Education - Formal qualification - Reason job related	B_Q05c	-0.01255	0.00	0.002728
58	Participated in non-formal education in 12 months preceding survey (derived)	NFE12	0.011241	0.00	0.003405
59	Participated in non-formal education for non job-related reasons in 12 months preceding survey (derived)	NFE12NJR	0.012111	0.00	0.001862
60	4-digit ISCO Group Digital Intensity	digi4	0.028122	0.00	0.004503
61	Index of learning at work (derived)	LEARNATWORK	0.053883	0.00	0.005889
62	Index of readiness to learn (derived)	READYTOLEARN	-0.11646	0.00	0.012274
63	Index of use of numeracy skills at home (basic and advanced - derived)	NUMHOME	0.11306	0.00	0.012164
64	Index of use of numeracy skills at work (basic and advanced - derived)	NUMWORK	0.158989	0.00	0.011575

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>p</b>	<b>std error</b>
65	Index of use of planning skills at work (derived)	PLANNING	0.036474	0.00	0.006285
66	Index of use of writing skills at home (derived)	WRITHOME	0.125369	0.00	0.011819
67	Index of use of writing skills at work (derived)	WRITWORK	-0.06518	0.00	0.006293
68	Education - Highest qualification - Level	B_Q01a	0.11341	0.00	0.007726

**Table 6.** Group 1 Multivariable Regression without significance testing Results

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
0	About yourself - Learning strategies - Relate new ideas into real life	I_Q04b	0.167181	0	0.015853
1	Skill use everyday life - Literacy - Write letters memos or mails	H_Q02a	-0.156728	0	0.014181
2	Index of use of writing skills at home (derived)	WRITHOME	0.136293	0	0.011799
3	Index of readiness to learn (derived)	READYTOLEARN	-0.134132	0	0.017754
4	About yourself - Learning strategies - Looking for additional info	I_Q04m	-0.128778	0	0.017244
5	Skill use work - ICT - Internet - How often - For mail	G_Q05a	-0.123147	0	0.011315
6	Skill use everyday life - Literacy - Read letters memos or mails	H_Q01b	0.123125	0	0.020972
7	Index of use of ICT skills at home (derived)	ICTHOME	-0.11736	0.0003	0.032169
8	Index of use of reading skills at home (prose and document texts - derived)	READHOME	-0.113597	0.021	0.049204
9	Skill use work - How often - Planning own activities	F_Q03a	-0.103233	0	0.010478

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
10	Education - Highest qualification - Level	B_Q01a	0.101703	0	0.008693
11	Index of use of numeracy skills at home (basic and advanced - derived)	NUMHOME	0.101589	0	0.018134
12	Skill use everyday life - ICT - Internet - How often - In order to better understand various issues	H_Q05c	0.101398	0	0.014861
13	Skill use work - Literacy - Write letters memos or mails	G_Q02a	0.09964	0	0.010343
14	Index of use of numeracy skills at work (basic and advanced - derived)	NUMWORK	0.098196	0.000 1	0.025857
15	Skill use work - How often - Sharing work-related info	F_Q02a	-0.089238	0	0.010424
16	Skill use everyday life - ICT - Computer - How often - Word	H_Q05f	0.088521	0	0.013214
17	About yourself - Political efficacy - No influence on the government	I_Q06a	0.081575	0	0.0081
18	About yourself - Learning strategies - Like learning new things	I_Q04d	0.080431	0	0.01827
19	About yourself - Learning strategies - Attribute something new	I_Q04h	-0.07666	0	0.018416
20	Skill use work - Literacy - Read letters memos or mails	G_Q01b	-0.070038	0	0.011417
21	Skill use work - ICT - Computer - Level of computer use	G_Q06	-0.066722	0	0.009713
22	Skill use everyday life - Literacy - Fill in forms	H_Q02d	-0.065534	0	0.009084
23	Index of use of influencing skills at work (derived)	INFLUENCE	-0.065082	0.064 2	0.035159
24	Skill use work - How often - Teaching people	F_Q02b	0.062823	0	0.008619
25	Skill use everyday life - Literacy - Read diagrams maps or schematics	H_Q01h	0.060964	0	0.009466
26	Skill use work - Literacy - Read books	G_Q01e	-0.059069	0	0.005766
27	Skill use work - Numeracy - How often - Use advanced math or statistics	G_Q03h	-0.058857	0	0.009041
28	Skill use work - Literacy - Read directions or instructions	G_Q01a	0.057698	0	0.008053

