Working paper on EU social dialogue for up- and re-skilling: qualitative analysis and skill intelligence-based quantitative analysis on sectors and occupations

Deliverable 2.2

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Executive summary

I SKILL (Industrial Relations to Kick-Start Inclusive Adult Learning) is a project investigating how industrial relations and social dialogue may contribute to the advancement of adult learning, with a focus on up-skilling and re-skilling in the EU. The objective of the project's deliverable D2.2 is to analyse the evolving EU policy framework for adult learning and the role taken by the EU-level social dialogue in shaping it. It pays attention to the actions following the European Skills Agenda 2020.

To this end, the study will concentrate on three Actions of the aforementioned Agenda in the following order: Action 9 the 'Initiative on individual learning accounts', Action 10 the 'European approach to micro-credentials' and Action 2, 'Strengthening of skill intelligence' These three actions are interrelated and each of them, with its distinct goal, should contribute to the attainment of the ambitious target set by the European Pillar of Social Rights Action Plan whereby at least 60% of all adults should participate in training every year by 2030. By considering these three Actions, it is possible to take into account both the supply and demand side of the labour market, while also emphasising the importance of sectors and occupations. From a methodological perspective, our study is based, depending on an examination of grey and/or scientific literature, as well as the results of semi-structured interviews conducted by CEPS in Spring 2023 with social partners and other relevant stakeholders. Regarding specifically the action 'Strengthening of skill intelligence', a chapter will be devoted to an empirical exercise whose aim is to investigate whether a correlation exists between the skills that are in high demand and their digital and green content. The quantitative part relies on cross-referencing data from Skills-OVATE and ESCO for the EU 27 from Q3_2022 to Q2_2023.

The mixed methodology adopted in this paper, which sees both qualitative and quantitative analysis, leads to the following key findings:

In the **first Chapter**:

- Both the European Union and the EU Member States are prioritising initiatives that promote adult learning. The setting in which these policies are contextualised is complex and multiple forces are at work.

The main challenges that have been generally recognised are:

- Labour, knowledge and skills shortages and mismatches.
- Adult learning and continuing training strategies need to address a very large number of individuals and skills.
- Adult learning, up-skilling, and re-skilling need to be inclusive.
- Social partners, trade unions and employers' organisations, are called to further strengthen their efforts, along with other relevant stakeholders.
- The role of social partners in adult learning is paramount, with the expectation that their participation will progressively intensify in guaranteeing the right to training, enhancing access to lifelong/adult learning, evaluating its quality, and motivating employees to engage in training. Furthermore, they have an active role in promoting lifelong learning by influencing policy, sharing knowledge about effective strategies, and fostering a supportive atmosphere that acknowledges its significance.

Regarding specific measures, it is important to highlight that various social partners, stakeholders, and experts, although generally supportive of individual learning accounts

and the European approach to micro-credentials, would have preferred more definitive actions towards establishing a universal right to training. Such actions would have had a more significant effect in terms of reducing inequalities and including the most vulnerable groups.

Regarding both ILAs and micro-credentials:

- The (governing) body(ies) responsible(s) for determining whether to implement ILAs or micro-credentials in the context of enhancing adult learning should take into account that:
    - A one-fits-all solution may turn out to be not appropriate.
    - The specific measure needs to fit the existing adult learning system and be interoperable with already existing measures.
    - The decision should also be based on theoretical and empirical research done at the EU level and/or for specific Member States regarding the potential advantages and disadvantages, as well as the documented outcomes of the implementation of the measures.
- Data collection, both quantitative and qualitative, related to specific measures, needs to be enhanced becoming a standard practice.

As far as **ILAs** are specifically concerned, it is advisable to:

- Balance the autonomy of the individual in selecting the training and guarantee that the decision is taken with comprehensive information.
- Avoid the risk that ILAS may not be able to deliver on inclusiveness.
- Avoid the risk of deadweight loss i.e. the risk that ILAs will be used to fund the training that either an individual or an employer would be willing to sponsor from their resources.
- Improve ILAs' effectiveness by reinforcing the Member States' current paid training leave arrangements.

As far as **micro-credentia**ls are specifically concerned**,** it is advisable to:

- Ensure that micro-credentials are utilised to address both employment and labour market demands, as well as the personal growth and satisfaction of learners.
- Guarantee the quality of training through quality assessment of training and training providers.
- Attain an equilibrium between the comprehensive education offered by complete qualifications and the skill-oriented learning provided by micro-credentials.
- Pay particular attention to the micro-credential stackability to ensure that the process of accumulation of multiple micro-credentials is designed in a way that does not undermine the value of diplomas, degrees, and qualifications.

As far as **skills intelligence** is specifically concerned, it is advisable to:

- Take additional efforts to enhance the identification of existing skills requirements and the anticipation of future skills requirements. This can be achieved, among other methods, by enhancing forecasting analysis and tools. It is more effective to carry out these tasks at a regional or sectoral level, as labour market intelligence and observatories are more dependable at these levels due to their strong relationship with the local ecosystems and special characteristics of the labour market.

Regarding social partners in the context of ILAs, micro-credentials and skill intelligence:

- Social partners should further increase their involvement, intervention and collaboration in the actual implementation of ILAs and micro-credentials. Indeed, they possess at all levels a privileged viewpoint and a comprehensive understanding of specific circumstances.
- The effectiveness of ILAs and micro-credentials is strongly linked to their design, thus the involvement of social partners is essential in shaping and improving their implementation and in preventing and avoiding drawbacks. In particular social partners can:
    - Anticipate skill needs and targeting skills;
    - Contribute to the specific design and implementation of tools for the quality check processes of the training and the training providers.
    - Provide individuals with information, advice and guidance in the selection of the most suitable training.
    - Promote the inclusiveness of the measures by enhancing the learning culture in general, providing support for accessing, information, guidance, and motivation.
    - Further collaborate with other relevant stakeholders, particularly, with government and adult learning providers (public and private).

The **second Chapter** aims to address the following research question: i) Is there a correlation between the proportion of most in-demand skills and their digital and green content? ii) Does this correlation differ based on particular sectors and/or occupations? iii) Does this phenomenon exhibit repetitive occurrences, and what are the possible explanations? To answer these questions, it has been used a methodology based on cross-referencing data from Cedefop Skills-OVATE and ESCO. The investigation considers the EU 27 and the period that goes from the third quarter of 2022 (Q3_2022) to the second quarter of 2023 (Q2_2023). A correlation analysis between the share of OJAs in which a hierarchical group of skills is demanded and the share of digital (green) skills present in the same hierarchical group of skills (for brevity named 'incidence of skills in demand', 'incidence of digital skills', 'incidence of green skills', respectively) led to the following main results:

- **An overall positive and statistically significant association** with the incidence of digital skills that but with a low value.
- No association with the incidence of green skills.

By computing the correlation between the incidence of skills in demand and the incidence of digital skills within sectors and between occupations (and also within occupations and between sectors) it is found that:

- **The statistically significant correlation is mostly associated with the occupational dimension rather than the sectorial dimension**.
- **The occupations that consistently demonstrate a considerable correlation remain mostly unaltered.** This means that the hierarchical skill groups that are most in demand and that, at the same time, contain the highest percentage of digital skills are always associated with the same type of occupation.
- An economic reason may explain the fact that the hierarchical categories of skills containing digital skills are confined to four specific occupations (in order of relevance Professionals, Clerical support workers, Technicians and associate professionals, and Managers)**.** Regardless of the sector, digital skills are only in demand among occupational categories that may have in common a medium-high average income.

- As far as green skills are concerned the possible explanation, instead, can be that they are still not very common in the OJAs.

Introduction

Since the Lisbon strategy[1,2] policy discussions have focused on the promotion of adult learning. Many binding and non-binding initiatives on lifelong/adult learning and closely related themes have been initiated by European institutions over the previous two decades. The 'Education & Training 2020 Strategic Framework - ET2020' (Council of the European Union, 2009), to make the EU: "the most competitive and dynamic knowledge-based economy in the world" (p. 1)., the 'Council Recommendation on Upskilling Pathways: New Opportunities for Adults' (Council of the European Union, 2016), which targeted low-skilled workers regardless of their working conditions, or the 'European Pillar of Social Rights - EPRS'[3] (European Parliament, Council, European Commission, 2017), which establishes a foundation for a universal right to life-long learning with its first principle, are some examples.

In recent years, the European framework for lifelong/adult learning has been enlarged to emphasise that all individuals have a right to high-quality, inclusive education, training, and adult learning. The COVID-19 epidemic, its recovery, the energetic crisis, and the ongoing digital and green transitions, substantially impacted the European economy, sectors, and workforce. These latter are asked to adapt, in terms of skills, to the rapidly evolving conditions within the context of the ageing population, climate change and globalisation. In July 2020, the European Commission published its 'Communication on a European skills agenda for sustainable competitiveness, social fairness, and resilience' (European Commission, 2020), marking a significant milestone. It was published six months after the declaration of COVID-19 as a global pandemic and advocated for: "a skills revolution and a paradigm shift in skills policies" (European Commission, 2020 p. 26). The new European Skills Agenda 2020 outlines ambitious goals to be met over the following five years and emphasises the need for people to continuously improve their skills, as well as, the fact that these skills are 'skills for employment'. It encompasses a set of 12 'actions', structured into five fundamental building blocks. The Agenda, indeed: "Calls for collective action, mobilising businesses, social partners and stakeholders, to commit to work together, in particular within the EU's industrial eco-systems […] Defines a clear strategy to ensure that skills lead to jobs […] Helps people build their skills throughout life in an environment where lifelong learning is the norm […] Identifies the financial means to foster investment in skills […] Set ambitious objectives for up and reskilling to be achieved within the next 5 years (European Commission, 2020, pag. 3).

This study will analyse three 'Actions' of the European Skills Agenda 2020. The focus will primarily be on Action 9 and Action 10: the 'Initiative on individual learning accounts' and the 'European approach to micro-credentials', respectively. Subsequently, the attention will be

[1] The heads of State and Government of the Member States of the European Union endorsed the Lisbon Strategy, an economic reform programme, in 2000. The special gathering that took place in Lisbon in March inspired its name.

[2] Even if, for example, Dehmel (2006) already identifies the link between continuing education discourse and European strategies, at least since the 1970s.

[3] The first article reads: "[e]veryone has the right to quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage the transitions in the labour market". Furthermore, the initial parts of the fourth and fifth principles read respectively: "Everyone has the right to timely and tailor-made assistance to improve employment or self-employment prospects. This includes the right to receive support for job search, training and re-qualification". And: "Regardless of the type and duration of the employment relationship, workers have the right to fair and equal treatment regarding working conditions, access to social protection and training".

directed towards Action 2, which pertains to the 'Strengthening of skill intelligence'. The **initiative on individual learning accounts** and the **European approach to micro-credentials** aims to enhance the accessibility to quality learning and training possibilities, increase the visibility of individuals' skills, and provide support in identifying opportunities for career advancement and personal growth. While the two actions pursue similar goals as instruments designed to facilitate individuals' entry into learning and support their career progression, they are also interconnected from a functional point of view. Indeed, Member States can include training courses leading to micro-credentials in their registry of recognised opportunities that are eligible for funding from individual learning accounts. **Skill intelligence**[4] is the: "Outcome of a knowledge-driven process of collecting, selecting, combining and presenting evidence to map and anticipate labour market and skills trends" Cedefop (2021), and acts as a guidance tool, for example, the development of skills suitable for the workers of the future. These actions should be able to ensure the achievement of the ambitious **target set by the European Pillar of Social Rights Action Plan**[5] (European Commission, 2021a) whereby at least 60%[6] of all adults should participate in training every year by 2030. This target was recently confirmed by the Porto declaration (8th May 2021)[7].

The working paper is structured into two chapters.

Chapter 1 is dedicated to the qualitative analysis of EU-level social dialogue on adult learning. More specifically, the initial section describes the methodology employed. The second, fourth, and fifth sections specifically address three measures: individual learning accounts, micro-credentials, and skill intelligence, respectively. These three latter sections are organised to contain: a description of the evolution of the measure under consideration, followed by an analysis of the grey literature (i.e. the points of view, mainly expressed in position papers, of the various social partners and other relevant stakeholders) along with the reporting of the content of the semi-structured interviews conducted by CEPS in Spring 2023[8].