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
29	Skill use work - How often - Organising own time	F_Q03c	-0.057279	0	0.010437
30	Index of use of writing skills at work (derived)	WRITWORK	-0.056549	0	0.009802
31	Index of learning at work (derived)	LEARNATWORK	0.053046	0	0.006099
32	Skill use work - Literacy - Read manuals or reference materials	G_Q01f	-0.050498	0	0.007519
33	Skill use work - Numeracy - How often - Use a calculator	G_Q03d	-0.049414	0	0.011655
34	Skill use work - Not challenged enough	F_Q07a	-0.048567	0	0.010802
35	Skill use work - How often - Using hands or fingers	F_Q06c	0.047581	0	0.005957
36	Skill use work - How often - Negotiating with people	F_Q04b	0.043062	0	0.010492
37	Skill use everyday life - Literacy - Read books	H_Q01e	0.042845	0	0.00726
38	Skill use work - Numeracy - How often - Use simple algebra or formulas	G_Q03g	-0.041737	0	0.007062
39	Skill use everyday life - Literacy - Read professional journals or publications	H_Q01d	0.041607	0.0001	0.010901
40	Skill use work - Time cooperating with co-workers	F_Q01b	-0.041284	0	0.006708
41	Index of use of planning skills at work (derived)	PLANNING	0.040914	0.0003	0.011424
42	Skill use everyday life - ICT - Computer - How often - Spreadsheets	H_Q05e	0.040487	0.0002	0.010868
43	Skill use everyday life - ICT - Internet - How often - Conduct transactions	H_Q05d	0.039863	0	0.007101
44	About yourself - Health - State	I_Q08	-0.039538	0	0.006288
45	Skill use work - How often - Working physically for long period	F_Q06b	-0.038317	0	0.004443
46	Skill use everyday life - ICT - Computer - How often - Programming language	H_Q05g	0.038069	0	0.007135
47	About yourself - Social trust - Other people take advantage of you	I_Q07b	0.036682	0	0.006435

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
48	Skill use everyday life - Numeracy - How often - Use a calculator	H_Q03d	-0.035817	0.000 1	0.009017
49	Skill use work - Literacy - Read diagrams maps or schematics	G_Q01h	0.034594	0	0.005852
50	About yourself - Learning strategies - Get to the bottom of difficult things	I_Q04j	0.034533	0.038 4	0.016679
51	Skill use everyday life - ICT - Internet - How often - For mail	H_Q05a	0.033614	0.120 9	0.021672
52	Skill use work - How often - Presentations	F_Q02c	0.03336	0	0.007465
53	Skill use work - Numeracy - How often - Use or calculate fractions or percentages	G_Q03c	0.032104	0.007 1	0.011928
54	Skill use work - How often - Selling	F_Q02d	-0.031505	0	0.004784
55	Skill use work - ICT - Internet - How often - Conduct transactions	G_Q05d	0.030978	0	0.004718
56	Skill use everyday life - ICT - Computer - How often - Real-time discussions	H_Q05h	0.029809	0	0.005022
57	Skill use work - Literacy - Read newspapers or magazines	G_Q01c	0.02972	0.000 1	0.007805
58	Skill use work - ICT - Computer - Lack of skills affect career	G_Q08	-0.028932	0.004 7	0.010244
59	Skill use work - How often - Advising people	F_Q02e	0.027683	0.002 3	0.009076
60	Index of use of reading skills at work (prose and document texts - derived)	READWORK	0.027273	0.043 1	0.013485
61	Skill use work - Problem solving - Complex problems	F_Q05b	-0.026242	0.000 2	0.006987
62	4-digit ISCO Group Digital Intensity	digi4	0.025323	0	0.004923
63	Skill use everyday life - Literacy - Write articles	H_Q02b	-0.024752	0	0.00496
64	Skill use everyday life - Numeracy - How often - Use simple algebra or formulas	H_Q03g	-0.02424	0.000 1	0.006076
65	Skill use work - How often - Influencing people	F_Q04a	0.022918	0.094 9	0.013723
66	Skill use work - ICT - Internet - How often - Work related info	G_Q05c	-0.022915	0.018 5	0.009728

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
67	Skill use work - ICT - Computer - How often - Real-time discussions	G_Q05h	-0.022907	0	0.005182
68	Skill use work - ICT - Computer - Got the skills needed	G_Q07	0.022691	0.0191	0.009683
69	Skill use everyday life - Literacy - Write reports	H_Q02c	-0.022382	0.0002	0.006107
70	Skill use work - ICT - Computer - How often - Word	G_Q05f	-0.021994	0.0172	0.009229
71	Skill use everyday life - Literacy - Read manuals or reference materials	H_Q01f	-0.021276	0.0903	0.012562
72	Skill use everyday life - Numeracy - How often - Prepare charts graphs or tables	H_Q03f	-0.020803	0.0004	0.005838
73	Skill use work - Need more training	F_Q07b	0.020628	0.004	0.007174
74	Skill use work - ICT - Computer - How often - Programming language	G_Q05g	-0.019089	0	0.004576
75	Skill use everyday life - Numeracy - How often - Calculating costs or budgets	H_Q03b	-0.019064	0.0047	0.006738
76	Skill use work - How often - Planning others activities	F_Q03b	0.016488	0.076	0.009293
77	Skill use work - Literacy - Fill in forms	G_Q02d	-0.016221	0.0194	0.006937
78	Educational Domain Digital Intensity	isced_dii	0.015885	0.0012	0.004893
79	Skill use everyday life - Literacy - Read directions or instructions	H_Q01a	0.015082	0.1583	0.01069
80	Skill use everyday life - Literacy - Read newspapers or magazines	H_Q01c	-0.014944	0.2347	0.012575
81	Skill use everyday life - Numeracy - How often - Use advanced math or statistics	H_Q03h	-0.014245	0.0136	0.005773
82	Participated in non-formal education in 12 months preceding survey (derived)	NFE12	0.013546	0.0001	0.003508
83	Skill use everyday life - Literacy - Read financial statements	H_Q01g	0.012845	0.1655	0.009262
84	Education - Formal qualification - Reason job related	B_Q05c	-0.01284	0	0.00297
85	Occupational Domain Technical Intensity (R&D significance 1/6)	tti1-5	0.012839	0.009	0.004918

	<b>Description</b>	<b>Variable</b>	<b>Coef</b>	<b>P&gt; z </b>	<b>std error</b>
86	Skill use work - ICT - Computer - How often - Spreadsheets	G_Q05e	0.012724	0.155	0.008947
87	Skill use everyday life - Numeracy - How often - Use or calculate fractions or percentages	H_Q03c	0.012048	0.127 6	0.007908
88	Participated in non-formal education for non job-related reasons in 12 months preceding survey (derived)	NFE12NJR	0.010612	0	0.001986
89	Skill use work - Literacy - Read financial statements	G_Q01g	-0.009786	0.183 3	0.007355
90	Skill use work - Numeracy - How often - Calculating costs or budgets	G_Q03b	0.008948	0.270 7	0.008124
91	Index of use of task discretion at work (derived)	TASKDISC	-0.008105	0.086	0.004721
92	Skill use work - Numeracy - How often - Prepare charts graphs or tables	G_Q03f	0.007997	0.285 5	0.007487
93	About yourself - Social trust - Trust only few people	I_Q07a	-0.007748	0.248 9	0.006721
94	About yourself - Cultural engagement - Voluntary work for non-profit organisations	I_Q05f	0.005274	0.209 2	0.0042
95	Skill use work - Problem solving - Simple problems	F_Q05a	0.005095	0.656 9	0.01147
96	Skill use work - Literacy - Write articles	G_Q02b	0.004832	0.403 6	0.005786
97	Index of use of ICT skills at work (derived)	ICTWORK	-0.002472	0.887 5	0.017466