Chapter 2 delves further into the topic of skill intelligence within sectors (NACE Rev.2) and occupations (ISCO-08) from both a theoretical and empirical perspective. The first section briefly examines the scientific literature on skill intelligence methodologies. The second section and its subsections are devoted to an empirical exercise that aims to address the following research questions: Which are the skills most in demand by sector and occupation? Is there a correlation between the skills that are most in demand and their digital and green content? Is this correlation higher/lower for certain sectors and occupations? Is this phenomenon recurrent and what can be a possible explanation? To answer these questions, it has been used a methodology based on cross-referencing data

[4] Also called labour market and skill intelligence (LMSI).

[5] The European Pillar of Social Rights Action Plan sets a new target whereby at least 60% of all adults should participate in training every year by 2030 in order to ensure the implementation of the EPSR which says that "Everyone has the right to quality and inclusive education, training and lifelong learning" (principle 1), "regardless of the type and duration of the employment relationship" (principle 5) and this includes "the right to transfer training entitlements during professional transitions" (principle 4). Member States and social partners in the Porto Summit welcomed the new EU headline targets on jobs, skills and poverty reduction, taking into account different national circumstances, and as part of the policy coordination framework, in the context of the European Semester and following already agreed decisions under the Strategic framework for European cooperation in education and training 2021-2030.

[6] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2059

[7] https://www.consilium.europa.eu/en/press/press-releases/2021/05/08/the-porto-declaration/pdf

[8] For details on the interviewees see section 1.1 devoted to methodology.

from Cedefop Skills-OVATE[9] and ESCO[10]. The investigation considers the EU 27 and the period that goes from the third quarter of 2022 (Q3_2022) to the second quarter of 2023 (Q2_2023)[11].

1. Chapter 1. EU-level adult learning measures and social partner involvement

1.1 Methodology

Each of the abovementioned 'Actions' is assessed independently and analysed using a thematic approach that emphasises the key topics that remain at the forefront of the ongoing discussion. The analysis is undertaken referring to the grey literature, which mostly consists of publicly available declarations, answers to public consultations, and position papers from social partners and other relevant stakeholders. Furthermore, to complement the findings emerging from the grey literature review, CEPS conducted ten semi-structured interviews in Spring 2023. As far as these latter are concerned:

- A written set of questions ("Questions for semi-structured interviews for qualitative analysis of EU-level social dialogue on adult learning") was prepared as part of the I SKILL project deliverable D1.2 ("Questionnaires for data collection")[12] to act as a guide both for the interviewer and the interviewee during the semi-structured interviews.
- A list of potential interviewees was prepared as part of the I SKILL project deliverable D1.3 ("Database with a provisional list of contacts for data collection")[13]. This list was later extended.
- Around twenty-five potential interviewees were approached by an e-mail describing the general purpose of the I SKILL project, details of the topics to be covered in the interview and other information on timing and modalities. Out of the twenty-five potential interviewees, ten responded and agreed to be interviewed.
- To the ones that accepted, a further email was sent containing: i) a "Participant information sheet" with a description of the I SKILL project; ii) the "Guidelines for the semi-structured interviews" including also the guiding questions for the interview; iii) a consent form for the management of personal information. On this latter point, it is worth specifying that in this paper the personal identity of the interviewees is not disclosed, but only their role and generic affiliation.
- The semi-structured interviews were conducted in a virtual environment (Microsoft Teams) and lasted on average one hour each.
- The semi-structured interviews focussed on the interviewee's perspective regarding the general contribution that can be provided to enhance adult learning, and in particular in the reskilling and upskilling processes, as well as the opinion on some recent European Union initiatives/measures such as individual learning accounts,

[9] https://www.cedefop.europa.eu/en/tools/skills-online-vacancies
[10] https://esco.ec.europa.eu/en
[11] That is the last available data in Cedefop Skill Ovate at the moment this paper was finalised.
[12] For internal use.
[13] For internal use.

micro-credentials, skill intelligence, the benchmarks set for the participation rates in adult learning, and the issues related to the inclusiveness of those most in need of adult learning.

- Among the participants, three are representatives of European or EU level employer's associations, three are representatives of European or EU level trade unions federations, one is representative of an EU adult learning education association and three are experts (including academics) in the field of adult learning.

1.2 Individual Learning Accounts (ILAs)

The ILAs initiative is one among several initiatives that were announced in the 2020 European Skills Agenda published in July 2020 (European Commission, 2020), described explicitly in **'Action 9'**, which states: "The Commission will assess how a possible European initiative on individual learning accounts can help close existing gaps in the access to training for working-age adults and empower them to successfully manage labour market transitions. The Commission will also assess which enabling services and other factors could support individual learning accounts. This could include guidance, validation, and transparency on the quality of training opportunities, as well as educational or training leave provisions. In its work, the Commission will engage in broad consultations with Member States, social partners and all relevant stakeholders".

In March 2021, the European Pillar of Social Rights Action Plan (2021a) **announced the launch of an initiative concerning individual learning accounts** "to facilitate the exercise of the right to lifelong skill development". The initiative was incorporated, as well, in the Commission Work Programme for 2021 of the 19th October 2021 (European Commission, 2021b), where it is stated: "As part of wider efforts to instil a lifelong learning culture and facilitate job transitions, we will propose an initiative on individual learning accounts to empower individuals to undertake training and manage their career."

After extensive preparatory works**, on the 10th of December 2021 the European Commission released a proposal for a Council Recommendation on individual learning accounts** (European Commission, 2021d) and **on the 16th of July 2022[14], the Council recommended that the Member States put in place individual learning accounts and the corresponding frameworks** to enable individuals to engage in training that is relevant to the labour market and is intended to help them join or remain in employment (Council of the European Union, 2022b).

The Council Recommendation includes, inter alia, the objectives, the scope, some definitions and the enabling framework.

As for the **objectives,** they are two and formulated as: "(a) support all working-age adults in accessing training, including for professional transitions and irrespective of their labour force or professional status; (b) increase individuals' incentives and motivation to seek training.".

The **scope** of the Recommendation covers: "working-age adults legally residing in a Member State, independently of their level of education and current labour force or professional status.".

Among the **definitions,** the two most important are that of 'individual training entitlement' that: "means the right to access a personal budget at an individual's disposal to cover the

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32022H0627%2802%29

direct costs of labour-market-relevant training, guidance and counselling, skills assessment or validation that are eligible for funding" and 'individual learning account' that: "is a delivery mode for individual training entitlements. It is a personal account that allows individuals to accumulate and preserve their entitlements over time, for whichever eligible training, guidance or validation opportunity they deem most useful and whenever they want to, in line with national rules. It grants the individual full ownership of the entitlements, irrespective of the funding source.".

The **enabling framework** includes i) career guidance and validation; ii) a national registry of eligible quality training, career guidance and validation opportunities; iii) a single national digital portal supporting individual learning accounts; iv) paid training leaves.

Furthermore, it is recommended to introduce **paid training leaves**, to provide additional individual training entitlements to the accounts of individuals most in need of upskilling and reskilling, and to organise outreach and awareness-raising activities.

1.2.1 Points of discussion on ILAs

This section outlines the perspectives expressed by various experts, European or EU-level social partners and other stakeholders about the individual learning accounts (ILAs) as designed by the European Commission and translated into the Council Recommendation. It analyses a selection of issues related to this measure, based on their relevance and on the fact that remained the focus of attention or discussion.

1.2.1.1 ILAs versus training right

One of the two objectives of the Council Recommendation on ILAs is the **support of all working-age adults in accessing training**[15]. Regarding this point, **it has been expressed concern that an account in itself does not necessarily imply the use of it**[16] **and that it does not yet constitute the right to (useful) training**[17].

Such points were raised also during the semi-structured interviews, by two European level Trade Unions:

> *"The individual learning account is a tool. However, it does not guarantee that the tool is used. What we are more concerned with is that people have access to training and, unfortunately, the individual learning account is not solving the issue of who is going to access it. […] We are part of those who were a bit surprised by the focus that the European Commission was putting on this. We understood that it was maybe indeed a way to answer the long-standing demand of trade unions to secure the call for individual right to training, dating back to the nineties […]. The difference with the actual context is the scale of the needs for reskilling and upskilling of training. And the speed at which we have to do it".* Senior Policy Advisor of a European-level Trade Union

> *"A right to training, given to almost every worker and citizen actually would make lifelong learning a reality and it is a necessity we have discussed for the last twenty years. While ILAs are inspired by the French experience, what we would*

[15] More specifically the text reads: "Support all working-age adults in accessing training, including for professional transitions irrespective of their labour force or professional status" (pag. 5, paragraph 1, letter (a)).

[16] See for example: ADAPT (2021), BusinessEurope (2022), ETUC (2021), ETUCE (2021), SMEunited (2021).

[17] ETUC (2021) further pointed out a possible confusion in the policy debate between the use of expressions such as "access to rights/entitlements" and "access to individual learning accounts".

prefer is a clear right to training". Senior Policy Advisor of a European-level Trade Union

1.2.1.2 ILAs may not be a "one-fits-all solution"

Many social partners and other stakeholders emphasised, as a **concern, the need to acknowledge the disparities among various Member States' tools system[18] to foster training participation** and the respect of pre-existing measures implemented[19], or in other words, **to take into consideration ILAs within the already existing national training ecosystem, making them interoperable[20].**

Furthermore, there is frequent concern that, some Member States are not suitable for implementing ILAs having already in place other incompatible (and in some cases well-functioning) tools. A similar concern is that the implementation of ILAs would divert funds from existing schemes[21]. This kind of argument has been put forward also during the semi-structured interviews.

> *"We do not agree with the European Commission when saying that Member States should establish ILAs as a solution or as part of the solution. Europe is very diverse and the adult learning training systems across the Member States are very different. What we see is that in many Member States, there are already well-functioning practices or schemes for training, up-skilling and re-skilling policies. Thus, we fear that if there is some pressure on Member States, so, it has to be agreed with social partners to set up these ILAs, maybe resources will drought away from well-functioning schemes."* Senior Policy Advisor of a European-level Employer's Organisation

Another interviewee stated:

> *"It's one tool among others. This is not the silver bullet to deal with the problem."* Senior Policy Advisor of a European-level Trade Union

Referring also to specific Member States for providing examples, another interviewee stated:

> *"Some Member States, like France, are strongly in favour of ILAs mostly because they already had them. Other Member States were opposed to it. Therefore, it's for each Member State to decide, together or not with social partners, on the future when they would like really to implement ILAs or not. A country like Portugal is ready to implement it. Other Member States, like for example Austria,*

[18] See for example: Advisory Committee on Vocational Training – ACTV (2020), BusinessEurope (2022).

[19] The ILAs Council recommendation states: "It is recommended that Member States consider establishing individual learning accounts as a possible means for enabling individuals to participate in labour-market relevant training". (pag. 5 paragraph 2). On this aspect, Ms Klara Engels-Perenyi, Policy Officer in the Skills Agenda Unit – DG Employment, Social Affairs & Inclusion from the European Commission said: "There are many countries and regions with a similar idea of ILA. We don't want everyone to use the same model because that model must be adapted to local needs. From our point of view, the involvement of local stakeholders is very important to have a successful ILA (or similar) scheme in place. Particularly for regions facing a severe labour shortage, ILAs become a suitable tool to boost upskilling and reskilling in the active working population." EARALL webinar 'Understanding Individual Learning Accounts: Challenges and Prospects ahead', 20 February 2023.

[20] See for example Advisory Committee on Vocational Training – ACTV (2020)

[21] See for example ADAPT (2021); Advisory Committee on Vocational Training –- ACTV (2020); Ceemet (2022); European Federation of Education Employers – EFEE (2021); Eurochambres (2022); Word Employment Confederation – WEC (2020).

Germany or even Italy, not at all – ILAs are not suitable to their reality." Director (Social Affairs & Training Policy) of a European-level Employer's Organisation

1.2.1.3 ILAs may not be targeted to the low-skilled group and SMEs

The second objective of the Council Recommendation on ILAs is to **increase individuals' incentives and motivation to seek training**. There is consensus among social partners and other stakeholders regarding the fundamental importance of the barriers to accessing adult training identified in the European Commission proposal and the Council Recommendation[22] (at points 9, 10, and 11 of the recital)[23]. However, **scepticism is expressed on whether ILAs are the best tools to pursue this objective and questions are raised on how ILAs can in practice increase training participation rates and address not only financial and time constraints, but also motivational barriers[24].** Motivation is considered, indeed, the driving force behind the learning process and successfully reaching these groups depends on cultivating a learning culture and promoting a change in mindsets[25].

Focussing on the **lack of motivation**, during the semi-structured interview, one interviewee claimed:

> *"The European Commission itself has identified that lack of motivation to undertake training as one of the big challenges for adults to participate in training and especially of the low-skilled workers, and we do not see how individual learning accounts are going to tackle this issue. We refer, in this context, to some OECD studies that have reflected that when this kind of scheme, similar to individual learning accounts, was put in place, there was a poor record of low-skilled workers participating in training."*[26] Senior Policy Advisor at a European-level Employer's Organisation

As the problem of lack of motivation is typically observed among vulnerable and disadvantaged groups, the issue raised is how ILAs might effectively address it

[22] See for example ALL DIGITAL (2022); BusinessEurope (2022); Ceemet (2021).

[23] The Councill in the Recital of the Recommendation on ILAs (Council, 2022a, points 9, 10 and 11 of the recital acknowledged that the main barriers to learning participation are:

i) "the insufficient financial support as it appears, indeed, that a significant portion of job-related training in the EU is typically sponsored by employers. However, it is worth noting that many companies, including SMEs, may not currently offer or allocate resources for their worker's training. Additionally, individuals in non-traditional employment arrangements may have limited or no access to employer-sponsored training opportunities;"

ii) "the time constraint for training, as well as, a lack of awareness and utilisation of training leaves, where available, which may not be applicable to atypical workers or those who are unemployed;"

iii) "the lack of motivation particularly among individuals with low qualifications and those who are distanced from the labour market. Individuals may lack awareness of their own skills requirements and may be uncertain about the availability, quality, and recognition of support and training opportunities within the labour market. Moreover, individuals may lack the motivation to participate in training programmes that have been selected without their input and fail to address their specific needs."

[24] See for example Ceemet (2021); DIGITALEUROPE (2021); European Federation of Education Employers – EFEE (2021); Lifelong Learning Platform (2022).

[25] See for example Ceemet (2021); Ceemet (2022); Digital Europe (2021); European Federation of Education Employers – EFEE (2021).

[26] The studies the interviewee was referring to are:
OECD (2019a). *Individual Learning Accounts. Panacea or Pandora's boxes?* OECD Publishing, Paris.
OECD (2019b). *Individual Learning Accounts. Design is key for success.* OECD Publishing, Paris.

specifically[27] **avoiding the risk of exclusion of those who need training the most**[28]**.** Some refer to already existing individual learning schemes pointing out that these latter have poor track records as far as participation of the low-skilled workers is concerned. On the contrary, higher-skilled individuals tend to be over-represented in the take-up of these schemes[29].

On this point, in the semi-structured interview, one interviewee claimed:

> *"One of the most significant challenges encountered in adult learning is the tendency for training to consistently attract always the same individuals, typically those who are already well-educated, whereas those who are more in need, as precarious and temporary workers, women and younger workers keep having difficulties in accessing training".* Senior Policy Advisor of a European-level Trade Union.

Further to the lack of motivation, another interviewee highlighted the potential disparity in treatment that firms may exhibit towards white-collar and blue-collar workers.

> *"White-collar workers have naturally more appetite than blue-collar workers. Sometimes, these latter, had bad experiences when they were younger, so they're less inclined towards training. Nevertheless, if one compares what is offered to white-collars and blue-collars in terms of training, the latter is not so much. If there is an issue of motivation, companies invest more into some work group of* wor*kers than others*". Senior Policy Advisor of a European-level Trade Union.

Possible solutions have been identified in targeting the groups that need training the most, as already said, low-skilled adults, the unemployed, and those employed in occupations highly susceptible to automation. Promoting inclusivity can be achieved by specifically focusing on guidance and skills assessment. Providing counselling sessions is crucial in assisting individuals in making informed decisions on their further education and career trajectories. Enhancing skills assessment and validation involves aligning labour market demands with upskilling and reskilling programmes. It also entails recognising entitlements and ensuring their portability, allowing individuals to transfer their rights across different jobs and countries and accumulate them over time. Additionally, it is crucial to allocate sufficient funding, which entails providing increased financial support for lifelong learning (including paid leave). This should be accompanied by implementing effective information and communication campaigns in collaboration with key stakeholders at the local, regional, and national levels[30].

Moreover, **some stakeholders expressed dissatisfaction with the exclusion of certain groups from the ILAs target group** as per the Council Recommendation that explicitly

[27] This position was reiterated, for example, also by Stijn Broecke, Senior Economist, at the OECD Employment, Labour and Social Affairs Directorate explaining that: "if the problem is about increasing choice for individuals in their learning journeys, then ILAs may be the solution. But, if the problem is about training only low-skilled workers with higher skills, then this may not be the role of ILA. It is very important to ILAS as part of a wider ecosystem of training on offer." EARALL webinar 'Understanding Individual Learning Accounts: Challenges and Prospects ahead', 20 February 2023.

[28] See for example Adapt (2021); ALL DIGITAL (2022); Lifelong Learning Platform (2022).

[29] See for example Ceemet (2021, 2022).

[30] See for example Ensie (2021).

refers to “all working-age adults”[31]. **The limitation of the measure to the working age can be detrimental for a part of the population that mostly requires improving their skills**[32]**.**

Finally, various stakeholders referred **to the specific conditions of the SMEs and their workers**[33]. A significant barrier to increasing training opportunities in the labour market is the limited ability of SMEs to effectively organise staff training. This adds up to the fact that employees in SMEs tend to participate less in training.

An explanation lies, as clarified by an interviewee, in the fact that:

> *“Small business owners are hesitant to engage in upskilling because they fear that their employees will quickly hunt for another employment, most likely at a larger company where they may receive a higher offer”.* Director (Social Affairs & Training Policy) of a European-level Employer’s Organisation

Also, the significance of a shift in perspective, particularly in the context of SMEs, is emphasised by an interviewee:

> *“The first step would be to change the individual's mentality towards the necessity of fostering self-motivation, both for their personal growth and for the collective success of the workforce inside the small enterprise. Otherwise, if you don't change it, I don't see any probable progress towards understanding the added value of upskilling”*. Director (Social Affairs & Training Policy) of a European-level Employer’s Organisation

Furthermore, SME representatives emphasised the importance of tailoring training programmes to meet the specific needs of companies, particularly SMEs. This includes incorporating informal and on-the-job training.

1.2.1.4 ILAs and individual autonomy to choose training

There is a diversity of opinions regarding the extent to which individuals should be autonomous in selecting their training. In the case of ILAs, it is common for third parties like the government and employers to (financially) contribute to the accounts. However, individuals generally retain the discretion to choose the type and timing of training, the training provider, and the amount of money invested. The line taken by the European Commission is that ILAs are empowering tools for individuals who, thus, take responsibility also for their future[34]. Others express concerns that this could result in workers bearing the majority of the responsibility[35]. Still others, are concerned that the content of the training will

[31] E.g. employed, self-employed, those engaged in non-traditional work arrangements, unemployed or those not actively participating in the labour market.

[32] AGE Platform Europe (2022) for example states: “AGE regrets that the notion of life-long learning is not fully addressed in the proposal. The use of individual learning accounts, limited to adults of « working age », explicitly excludes many older persons. In a context where more and more persons continue working beyond retirement age. This restriction seems unjustified and obsolete”. This point is taken also by ALL DIGITAL (2022).

[33] For example see Ceemet (2021, 2022).

[34] For example Manuela Geleng, Director for Jobs and Skills at the EU Commission, referring to ILAs, said: “We often see that for a majority of adults it is difficult or they are not motivated to engage in training. […] We need such an initiative where everybody is empowered to take training and also feels responsible for managing the change that is coming towards us.”. Source: Euractive Event of 25th January 2022 ‘Skills – the currency of the future. How is the EU accelerating upskilling and reskilling?’

[35] For example Tatjana Babrauskienė, workers' representative at the European Economic and Social Committee, referring to ILAs said: "Placing individuals in the driving seat as individual learning accounts are supposed to

not be sufficiently job-relevant and others, more explicitly, favour training with labour market relevance[36]. In this latter direction, the following opinion was expressed in one of the semi-structured interviews:

> *"For us, it's very important that training is labour market relevant and we do not see how ILAs are going to ensure that training is labour market relevant. For us, this is another critical point".* Senior Policy Advisor at a European-level Employer's Organisation

Another interviewee warned about the:

> *"National cases of misuse of ILAs for things that are not in line with labour market needs, for example, driving license".* Director of Social Affairs & Training Policy of a European-level Employer's Organisation

1.2.1.5 ILAs and paid training leaves

It is emphasized the necessity to reinforce the Member States' current paid training leave[37] arrangements[38]. Relevant obstacles identified regarding participation in training were the financial burden of training and the challenges of scheduling and determining whether training should occur during working hours. Thus the positive impact of paid leave is recognised in enhancing access to education or training.

The fundamental role of this right was also stressed during the semi-structured interviews:

> *"What is equally important here is the notion of paid leave, because especially for low-skilled workers, you're not going into training, if you don't have the guarantee that this is going to be paid"* Senior Policy Advisor of a European-level Trade Union

Referring back to the right to training it is also stated:

> *"Having been fighting for quite some time for paid educational leave, which is a bit different, but the idea is still kind of the same of providing an individual right to training or a clear educational path for everybody, the answer has been individual learning accoun*t". Senior Policy Advisor of a European-level Trade Union

Some[39] suggest that paid training leave is an adequate solution for delivering training where agreed upon by social partners and/or collective bargaining as social partners are closer to the requirements of businesses and workers, they can offer innovative solutions tailored to those needs. In this context, The ILO's Paid Educational Leave Convention, 1974 (No. 140)[40], is frequently cited by social partners and other stakeholders[41].

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do is […] not the right formula because it can put more pressure on workers" Source: Euractive Event of 25th January 2022 'Skills – the currency of the future. How is the EU accelerating upskilling and reskilling?' See also ENSIE (2021).

[36] See for example Advisory Committee on Vocational Training – ACTV (2020); Adapt (2021); Business Europe (2022); Ceemet (2021, 2022); Eurocadres (2022); SMEunited (2022).

[37] In the Council Recommendation is said: "Member States are recommended to enter into dialogue with social partners on arrangements to allow employees to participate in training during working hours using their individual learning accounts."

[38] See for example BusinessEurope (2022); Ceemet (2022).

[39] See for example BusinessEurope (2022); Ceemet (2022); SMEunited (2022),

[40] ILO (1974), "Paid Educational Leave Convention", No 140.

[41] See for example BusinessEurope (2022); ETUC (2020); ETUC (2021); ETUCE (2021), Eurocadres (2022).

1.3 European approach to micro-credentials

The micro-credentials initiative is one among several initiatives that were announced in the 2020 European Skills Agenda published in July 2020 (European Commission, 2020), described explicitly in **'Action 10'**, stating that: "The Commission will propose a new initiative to support the quality, transparency and take-up of micro-credentials across the EU. In particular, it will:

- Develop, together with all relevant stakeholders (public or private education and training providers, social partners, chambers of commerce, employers) European standards which address minimum requirements for quality and transparency. This will build trust in micro-credentials and facilitate their portability and recognition across the EU.
- Explore the inclusion of micro-credentials in qualifications frameworks, in dialogue with national qualification authorities.
- Make it easier for individuals to store and showcase to employers acquired micro-credentials through Europass and its Digital Credentials.

This initiative builds, among others, on the results of the evaluation of the 2012 Council Recommendation on Validation of non-formal and informal learning, which are published in parallel with this Skills Agenda."

In March 2021, the European Pillar of Social Rights Action Plan (2021a) **announced the launch of an initiative concerning micro-credentials**: "to facilitate flexible learning pathways and labour market transitions. The initiative was incorporated, as well, in the Commission Work Programme for 2021 of the 19th October 2021 (European Commission, 2021b), where it is stated: "As part of wider efforts to instil a lifelong learning culture and facilitate job transitions, we will […] set out a European approach to micro-credentials to widen personalised learning opportunities for all."