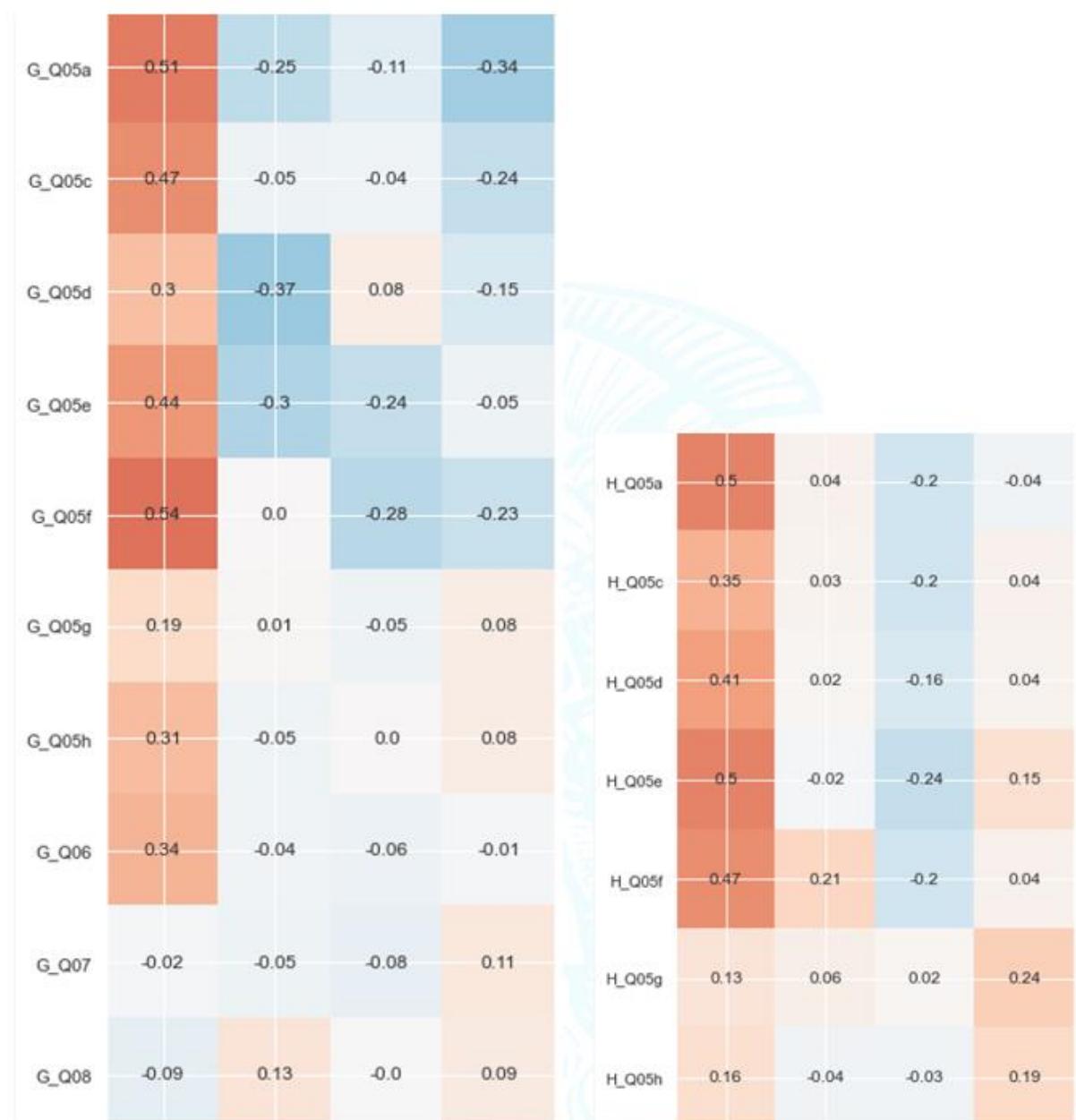


Fig. 1. ICT Content in Everyday life (left graph) and Work (right graph)