After extensive preparatory works, **on the 10th of December 2021 the European Commission** released a **proposal for a Council Recommendation on micro-credentials** (European Commission, 2021c) and on the 16th of June 2022[42], **the Council adopted a Recommendation on a European approach to micro-credentials for lifelong learning and employability** (Council of the European Union, 2022a)[43].

The Council Recommendation includes inter alia, **building blocks consisting of definitions, standard elements** for describing micro-credentials, and **principles for designing and issuing** micro-credentials.

As for the **definitions**, the main one is that of **micro-credential**: "Micro-credential" means the record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes will have been assessed against transparent and clearly defined criteria. Learning experiences leading to micro-credentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs. Micro-credentials are owned by the learner, can be shared and are portable. They may be stand-alone or combined into larger credentials.

[42] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32022H0627%2802%29

[43] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0627(02)#:~:text=Member%20States%20are%20recommended%20to,the%20European%20Pillar%20of%20Social

They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity."[44]

The **standard elements** to describe a micro-credential are: " i) identification of the learner; ii) title of the micro-credential; iii) country(ies)/region(s) of the issuer; iv) awarding body(ies); v) date of issuing; vi) learning outcomes; vii) notional workload needed to achieve the learning outcomes (in European Credit Transfer and Accumulation System – ECTS, wherever possible); viii) level (and cycle, if applicable) of the learning experience leading to the micro-credential (European Qualifications Framework, Qualifications Frameworks in the European Higher Education Area), if applicable; ix) type of assessment; x) form of participation in the learning activity; xi) type of quality assurance used to underpin the micro-credential"[45].

The **ten principles for the design** and issuance of micro-credentials[46] are: i) quality; ii) transparency; ii) relevance; iv) valid assessment; v) learning pathways (stackability and validation of non-formal and informal learning); vi) recognition; vii) portability.

Furthermore, Member States are recommended to develop an **ecosystem for micro-credentials both within formal, non-formal and informal learning settings**. The Recommendation also outlines key areas for action on micro-credentials in education and training and in labour markets policies.

1.3.1 Points of discussion on Micro-credentials

This part focuses on delineating the viewpoints articulated by diverse experts, European or EU social partners and other stakeholders about the European approach to micro-credentials as designed by the European Commission and translated into the Council Recommendation. The analysis is conducted on the salient topics that are considered to be the most pertinent and persistently debated or problematic.

1.3.1.1 Micro-credentials: some generally supported features

Social partners and other stakeholders generally supported some of the elements of the European approach to micro-credentials[47] as the: common European definition[48], short nature of the courses, flexibility[49], reference to formal, non-formal and informal education[50], and a more inclusive education[51].

The positive viewpoints mentioned emerged also during the semi-structured interviews:

> *"Overall I think we are very positive about the role they can play. Having a common European definition, a common approach, is something that we very much welcome in the Council Recommendation. We see good added value in their potential in terms of the shorter nature of the courses as well as the ability to update flexibly."* Senior Adviser at a European-level Employers' Organisation

[44] Along with the definition of micro-credentials the Council Recommendation defines as well the following concepts: 'Providers of micro-credentials', 'Learning settings', 'Formal learning', 'Non-formal learning', 'Informal learning', 'Portability', 'Stackability', 'Assessment'.
[45] The standard elements are described in the Annex I of the Council Recommendation.
[46] Are listed and described in Annex II of the Council Recommendation.
[47] See for example Ceemet (2022); Lifelong Learning Platform (2022).
[48] See for example Ceemet (2022).
[49] See for example Lifelong Learning Platform (2022).
[50] See for example Ceemet (2022).
[51] See for example Lifelong Learning Platform (2021).

A couple of interviewees placed more emphasis on the tailor-made nature and the length and pace of training:

> *"I think, up to a certain level, they could be useful because we know from the PIAAC[52] data or the Adult Education Survey data that among the main barriers to participating in adult learning, including up-skilling and re-skilling, there is the lack of time. Then providing employees with a more tailor-made package that they can attend in a limited number of hours and for which in the end they get micro-credential may have a positive effect on their participation."* University Professor of Education

> *"Among the features of micro-credentials that we appreciate, is the fact that individuals can learn gradually and at their own pace because we think that people should be given the time and the space to learn and try or be able to integrate it into their work lives and private lives and so on. Because I mean, adults very often have families"*. General Secretary of an European-level Association for Adult Learning.

Another interviewee positively assessed the flexibility of micro-credentials, especially because the European approach encompasses not only formal learning but also non-formal and informal ones. Indeed, admits, that a significant portion of the learning process takes place via everyday on-the-job experiences. In the semi-structured interview, it was specified that:

> *"We know that low-skill workers tend to participate less in training and to be less up-skilled and/or re-skilled. Micro-credentials are a much more flexible tool to recognize a course or training that you have been doing and it can be in any setting, as the Council rightly points out, being formal, non-formal and informal training. I think the flexibility of micro-credentials is an incentive for many low-skill workers to participate. Indeed, it is much easier to do so because you are doing it on the job, or also online but with the support of guidance, and in a limited amount of time. I think it can somehow reduce a little bit the inequalities."* Senior Policy Advisor at a European employer's organisation

Others, particularly European level trade unions, are concerned about the adoption of micro-credentials in general, believing that they will hinder the attainment and recognition of full qualifications that are seen as increasingly crucial in the battle against growing inequality and the need for recovery in light of the circular economy, climate change, and digitalization.[53]

1.3.1.2 Micro-credentials and their labour market relevance

There are different positions on whether and to what extent micro-credentials should be labour market relevant. One perspective argues that the European framework incorporates micro-credentials to address learners' fulfilment in addition to employment and labour market requirements[54]. Another one is more prone to consider micro-credentials as a tool to narrow skill gaps or to meet the quickly evolving market needs[55].

Both these positions have been expressed also during the semi-structured interviews:

[52] Programme for the International Assessment of Adult Competencies.
[53] See for example ETUC/ETUCE (2020).
[54] See for example EAEA (2021); ETUC/ETUCE (2020); Lifelong Learning Platform (2021).
[55] See for example Ceemet (2022); EUROCHAMBERS (2021).

"*We have been supportive from the beginning of micro-credentials because we consider them extremely useful to reply to labour market needs. The exact and key role of micro-credentials is to up-skilling, not re-skilling, but up-skilling people in a targeted manner. Since many Member States have been using micro-credentials for a long time now, and since many of the used micro-credentials are considered obsolete and not anymore up-to-date, their flexibility is essential. Being able to create new micro-credentials based on the new market requests and needs, and being able to delete the old ones because of a rapidly evolving labour market, is crucial.*" Director (Social Affairs & Training Policy) of a European-level Employer's Organisation

"From our perspective, it is critical that micro-credentials are conceived not only to meet job and labour market needs but also to consider learners' personal development and fulfilment. Education is a public good that should be centred on the students and their needs. Micro-credentials have the potential to upset the governance framework in which education systems (especially public institutions) operate; therefore, detailed guidelines should be provided to Member States to build a system that prioritises public offers while keeping learners' demands at the forefront." General Secretary of a European-level Association for Adult Learning

Furthermore, especially European-level trade unions[56] draw attention to upholding individual academic freedom and the autonomy of higher education institutions, both of which have come under pressure from labour market pressures and reductions in public funding.

1.3.1.3 Micro-credentials and stackability: some caution is needed

There is an ongoing discussion over the potential of micro-credentials to result in official and/or full qualifications.

Stackability[57] is one of the underlying principles of the Council Recommendation on micro-credentials meaning that these latter can be accumulated and grouped over time, building into a larger, more recognizable credential. The Council Recommendation does not specify whether one can stack short courses to receive a full degree. It also doesn't indicate how many ECTS points should be assigned to micro-credential courses. So it is up to the higher education and training providers to consider developing stackability of micro-credentials and what kind of courses they want to propose.

Some universities have already implemented micro-credentials, whereas others have not and oppose their use.[58] As explained, for example by the 4EU+ Alliance: "The Alliance will further explore stackability of micro-credentials into larger credentials and the possibility of offering learning pathways. Stacking models – whether and how stacking will be

[56] See for example ETUC/ETUCE (2020).

[57] In the Council Recommendation, stackability is defined as: ''the possibility, where relevant, to combine different micro-credentials and build logically upon each other. Decisions to 'stack' or combine credentials lie with the receiving organisation (e.g. education and training institutions, employers, etc.) in line with their practices and should support the goals and needs of the learner. Stacking does not create an automatic entitlement to a qualification or a degree. Such decisions are made by regional and national authorities or institutions in line with their awarding processes."

[58] For an analysis of the various positions of the Universities, University alliances and other training providers see European Commission (2022) A European approach to micro-credentials for lifelong learning and employability Summary of the Open Public Consultation.

accommodated - will greatly depend on national legislation about degree programmes and/or lifelong learning of the awarding institution(s)."[59]

At the social partners level some claim that micro-credentials can serve as an additional way to improve adult education accessibility. However, it is crucial to ensure that they do not enable the accumulation of multiple micro-credentials to get qualifications or degrees, as this would undermine the value of diplomas, degrees, and qualifications[60].

As for the opinions gathered during the semi-structured interviews conducted, on a general ground, one of the interviewees underlined that:

> *"One of the shifts that we have seen in the last 20-25 years is the shift from 'traditional' to a 'new' lifelong learning approach, which is much more about changing from a linear model where you have to do all the courses to more stackable modules"*. University Professor of Education/Adult Learning

More specifically, another interviewee stated:

> *"The point we were a little bit more cautious about is their stackability. The fact that a set of micro-credentials can lead automatically to a full qualification, in principle, is fine. Nevertheless, I think one of the points to highlight is that you should still have some sort of final assessment or exam to reach the full qualification."* Senior Adviser at a European-level Employers' Organisation

A third interviewee expressed concerns about stackability, underlying:

> *"Stackability is one of the Council Recommendation elements that surprised us. In our view, this is not the right approach because we need a very good and solid initial education or training to be able to add on micro-credentials. They can only complement, but not replace a formal qualification. In principle, we don't see any competition between full qualifications and micro-credentials, because they are complementary. Again, for us micro-credentials are more for up-skilling, whereas for re-skilling, especially in the field of digitalisation, one might need longer training."* Director (Social Affairs & Training Policy) of a European-level Employer's Organisation

1.3.1.4 Micro-credentials quality, quality assurance and best-suited subjects for ensuring quality assurance

According to the Council Recommendation, the quality of micro-credentials should be guaranteed by internal and external quality assurance by the system producing them. More specifically, external quality assurance is based primarily on the assessment of providers (rather than individual courses) and the effectiveness of their internal quality assurance procedures.

Both quality assurance of the micro-credentials, as well as, quality requirements of training providers seems to be a particularly relevant issue and source of concern[61], in particular for trade unions. As ETUC and ETUCE (2020) explain "Micro-credentials should be meaningful and have high quality. They should be based on standards on delivery mode, assessment procedure, and duration, and they should indicate how they link to full qualifications."

[59] See for example 4EU+ (2022).
[60] See for example EUROCHAMBERS (2021); ETUCE(2021); ETUC (2021).
[61] See for example ETUC/ETUCE (2020); ETUCE (2021); EURASHE (2022); IndustriAll (2021) Lifelong Learning Platform (2022). This theme is also treated more recently in Cedefop (2023), and OECD(2023).

Quality assurance can contrast the phenomenon of the widespread existence of unregulated micro-credentials and the possibility of counterfeit certifications. The market offers a vast array of micro-credentials, especially those offered outside the conventional education system. The majority of them lack regulation, quality assurance, and integration with credentialing systems. An excessive surplus can lead to depreciation, confuse learners, and erode trust among end users.

On this latter point, one interviewee underlined:

> *"Quality of micro-credentials is important as well as it is important selecting the training that makes more sense for employee and/or for the employer. In a context where there are plenty of training and training providers choosing is particularly difficult and the social partners have a key role, in guiding employees in the choice of both of the training, including those online, and of the training provider"* Senior Policy Advisor at a European Employer's organisation

As pointed out in a recent study (OECD, 2023) public authorities worldwide are actively engaged in establishing frameworks for ensuring the quality of micro-credentials or have expressed their intention to do so. Two broad techniques have been followed, similar to those used for degree programmes, which include creating either programme or institutional accreditation procedures. Some countries, on the one hand, opted for quality assurance at the programme level. Some countries, on the other hand, opted to proceed with the institutional-level quality assurance of micro-credentials.[62]

A part of the debate regards who should bear the responsibility for ensuring the quality of micro-credentials (e.g. the public sector, education providers, learners/employees, employers).