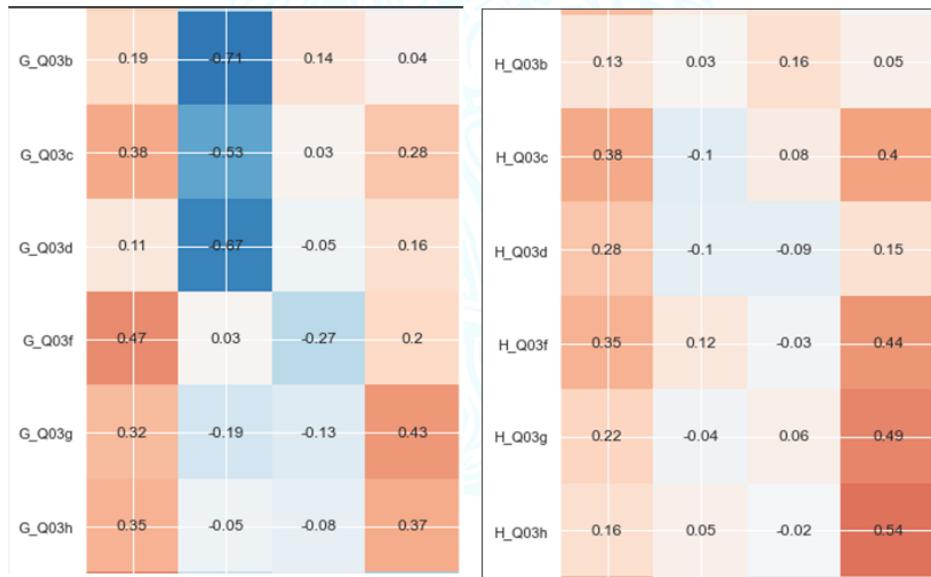


Fig. 2. Numeracy Content in Everyday life (left graph) and Work (right graph)

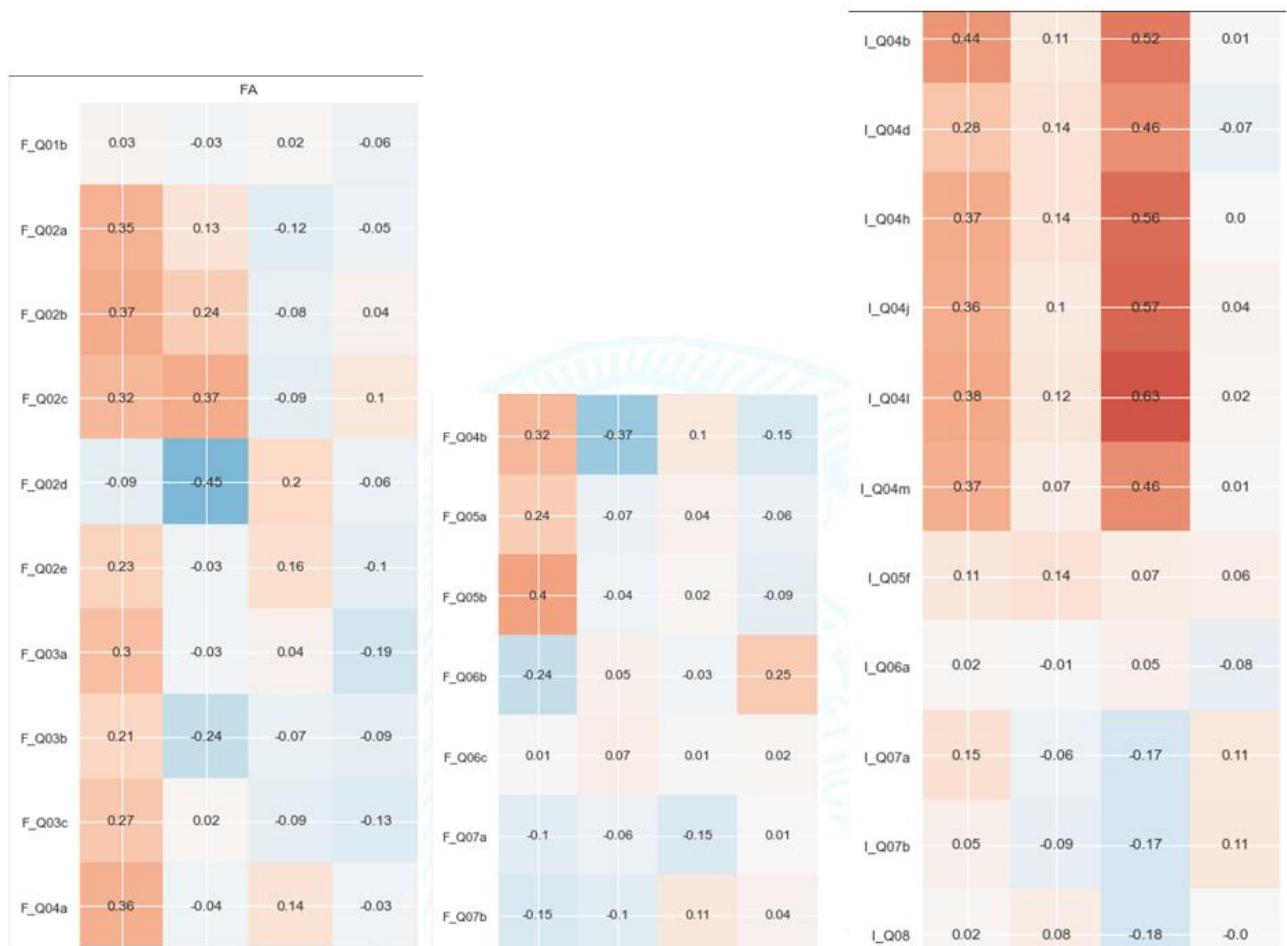


Fig. 3. Broad Work activities (left & middle graph) – Broad Life Stances (right graph)