On the point of quality and who would be more suitable to be in charge of quality assurance, an interviewee underlined:

> *"Quality and quality assurance are big challenges. A source of concern is who will ensure quality assurance because there is a perceived risk that quality assurance will solely be conducted by higher education authorities or VET authorities at the national level. The lack of consideration for the perspective of adult learning providers poses a significant problem, particularly for small organisations with limited budgets. These organisations struggle to afford to pay educators and consequently lack the resources to participate in quality labels certification and similar initiatives".* General Secretary of a European-level Association for Adult Learning.

1.3.1.5 Are micro-credentials able to reduce inequality?

Whether micro-credentials can cushion social inequalities and/or inequalities in accessing learning opportunities is a matter of debate. The following are some essential arguments that need to be considered.

Cedefop (2023) referring to micro-credentials in general states: "[…]microcredentials can improve employability and be a way rapidly to address skill needs and gaps and encourage lifelong learning. Given their locus in the private sector, micro-credentials are most likely to have value primarily in the labour market rather than as a route to further learning or in terms

[62] For some examples of implementation on quality assurance experiences in EU and OECD countries see UNESCO (2023).

of social mobility; the cost of micro-credentials as private goods means that they are likely to be a source of inequality rather than a solution. One reason that micro-credentials have emerged in the private sector is as a solution to skills issues rather than in response to wider social issues or as a route to further learning […]".

Furthermore, as highlighted by ETUC (2020): "Micro-credentials can contribute to social and economic exclusion of those who obtain only micro-credentials and not full qualifications because salary levels of many collective agreements link to full qualification. […] Trade unions are concerned that those people who will obtain only micro-credentials, and not full qualifications, will lose their right for long term jobs and fair jobs. Workers in precarious situations, who are mostly female workers need more support to access training leading to full qualification".

The topic of inequality in learning participation was discussed as well during the semistructured interview. An interviewee remarked:

> *"Whether micro-credentials can help contribute to tackling inequality is a quite complex issue. While they are specifically targeted at individuals with low qualifications, to address the inequalities faced by these groups acquiring more than just micro certificates is necessary. It requires a significant amount of time and not just little training sessions. Micro-credentials can serve as a supplementary enhancement to an already strong and comprehensive foundation of education and training".* University Professor of Education/Adult Learning

Furthermore as highlighted in UNESCO (2023) "Courses and credentials will increasingly be delivered online, requiring IT infrastructure and internet access. These are unequally spread across and within countries. This digital divide affects citizens' chances to access and acquire education and training. This is one factor that slows down the spread of short courses and micro-credentials, increasing inequality in access to learning opportunities, particularly for adults."

1.4 Skills intelligence

As already stressed in the introduction**, enhancing adult learning system(s) is becoming an increasingly pressing challenge, especially in the face of digital and green transitions.** Both workers and companies are called to confront this challenge and, along with them, social partners, adult learning providers, and supranational and national institutions, each with a different, but complementary role. While involving various actors, these challenges are also multifaceted and strictly interconnected. And among them, there is the correct understanding and anticipation of "skill needs". The 'Strengthening of skill

intelligence' is the second flagship action[63] of the new European Skills Agenda 2020. 'Skills intelligence' is defined as the: "Outcome of a knowledge-driven process of collecting, selecting, combining and presenting evidence to map and anticipate labour market and skills trends". Cedefop (2021).

As for the grey literature social partners and various relevant stakeholders expressed a positive opinion towards the use of these tools[64] that were reiterated also during the semi-structured interviews.

> *"I see that there is a lack of clarity regarding the necessary skills and how to accurately predict future skill requirements. To effectively plan training, indeed, it is crucial to anticipate the specific skills that will be in demand. It is well acknowledged that there exist several employment opportunities and professions. It is difficult for anyone to provide a simple definition for something that they do not know. Furthermore, seeking employment in the labour market is exceedingly challenging. Defining the most suitable skills for the next five to ten years is a significant challenge to address."* Director (Social Affairs & Training Policy) of a European-level Employer's Organisation

> *"We believe that possessing a robust labour market and skills intelligence is of utmost importance. Undoubtedly, this aids in shaping the curricula of educational and training programmes to ensure they accurately align with the demands of the job market. We acknowledge that it is not feasible to continuously revise curricula, and there is a delay in incorporating newly developing skills into curriculum updates. However, implementing a feedback loop and utilising a method to assess marketing skills intelligence can provide valuable insights for revising curricula in both vocational and higher education institutions, with a specific focus on universities."* Senior Adviser at a European-level Employers' Organisation

As far as one aspect of the methodology regarding skill intelligence is concerned and specifically the level at which it should be carried on SMEunited (2022) suggested an important point: "Further work is needed on the identification of current skills needs and the anticipation of future skills needs, inter alia by improving forecasting analysis and tools. This is best done at a regional or sectoral level as labour market intelligence and observatories are more reliable at these levels due to their close connection with the local ecosystems and

[63] "To strengthen and disseminate skills Intelligence, the Commission will: • Support the development of new and deepened skills intelligence, including at regional and sectoral levels. Building upon the Cedefop pilot of big data analysis, a permanent online tool will be created where 'real-time' information will be published so that all interested stakeholders can use it. Partnerships to use data from private job portals and national skills intelligence will be explored. • Centralise and widely disseminate skills intelligence through the Pact for Skills, in synergy with the European Research Area. • Promote the participation of social partners in labour market projections and the identification of training needs to develop skills intelligence • Encourage the use of skills intelligence by the public and private employment services and in particular, encourage the public employment services (PES) network to promote the early identification of skills shortages and trends linked to growing job opportunities, including to better draw on the potential of intra-EU mobility and migration from third countries. • Present skills intelligence information tailored to individuals' needs in Europass, the EU platform for people to manage their learning and careers. This will assist individuals in their study, training and work choices, and help counsellors and mentors, inter alia in Public Employment Services."

[64] See for example Adapt (2021); DIGITALEUROPE (2021); Eurochambres (2021); SGI Europe (2021); SMEunited (2021, 2022); and WEC (2020).

labour market specificities. In this context, specific attention to SMEs' skills needs is necessary. SMEunited strongly highlights that current methodologies, based on the online collection of data, do not adequately reflect the skills needs of Crafts and SMEs. Instead, they capture the high-skilled jobs and skills needs of larger companies […]. Therefore, SMEunited recommends reinforcing the role of skilled craft chambers and sectoral SME organisations in skills forecasting as they are best placed to identify the current and future skills required by SMEs at local level. A mapping of the skills supply and not just the skills demand would also be useful. In addition, it is extremely important to continue working on graduate tracking."

Skill intelligence is also one of the elements of the Charter of the 'Pact for Skills'[65]. The Charter delineates a collective vision for the abovementioned stakeholders concerning the provision of high-quality training. The key principles of the Charter are: "i) Promoting a culture of lifelong learning for all; ii) Building strong skills partnerships; iii) Monitoring skills supply/demand and anticipating skills needs; iv) Working against discrimination and for gender equality and equal opportunities." Thus, it is embraced in most of the Memorandum of Understanding of Ecosystems and Large Scale Skills Partnerships.

1.5 Involvement of social partners in EU adult learning initiatives is key

Regarding social partners in the context of ILAs, micro-credentials and skill intelligence there is a large consensus on the following:

- **Social partners should further increase their involvement, intervention and collaboration in the actual implementation of ILAs and micro-credentials**. Indeed, they possess at all levels a privileged viewpoint and a comprehensive understanding of specific circumstances.
- **The effectiveness of ILAs and micro-credentials is strongly linked to their design, governance, and monitoring,** thus the involvement of social partners is essential in shaping and improving their implementation and in preventing and avoiding drawbacks. In particular social partners can:
    - Anticipate skill needs and targeting skills;
    - Contribute to the specific design and implementation of tools for the quality check processes of the training and the training providers;
    - Provide individuals with information, advice and guidance in the selection of the most suitable training;
    - Being attentive both to the market and to the employee needs;
    - Promote the inclusiveness of the measures by enhancing the learning culture, providing support for accessing, information, guidance, and motivation;
- **The relevance of the collaboration between social partners and other relevant stakeholders** such as governments and training providers, was also underlined.

[65] The 'Pact for Skills' is the first flagship action and an overarching strategic governance tool of the new European Skills Agenda 2020. It was launched by the European Commission in November 2020 as a shared engagement and approach to skills development. The primary objective of the Pact for Skills is to optimise the enhancement of current skills (up-skilling), as well as the acquisition of new skills (re-skilling). It is based on the participation of a plethora of actors (including social partners, chambers of commerce, public authorities - at the national, regional and municipal level - education and training providers, and employment agencies to collaborate) and demonstrates a strong dedication towards allocating resources to provide training opportunities to all working age individuals throughout the European Union.

2. Chapter 2. Skill intelligence: skills demand and its digital and green content

The so-called “labour market skills intelligence” (LMSI), is defined as the: “Outcome of a knowledge-driven process of collecting, selecting, combining and presenting evidence to map and anticipate labour market and skills trends” Cedefop (2021)[66]. More generally it is meant as a skills anticipation mechanism that has been recognized as a fundamental tool also in the selection of the training opportunities.

The twin transition made the reorganizing of work more urgent and quite transversal across occupations and sectors. Among the various aspects of the reorganization, equipping the workers with new or updated skills, including digital and green ones seems to rank very high. This kind of investment is risky in financial and cost opportunity terms from the companies’ and workers’ perspectives. Briefly summarizing a complex mechanism, both individuals and firms face disincentives to invest in further education and training based on an individual cost-benefit analysis. The deterrent component for companies and workers is linked to a foregone investment. On the one hand, companies are worried about losing their staff because of turnover and because other companies may offer higher salaries as they save on training expenditures. On the other hand, workers are worried about lost wages, time or family obligations. When selecting how much to spend on training, both sides of an employment relationship sometimes fail to see the (shared) advantages. The risk may increase when there is a lack of awareness about the skills required by the fast-changing environment or when these latter are disregarded, not correctly interpreted, understood and anticipated with a certain degree of vision and foresight. On the contrary, being successful concerning this aspect of reorganization represents an 'insurance' against the quick obsolescence of the process, the product and the skills. It may be, then, crucial to the survival of the company and the workers' stability (or their mobility across different job opportunities), to invest in the right direction when upskilling or reskilling. While companies and workers are more directly involved in understanding the skill need, guidance from the social partners and the national and supranational institutions may prove to be key.

Many authors admitted that it is particularly difficult to anticipate the skill need, some of which are not yet known. As highlighted by ILO (2020), the fast-changing environment “[...] is turning the task of identifying skills need into the pursuit of a fast-moving target that is hard, if not impossible, to hit”. Simultaneously, uncertainty and disruption increased the threshold of expectation in anticipating the skills needed by future occupations (along with an evaluation of the time necessary to up-skill and re-skill)[67]. Furthermore, the anticipation of skill need is associated with the anticipation of jobs and, thus, is linked to many other complex aspects that include the dynamics in the labour market, under the aspect of job creation, destruction, transformation, and automation, the skill gap and the skill mismatch (shortages and surpluses).

[66] For similar definitions by Cedefop with more details see:
https://www.cedefop.europa.eu/en/blog-articles/crafting-skills-intelligence
https://www.cedefop.europa.eu/en/tools/vet-glossary/glossary?letter=S
https://www.cedefop.europa.eu/files/9164_en_0.pdf

[67] While skill needs anticipation is key, companies can approach the issue of a possible skill gap in different ways. Indeed, they can hire people with the right skills from outside the company. They can train their current employees to get them ready for new jobs by giving them new skills. Or, they can use a mix of methods, such as hiring skilled contract workers to meet short-term needs while developing the skills they need in-house.

2.1 Brief literature review on skill intelligence methodologies

Considerable attention and resources are dedicated to the field of skill intelligence mainly by international institutions and research institutes. One of the aspects of their diverse contribution lies in the way the information on the demand and supply side of skills is gathered. Indeed, on the one hand, data acquired from online job advertisements (OJAs) and employer surveys can provide information about the skill demand. On the other hand, data obtained from employee surveys or comprehensive skills tests can offer insights into the skill supply.

On various methodologies for gathering data both from the demand and the supply side Cedefop (2021a, 2021b, 2021c) prepared a series of three practical "how-to" guides, addressed to researchers and policymakers, for identifying the skills needed. The guides give a varied assortment of approaches, both established and newly developed, with a detailed analysis of benefits and drawbacks highlighting that no one way can give all of the answers. In anticipating the new skills need, the first practical guide (Cedefop, 2021a) focuses on traditional techniques including skills surveys and skills forecast, the second guide (Cedefop, 2021b) takes into consideration the big data and AI-driven analyses, the third one (Cedefop, 2021c) focus on participatory methods[68]. The various approaches with a short description are summarized in **Table 1.**

Table 1. Tools for carrying out skills assessment and anticipation

Descriptive statistics/stock-taking	Estimates of overall demand and supply of skills and technology use, based on collating data from various sources (for example, sector skill studies).
Quantitative forecasting	Forecasting or projecting future demand for skills typically using econometric modelling.
Skills and jobs surveys (questionnaire survey)	Assessment of demand for and supply of, skills and technology use, usually with an assessment of the extent to which demand and supply are in balance.
Graduate tracer studies	Using matched administrative datasets or surveys to track people through education and the labour market to see how the former influences the latter.
Qualitative research	Use of non-quantitative techniques to gauge in-depth information about current and future skill demand/supply and technology trends, e.g. via company case studies, use of focus group.
Foresight	Critical thinking about the future of skills supply/demand and technology trends using participatory methodologies.
Big data	Use of web sourcing combined with text mining and machine learning approaches to collect and classify data about skills, vacancies, technologies

Source: Cedefop (2021a, 2021b and 2021c)

[68] See also Napierala, Kvetan and Branka (2022) and Napierala (2023).

In a similar vein, there are the researches conducted by ILO (2010, 2015) and OECD (2016) as well as jointly by ILO, Cedefop, and ETF (2016a, 2016b, 2016c) that carried out between 2015 and 2017 a project having as aim the redaction of a guide for the design of methods, tools and institutional solutions for anticipation and matching skills. Also, ILO (2020) analyzed how big data analytics can help to anticipate in a better and faster way the skill needs. More recently Cedefop; European Commission, ETF, ILO, OECD, and UNESCO (2021) redacted a document to assist professionals and policymakers who are interested in participating in discussions regarding the possibilities of web-based big data for skills policy. The document delineates how this data might be utilised to alleviate issues in the labour market and skills mismatches[69]. Illustrative instances of global big data efforts demonstrate its potential and offer valuable insights into how big data is already assisting policy-makers in defining the future of work and education. The perspective of the European Commission – Joint Research Centre adds that: "From a policy angle, the next step requires the identification of education and training policies that enable a good match between supply and demand, in terms of both quantity and quality. This is challenging to achieve, as it requires establishing a clear relationship between the skills used in the labour market and education and training content and pathways. For training and adult learning, the main issue is to identify what type of intervention is needed to reskill or upskill individuals."[70]

2.2 Quantitative exercise on skills that are most in demand and their digital and green incidence

Among the considerations made in the first D1.1 deliverable of the I SKILL project[71], the need to have a workforce prepared to face the challenges of the twin transition was frequently emphasised. Labour and skills shortages, whereby it is becoming increasingly difficult to find individuals with the right skills, were also discussed, and much was said about digital and green skills that are becoming increasingly common. I SKILL focussed in particular on employed individuals, but it can be interesting to look at the overall labour demand to understand which are, at the present moment, the skills that are most in demand and their digital and green incidence. More specifically, the research questions we would like to address in this quantitative exercise are:

- **Is there a correlation between the percentage of skills in demand and their digital and green incidence?**
- **Does this association vary depending on specific sectors and/or occupations?**
- **Does this phenomenon occur repeatedly, and what are the potential explanations?**

2.2.1 Methodology

To answer these questions, a methodology based on cross-referencing data from Skills-OVATE[72] (Cedefop and Eurostat) and ESCO[73] (European Commission) will be used. The

[69] The document provides also Illustrative instances of global big data efforts demonstrating its potential and offers valuable insights into how big data is already assisting policy-makers in defining the future of work and education.

[70] See Rodrigues et al. (2022); Sostero and Tolan (2022).

[71] https://www.ceps.eu/ceps-publications/an-analytical-framework-on-industrial-relations-and-social-dialogue-for-adult-learning-in-a-changing-europe/

[72] https://www.cedefop.europa.eu/en/tools/skills-online-vacancies

[73] https://esco.ec.europa.eu/en

investigation will consider the EU 27 and the period between the third quarter of 2022 (Q3_2022) and the second quarter of 2023 (Q2_2023)[74] to picture the most recent moment.

Within the scope of this study, it is important to emphasise certain characteristics of ESCO and Skills-OVATE, as well as the point of intersection between the two that enables cross-referencing.

- **ESCO** (European Skill/Competences, Qualification and Occupation Classification), which recently reached its 13th version (V1.1.1), is a tool providing a taxonomy, translated into 28 languages, that details 13890 different concepts of skill and knowledge organised in a hierarchical structure comprising four sub-classifications: “transversal skills and knowledge” “skills”, “knowledge” and “language skills and knowledge". Among the abovementioned concepts, there is a “digital collection”[75] (of which 725 “skills” and 475 “knowledge”) and a “green collection” (of which 384 “skills” and 185 “knowledge”).
- **Skills-OVATE** (Skills Online Vacancy Analysis Tool for Europe) is a tool providing detailed and up-to-date information about the jobs and skills the employers demand through online job advertisements (OJAs) in 27 European Member States[76]. Skills-OVATE presents data for the last four available quarters and is updated four times a year. It provides access to a vast amount of information derived from millions of OJAs gathered from various sources, including private job portals, public employment service portals, recruiting agencies, online publications, and business websites.

The **cross-referencing**, as far as “skills” and “knowledge” are concerned, is based on the fact that Skills-OVATE adopts the ESCO classification. In this research, our focus goes exclusively on “skills”[77]. Furthermore, it is worth mentioning that ESCO's concept of “skills” is organised in a hierarchical structure of six levels[78]. The skills belonging to the first four levels (Level 0, Level 1, Level 2 and Level 3) have a unique identification code[79], while those belonging to the fifth and sixth levels do not have an identification code. Every level, save for the last one, consists of a hierarchical collection of skills, meaning a group of skills rather than a single skill.

For this research the descriptive statistics part will analyse the "skills" at ESCO Level 1 and ESCO Level 2. However, for the correlation analysis part, the calculations have been conducted at a more thorough level, ESCO Level 3, which is the key element for our cross-referencing.

[74] That is the last available data in Skills-OVATE at the moment this paper is finalised.

[75] For further details see: European Commission (2022), “Digital Skills and Knowledge Concepts: Labelling the ESCO classification”, Technical Report – October 2022.

[76] And the UK, and more recently, from January 2023 also Iceland, Liechtenstein, Norway, and Switzerland.

[77] Thus the other three concepts, “transversal skills and knowledge”, “knowledge” and “language skills and knowledge" are excluded. In the future, as a robustness check, the exercise can be extended also to the concept of “knowledge”.

[78] As the first level is called “0” it is preferable to refer in the rest of the paper to the following nomenclature: Level 0, Level 1, Level 2, etc.

[79] Moreover, for each skill, ESCO offers a unique preferred term (PT) that is defined as follows: “The preferred term is used to represent a concept in ESCO in a specific language. Out of a group of terms with similar meanings, the one that best represents the concept is chosen to be the preferred term” European Commission (2022), “Digital Skills and Knowledge Concepts: Labelling the ESCO classification”, Technical Report – October 2022.

The first point of interest consists in understanding whether there is a correlation between the percentage of skills in demand and their digital and green incidence. This, in a more accurate and technical language, translates into the correlation between the percentage of online job advertisements (OJAs) that require a specific hierarchical group of skills (e.g., at ESCO level 3) and the percentage of digital (green) skills present in the same hierarchical group of skills (e.g., at ESCO level 3).

- The percentage of online job advertising that requires a particular hierarchical group of skills is determined by dividing the number OJAs mentioning a specific skills group by the total number of OJAs. The calculation of this indicator is already provided on the Skill-OVATE platform. The ranking of the percentage identifies the skills (specifically, the hierarchical group of skills) that are in the greatest (smallest) demand.
- The percentage of digital (green) skills, present in a hierarchical group of skills, has been calculated as follows:

  '**incidence of digital skills'** and **'incidence of green skills'**, namely the frequency with which individual digital skills[80] (green skills) occur within each hierarchical group of skills (in this case at ESCO level 3).

$$IDS_{iL3} = \frac{N\_DS_{iL3}}{N\_TS_{iL3}} \quad (EQ1) \qquad IDG_{iL3} = \frac{N\_GS_{iL3}}{N\_TS_{iL3}} \quad (EQ2)$$

  In equations EQ1 and EQ2, IDS stays for 'incidence of digital skills" ('incidence of green skills'), N_DS and N_GS are the numbers of individual digital skills (green skills) found in each (*i*) hierarchical group of skills at ESCO Level 3 (*L3*) that includes 308 groups (in ESCO version V1.1.1). N_TS is the total number of skills in each hierarchical group of skills at ESCO Level 3 (*L3*).

For brevity, the rest of the paper will refer to the Skills-OVATE indicator as the '**incidence of skills in demand' (ISiD)** and to the indicators calculated by the author with ESCO data as the **'incidence of digital skills' (IDS)** and **'incidence of green skills' (IGS)**. Furthermore, it is worth considering that Skills-OVATE microdata allows also for computing the above-mentioned indicator for different breakdowns including by sectors (NACE Rev.2) and occupations.

2.2.2 Descriptive statistical analysis

This section will provide some descriptive statistics on the percentages of online job advertisements by sector, by occupation and by hierarchical group of skills (at ESCO Level 1)[81]. Furthermore, we present the average value of the "incidence of digital skills" and the "incidence of green skills" (at ESCO level 1)[82].

[80] Of level four or five in the hierarchical scheme.
[81] The percentage of a hierarchical group of skills at ESCO level 2 is provided in the Annex.
[82] The "incidence of digital skills" and the "incidence of green skills" at ESCO level 2 are provided in the Annex.

Table 1a. Percentages of Online Job Advertisements by sector[83], EU27, Q3_2022 – Q2_2023.

Sectors	% OJAs
Manufacturing	15.81%
Administrative and support service activities	15.19%
Consultancy, marketing, accounting and legal services	8.91%
Wholesale and retail trade; repair of motor vehicles and motorcycles	7.56%
Information and communication	6.49%
Human health and social work activities	4.80%
Transportation and storage	4.72%
Financial and insurance activities	4.44%
Education	4.13%
Accommodation and food service activities	3.95%
Technical, engineering and R&D activities	3.16%
Other professional activities	2.96%
Employment activities	2.93%
Sector not classified	2.90%
Construction	2.81%
Other service activities	2.61%
Public administration and defence	2.45%
Electricity, gas, steam and air conditioning supply	1.85%
Real estate activities	0.88%
Arts, entertainment and recreation	0.63%
Water supply; sewerage, waste management and remediation activities	0.55%
Agriculture, forestry and fishing	0.23%
Mining and quarrying	0.01%

Source: Cedefop and Eurostat Skills-OVATE
Note: Ordered from largest to smallest percentage. The cumulative percentage is 100%.

When examining the percentage of online job advertisements by sector **(Table 1a)**, Manufacturing has the highest rate at 15.9%, closely followed by Administrative and support services activities at 15.2%. The rate falls below 10% for Consultancy, marketing, accounting and legal services (8.9%), Wholesale and retail trade, repair of motor vehicles and motorcycles (6.5%), and Information and communication (6.5%). All other economic activities exhibit a proportion of online job advertisements below 5%, ranging from a

[83] Sectors correspond to NACE Rev.2 categories, in most of the cases at 1-digit level and, in some cases, at 2-digit levels. In particular, we have: Agriculture, forestry and fishing (NACE A) Mining and quarrying (NACE B), Manufacturing (NACE C), Electricity, gas, steam and air conditioning supply (NACE D), Water supply; sewerage, waste management and remediation activities (NACE E), Construction (NACE F), Wholesale and retail trade; repair of motor vehicles and motorcycles (NACE G), Transportation and storage (NACE H), Accommodation and food service activities (NACE I), Information and communication (NACE J), Financial and insurance activities (NACE K), Real estate activities (NACE L), Consultancy, marketing, accounting and legal services (NACE M69, M70, M73), Technical, engineering and R&D activities (M71 and M72), Other professional activities (M74 and M75), Administrative and support service activities (NACE code N), Employment activities (NACE N78), Public administration and defence (NACE O), Education (NACE P), Human health and social work activities (NACE Q), Arts, entertainment and recreation (NACE R), Other service activities (NACE S) and Sector not classified.

maximum of 4.8% for Human health and social work activities to a minimum of 0.01% in Mining and quarrying.