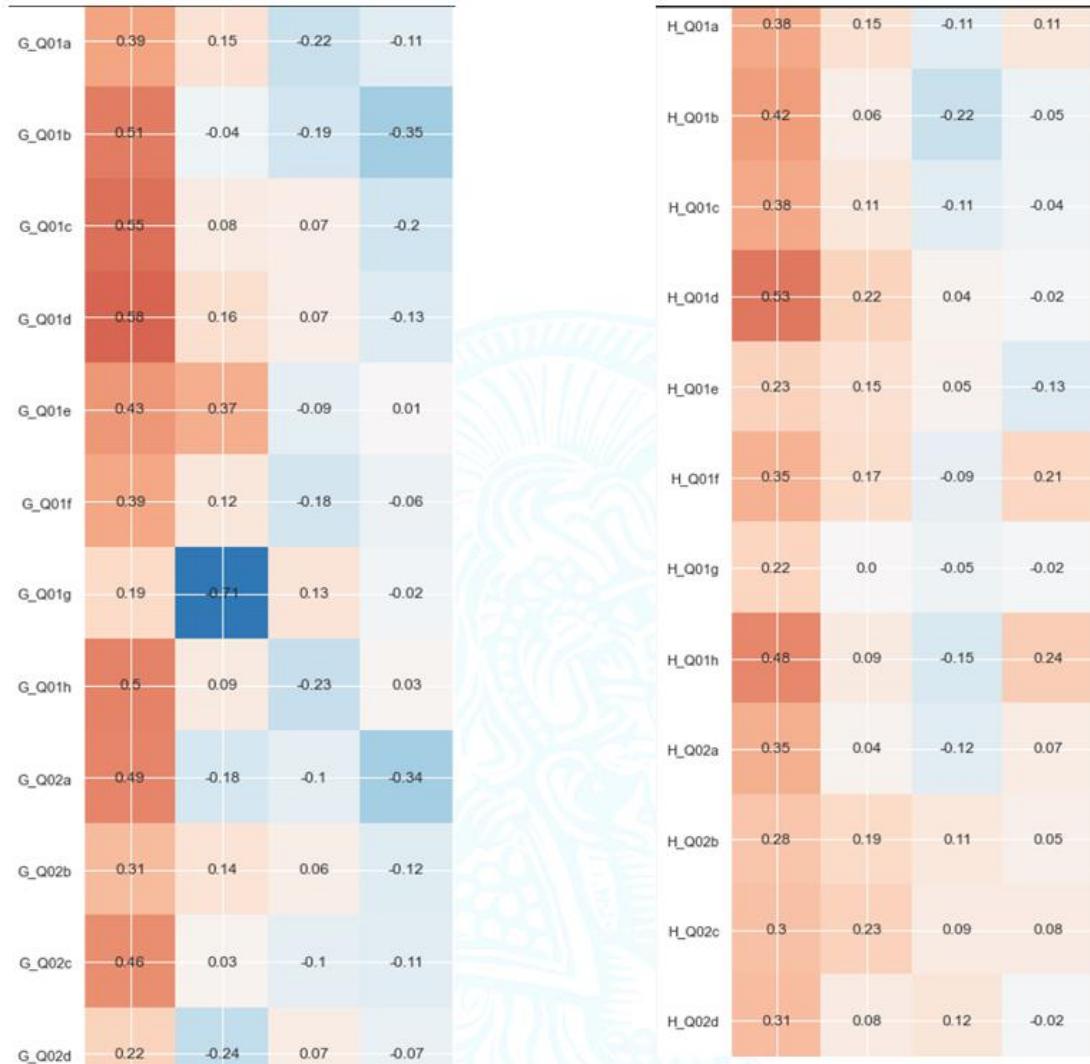


Fig. 4. Literacy Content in Everyday life (left graph) and Work (right graph)