Table 1b. Percentages of Online Job Advertisements by occupation[84], EU27, Q3_2022 – Q2_2023.

Occupations	OJAs %
Professionals	23.84%
Technicians and associate professionals	18.50%
Service and sales workers	12.11%
Elementary occupations	11.06%
Clerical support workers	9.88%
Craft and related trades workers	9.71%
Managers	7.71%
Plant and machine operators and assemblers	7.02%
Skilled agricultural, forestry and fishery workers	0.18%

Source: Cedefop and Eurostat Skills-OVATE
Note: Ordered from largest to smallest percentage. The cumulative percentage is 100%.

When examining the percentage of online job advertisements by sector **(Table 1b)**, the professional category is the one to which the highest percentage of oja is allocated (23.84%). Following in the second and third rank are the online job advertisements related to Technicians and associate professionals, accounting for 18.50% of the total, and to Service and sales workers, accounting for 12.11% of the total. Elementary jobs' online job advertisements constitute 11% of the total. The online job advertisements for the remaining five occupations show percentages that are less than 10%.

Table 1c. Incidence of skills in demand (ESCO level 1), EU27, Q3_2022 – Q2_2023

Code ESCO level 1	Preferred Term ESCO Level 1	OJAs %
S1	Communication, collaboration and creativity	60.34%
S5	Working with computers	46.94%
S4	Management skills	44.82%
S2	Information skills	20.96%
S3	Assisting and caring	20.05%
S6	Handling and moving	9.28%
S8	Working with machinery and specialised equipment	8.34%
S7	Constructing	4.17%

Source: Cedefop and Eurostat Skills-OVATE
Note: Ordered from largest to smallest percentage. The cumulative percentage surpasses 100% due to the possible presence of multiple hierarchical skill groups in an online job posting.

[84] Occupations correspond to ISCO-08 ad 1-digit: Managers (ISCO-08 code 1), Professionals (ISCO-08 code 2), Technicians and associate professionals (ISCO-08 code 3), Clerical support workers (ISCO-08 code 4), Service and sales workers (ISCO-08 code 5), Skilled agricultural, forestry and fishery workers (ISCO-08 code 6), Craft and related trades workers (ISCO-08 code 7), Plant and machine operators and assemblers (ISCO-08 code 8), Elementary occupations (ISCO-08 code 9).

Table 1c shows that online job advertisements are concentrated in the hierarchical skill group Communication collaboration and creativity with a percentage of 60.34%. The online job advertisements that include skills from the hierarchical groups of Working with computers (46.94%) and Management skills (44.82%) are likewise highly ranked. The skills belonging to the hierarchical categories of Information skills and Assisting and caring skills appear less frequently with a percentage of around 20% in both cases. Last in the ranking of appearance in online job advertisements are the skills belonging to the hierarchical groups Working with machinery and specialised equipment and Constructing (with a percentage below 10%).

Table 2ab. Incidence of digital skills (IDS) of Incidence of green skill (IGS), by a hierarchical group of skills at ESCO level 1.

Code ESCO level 1	Preferred Term ESCO Level 1	IDS	IDG
S5	Working with computers	77.4%	1.5%
S2	Information skills	12.9%	3.2%
S8	Working with machinery and specialised equipment	5.9%	1.6%
S1	Communication, collaboration and creativity	4.8%	2.2%
S4	Management skills	3.1%	1.6%
S7	Constructing	2.6%	5.2%
S3	Assisting and caring	2.0%	2.1%
S6	Handling and moving	0.5%	5.4%

Source: Own elaboration on ESCO
Note: Ordered from largest to smallest percentage of IDS.

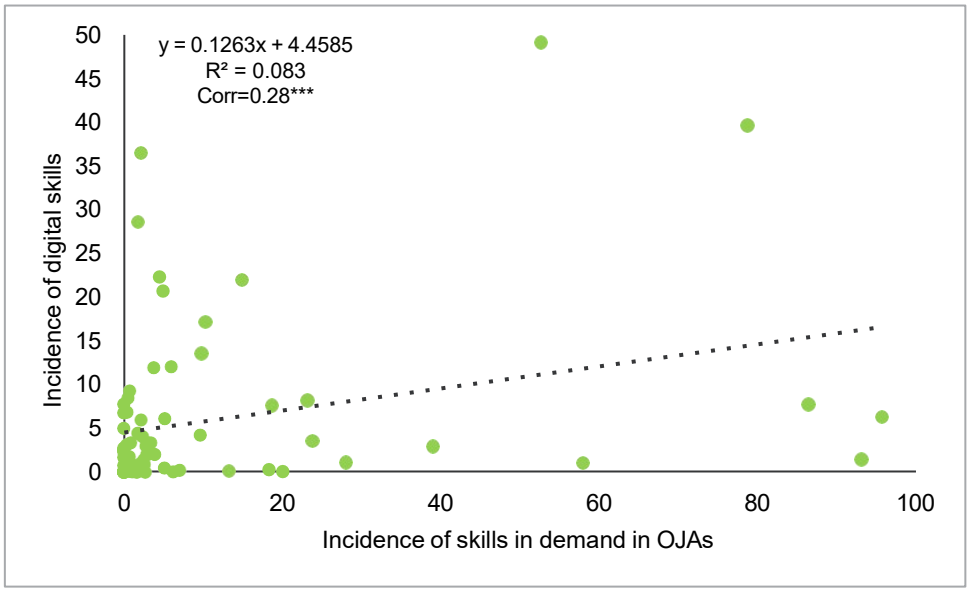
Across the hierarchical group of skills at ESCO Level 1, the average incidence of digital skills is 13.7% whereas the incidence of green skills is much lower with 2.9%. As expected, the incidence of digital skills is particularly high (77.4%) in the hierarchical group of skills at ESCO Level 1 S5, Working with computers, and then drops sharply to 12.9% for 'Information skills'. The incidence of green skills is always pretty low and does not exceed the 5.5% ceiling.

2.2.3 Correlation analysis and results

This section is dedicated to the correlation analysis between the share of OJAs in which a hierarchical group of skills is demanded and the share of digital (green) skills present in the same hierarchical group of skills. For brevity, as already highlighted, we will refer to 'incidence of skills in demand' (ISiD) and to the indicators calculated by the author with ESCO data as the 'incidence of digital skills' (IDS) and 'incidence of green skills' (IGS). The following results were found:

- **An overall positive and statistically significant association** with the incidence of digital skills that, nevertheless, is low with a value of 0.28 (Figure 1). There is no association with the incidence of green skills (results not shown).

Figure 1. Correlation between 'incidence of skills demanded in OJAs" and "Incidence of digital skills



Source: Own elaboration on ESCO and Skills-OVATE

The statistically significant correlation is mostly associated with the occupational dimension rather than the sectorial dimension. Additionally, **the occupations that consistently demonstrate a considerable correlation remain mostly unaltered**. This means that the hierarchical skill groups that are most in demand and that, at the same time, contain the highest percentage of digital skills are always associated with the same type of occupation. This result is derived by computing the correlation between the incidence of skills in demand and the incidence of digital skills within sectors and between occupations (see Tables 2Aa-2Ag in the Annex).[85] More in detail:

- **A positive and statistically significant correlation was observed across all sectors when occupations were taken into account altogether** (see 'All ISCO' rows in Tables 2Aa-2Ag in the Annex). However, the correlation indices exhibit low values, ranging from a minimum of 0.10 for Accomodation and food service activities[86] to a maximum of 0.27 for Information and communication[87].
- **The overall correlation is influenced by the positive correlations detected exclusively in certain occupations. This evidence remains consistent across all sectors.** The occupations involved are primarily: Professionals (in all sectors), Clerical support workers (in all sectors) followed by Technicians and associate professionals (in 16 out of 21 sectors), Managers (in 10 out of 21 sectors) and, marginally, Service and sales workers (in 2 out of 21 sectors) and Plant and machine operators (in 1 out of 21 sectors).
- The correlation coefficients exhibit a relatively low value. They remain within the bounds of the highest value of 0.57 recorded for Professionals operating in the

[85] Very similar results are obtained when by computing the correlation between the incidence of skills in demand and the incidence of digital skills within occupations and between sectors. Results not shown.
[86] NACE Rev.2 code I.
[87] NACE Rev.2 code J.

Information and communication sector. The correlation coefficients for the following groups exhibit the highest values on average: Professionals (0.41), Clerical support workers (0.31), Technicians and associate professionals (0.30), and Managers (0.25).

- The correlation coefficients exhibit a considerable variation in value, ranging from 0.32 for Human health and social work activities (NACE Q) to 0.57 for Information and communication (NACE J) for Professionals. In addition, for Clerical support personnel, it varies from 0.22 in Transportation and storage (NACE H) to 0.43 in Mining and quarrying (NACE B). Technicians and associate professionals exhibit correlation indices ranging from 0.23 for Real estate activities (NACE L) to 0.42 for Finance (NACE K). A correlation index of 0.22 is observed for Managers in the sector of education activities (NACE P) and 0.25 is that of Information and communication (NACE J). The complete set of results can be found in Table A2a-A2g of the Annex.

Concerning the correlation with the incidence of green skills, no statistically significant association is recorded at the sector level. The only exception is for the Real estate sector and Skilled agricultural, forestry and fishery workers.

There may be an economic explanation for the fact that the hierarchical categories of skills containing digital skills are confined to four specific occupations (in order of relevance Professionals, Clerical support workers, Technicians and associate professionals, and Managers). Regardless of the sector, digital skills are only in demand among occupational categories that may have in common a medium-high average income. Such an insight merits additional investigation.

As far as green skills are concerned the possible explanation, instead, can be that they are still not very common in the OJAs.

3. Conclusions

This working paper focuses on three specific Actions of the European Skills Agenda 2020: Action 9, the 'Initiative on individual learning accounts', Action 10, the 'European approach to micro-credentials', and Action 2 'Strengthening of skill intelligence'. These three measures are interconnected and each of them, with its own objective, should help to achieve the ambitious aim established by the European Pillar of Social Rights Action Plan of reaching at least 60% of all adults to participate in training every year by 2030. The study is divided into two chapters. Chapter 1 focuses on the qualitative examination of the abovementioned Actions taking into account the development of the measures being examined, followed by a review of the grey literature (i.e. the perspectives, primarily expressed in position papers, of the different social partners and other relevant stakeholders) in addition to the presentation of the findings from the semi-structured interviews carried out by CEPS in Spring 2023. In Chapter 2, the discussion expands on skill intelligence, with a concise overview of the scientific literature and an empirical exercise whose aim is to investigate whether a correlation exists between the skills that are in high demand and their digital and green content. The quantitative part relies on cross-referencing data from Skills-OVATE and ESCO for the EU 27 from Q3_2022 to Q2_2023.

The mixed methodology adopted in this paper, which sees both qualitative and quantitative analysis, leads to the following key findings:

In the **first Chapter**:

- Both the European Union and the EU Member States are prioritising initiatives that promote adult learning. The setting in which these policies are contextualised is complex and multiple forces are at work.

The main challenges that have been generally recognised are:

- Labour, knowledge and skills shortages and mismatches.
- Adult learning and continuing training strategies need to address a very large number of individuals and skills.
- Adult learning, up-skilling, and re-skilling need to be inclusive.
- Social partners, trade unions and employers' organisations, are called to further strengthen their efforts, along with other relevant stakeholders.
- The role of social partners in adult learning is paramount, with the expectation that their participation will progressively intensify in guaranteeing the right to training, enhancing access to lifelong/adult learning, evaluating its quality, and motivating employees to engage in training. Furthermore, they have an active role in promoting lifelong learning by influencing policy, sharing knowledge about effective strategies, and fostering a supportive atmosphere that acknowledges its significance.

Regarding specific measures, it is crucial to emphasise that while various social partners, stakeholders, and experts generally support individual learning accounts and the European approach to micro-credentials, they would have favoured more decisive actions in establishing a universal right to training. These initiatives would have had a greater impact in terms of diminishing disparities and incorporating the most vulnerable groups. The further specific results related to individual learning accounts, micro-credentials and skills intelligence are detailed in the devoted sections.

The **second Chapter** aims to address whether there is a correlation between the proportion of skills that are most in-demand and their digital and green content and whether this correlation is linked to specific sectors and/or occupations. To answer these questions, data from Skills-OVATE and ESCO have been cross-referenced with referring to the EU 27 and the period Q3_2022-Q2_2023. A correlation analysis between the share of OJAs in which a hierarchical group of skills is demanded and the share of digital (green) skills present in the same hierarchical group of skills (for brevity named ‘incidence of skills in demand’, ‘incidence of digital skills’, ‘incidence of green skills’, respectively) led to the following main results:

- An overall positive and statistically significant association with the incidence of digital skills that but with a low value.
- No association with the incidence of green skills.

By computing the correlation between the incidence of skills in demand and the incidence of digital skills within sectors and between occupations (and also within occupations and between sectors) it is found that:

- The statistically significant correlation is mostly associated with the occupational dimension rather than the sectorial dimension.
- The occupations that consistently demonstrate a considerable correlation remain mostly unaltered. This means that the hierarchical skill groups that are most in demand and that, at the same time, contain the highest percentage of digital skills are always associated with the same type of occupation.

- Economic factors may explain the fact that the hierarchical categories of skills containing digital skills are confined to four specific occupations (Professionals, Clerical support workers, Technicians and associate professionals, and Managers). Regardless of the sector, digital skills are only in demand among occupational categories that may have in common a medium-high level of income.
- As far as green skills are concerned the possible explanation, instead, can be that they are still not very common in the OJAs.

Appendix

Table A1. Incidence of skills in demand (ISiD), Incidence of digital skills (IDS) of Incidence of green skill (IGS), by a hierarchical group of skills at ESCO level 2, EU27, Q3_2022 – Q2_2023.

Code ESCO level 2	Preferred Term ESCO Level 2	ISiD	IDS	IDG
S1.0	Communication, collaboration and creativity	7%	0%	0%
S1.1	Negotiating	0.9%	0.8%	0.8%
S1.2	Liaising and networking	36.5%	2.1%	0.9%
S1.3	Teaching and training	6.1%	5.1%	4.2%
S1.4	Presenting information	5.9%	2.2%	0%
S1.5	Advising and consulting	4.4%	1.7%	7.4%
S1.6	Promoting, selling and purchasing	28.6%	1.7%	3.0%
S1.7	Obtaining information verbally	2.0%	2.9%	0.0%
S1.8	Working with others	6.8%	0.4%	0.4%
S1.9	Solving problems	22.0%	14.9%	5.8%
S1.11	Designing systems and products	8.1%	23.1%	9.7%
S1.12	Creating artistic, visual or instructive materials	17.1%	10.2%	0%
S1.13	Writing and composing	0.5%	5.1%	0.5%
S1.14	Performing and entertaining	8.4%	0.5%	0%
S1.15	Using more than one language	0.6%	1.6%	0%
S2.0	Information skills	0.0%	20.0%	0.0%
S2.1	Conducting studies, investigations and examinations	2.0%	3.9%	2.4%
S2.2	Documenting and recording information	4.0%	2.3%	1.6%
S2.3	Managing information	2.9%	39.0%	0.0%
S2.4	Processing information	3.5%	23.7%	0.7%
S2.5	Measuring physical properties	0.0%	1.6%	7.4%
S2.6	Calculating and estimating	3.3%	3.4%	3.4%
S2.7	Analysing and evaluating information and data	7.6%	18.6%	10.0%
S2.8	Monitoring, inspecting and testing	3.0%	2.8%	6.0%
S2.9	Monitoring developments in area of expertise	0.0%	13.2%	0.9%
S3.0	Assisting and caring	0.0%	0.0%	0.0%
S3.1	Counselling	0.0%	1.7%	1.7%
S3.2	Providing health care or medical treatments	3.1%	0.4%	0%
S3.3	Protecting and enforcing	13.5%	9.7%	12.3%
S3.4	Providing information and support to the public and clients	1.4%	2.5%	0.8%
S3.5	Preparing and serving food and drinks	3%	0%	0%
S3.6	Providing general personal care	3%	0%	0%
S4.0	Management skills	0.0%	6.2%	1.5%
S4.1	Developing objectives and strategies	12.0%	5.9%	7.2%
S4.2	Organising, planning and scheduling work and activities	22.3%	4.4%	2.4%
S4.3	Allocating and controlling resources	9.2%	0.7%	1.9%
S4.4	Performing administrative activities	20.7%	4.9%	0%
S4.5	Leading and motivating	0.9%	2.6%	0%
S4.6	Building and developing teams	0%	0%	0%
S4.7	Recruiting and hiring	8%	0%	0.0%
S4.8	Supervising people	11.9%	3.7%	0.7%
S4.9	Making decisions	0.0%	2.7%	2.7%

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 2.

Table A1 cont. Incidence of skills in demand (ISiD), Incidence of digital skills (IDS) of Incidence of green skill (IGS), by a hierarchical group of skills at ESCO level 2, EU27, Q3_2022 – Q2_2023.

Code ESCO level 2	Preferred Term ESCO Level 2	ISiD	IDS	IDG
S5.0	Working with computers	1.4%	93.1%	0%
S5.1	Programming computer systems	6.2%	95.7%	0%
S5.2	Setting up and protecting computer systems	7.7%	86.4%	4.9%
S5.5	Accessing and analysing digital data	49.1%	52.6%	4.3%
S5.6	Using digital tools for collaboration, content creation and problem solving	39.6%	78.7%	0%
S5.7	Using digital tools to control machinery	1.0%	57.9%	0%
S6.0	Handling and moving	n.a.	0%	0%
S6.1	Sorting and packaging goods and materials	0.6%	1.4%	4.1%
S6.2	Moving and lifting	1.8%	0.7%	1.4%
S6.3	Transforming and blending materials	1.7%	0.6%	1.9%
S6.4	Tending plants and crops	0%	0%	12.9%
S6.5	Assembling and fabricating products	0.7%	1.1%	0%
S6.6	Making moulds, casts, models and patterns	0.3%	2.2%	0%
S6.7	Using hand tools	2%	0%	0%
S6.9	Handling animals	0.1%	0.3%	0.6%
S6.11	Cleaning	5%	0%	0%
S6.12	Washing and maintaining textiles and clothing	0%	0%	0%
S6.13	Handling and disposing of waste and hazardous materials	0%	0%	43.9%
S7.0	Constructing	0%	0%	11.1%
S7.1	Building and repairing structures	4.2%	9.5%	1.2%
S7.2	Installing interior or exterior infrastructure	0.0%	1.1%	8.6%
S7.3	Finishing the interior or exterior of structures	1%	0%	0%
S8.0	Working with machinery and specialised equipment	0.2%	7.0%	1.2%
S8.1	Operating mobile plant	0.2%	0.7%	1.4%
S8.2	Driving vehicles	3.3%	0.9%	0%
S8.3	Operating watercraft	0.0%	1.6%	0%
S8.4	Operating machinery for the extraction and processing of raw materials	2%	0%	5.0%
S8.5	Operating machinery for the manufacture of products	1.0%	2.1%	0.7%
S8.6	Using precision instrumentation and equipment	1.1%	28.0%	0.9%
S8.7	Installing, maintaining and repairing mechanical equipment	1.4%	0.6%	1.3%
S8.8	Installing, maintaining and repairing electrical, electronic and precision equipment	0.2%	18.3%	5.4%
S8.9	Operating aircraft	n.a.	0%	0%

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 2.

Table A2a. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		A - Agriculture, forestry and fishing			B - Mining and quarrying			C - Manufacturing		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.20*** **	1		**0.16** **	1		**0.19*** **	1	
	IGS	0.06	-0.01	1	0.03	0.00	1	0.02	-0.05	1
1 - Managers	ISiD	1			1			1		
	IDS	0.21	1		**0.34** **	1		**0.22***	1	
	IGS	0.09	-0.01	1	-0.08	0.12	1	0.10	-0.03	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.46*** **	1		**0.37** **	1		**0.43*** **	1	
	IGS	0.09	-0.04	1	0.07	-0.04	1	0.01	-0.07	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.26** **	1		0.23	1		**0.31** **	1	
	IGS	0.11	-0.02	1	0.13	-0.02	1	0.11	-0.02	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.33*** **	1		**0.43** **	1		**0.26** **	1	
	IGS	0.06	0.00	1	0.03	0.11	1	0.08	-0.02	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.07	1		**0.47** **	1		0.04	1	
	IGS	0.04	-0.01	1	0.04	0.12	1	0.03	-0.03	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.17	1		n.a.	1		-0.05	1	
	IGS	0.01	-0.05	1	n.a.	n.a.	1	0.08	-0.02	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	0.02	1		0.04	1		0.07	1	
	IGS	0.14	0.01	1	-0.07	-0.04	1	-0.11	-0.05	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.05	1		0.13	1		0.10	1	
	IGS	0.01	0.07	1	0.09	-0.04	1	-0.07	-0.08	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.12	1		-0.03	1		-0.08	1	
	IGS	0.23	-0.05	1	-0.23	-0.31	1	-0.05	-0.08	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

Table A2b. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		D - Electricity, gas, steam and air conditioning supply			E - Water supply; sewerage, waste management and remediation activities			F - Construction		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.20*** **	1		**0.19*** **	1		**0.24*** **	1	
	IGS	0.07	-0.03	1	0.03	-0.02	1	0.04	-0.03	1
1 - Managers	ISiD	1			1			1		
	IDS	0.21	1		0.22	1		**0.26** **	1	
	IGS	0.09	-0.03	1	0.09	0.00	1	0.07	-0.03	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.40*** **	1		**0.41*** **	1		**0.42*** **	1	
	IGS	0.15	0.00	1	0.09	-0.04	1	0.09	-0.03	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.27** **	1		**0.25** *	1		**0.34*** **	1	
	IGS	0.10	-0.02	1	0.09	-0.03	1	0.09	-0.02	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.31** **	1		**0.30** **	1		**0.36*** **	1	
	IGS	0.09	0.04	1	0.06	0.01	1	0.04	0.01	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.11	1		0.05	1		0.13	1	
	IGS	0.04	-0.02	1	-0.02	-0.05	1	0.05	-0.02	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	0.07	1		-0.11	1		0.15	1	
	IGS	-0.02	-0.17	1	0.19	0.05	1	-0.08	-0.10	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	0.05	1		0.05	1		0.10	1	
	IGS	0.01	-0.02	1	-0.09	0.09	1	-0.01	-0.05	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.09	1		-0.05	1		0.14	1	
	IGS	0.08	-0.03	1	-0.07	-0.09	1	0.02	-0.03	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	0.00	1		0.02	1		0.20	1	
	IGS	0.05	0.00	1	0.03	0.01	1	0.02	-0.04	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

Table A2c. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		G - Wholesale and retail trade; repair of motor vehicles and motorcycles			H - Transportation and storage			I - Accommodation and food services		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.14*** **	1		**0.15*** **	1		**0.10** **	1	
	IGS	0.04	-0.04	1	0.03	-0.03	1	0.06	-0.02	1
1 - Managers	ISiD	1			1			1		
	IDS	0.17	1		0.21	1		0.18	1	
	IGS	0.05	-0.04	1	0.05	-0.03	1	0.14	-0.02	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.34*** **	1		**0.39*** **	1		**0.36** **	1	
	IGS	0.07	-0.04	1	0.09	-0.03	1	0.06	-0.02	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	0.18	1		**0.23***	1		0.07	1	
	IGS	0.06	-0.03	1	0.05	-0.02	1	0.09	0.00	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.28** **	1		**0.22***	1		**0.24***	1	
	IGS	0.12	-0.01	1	0.04	-0.03	1	0.06	0.01	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.08	1		0.05	1		-0.08	1	
	IGS	0.03	-0.03	1	0.03	0.01	1	0.11	0.00	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.08	1		-0.10	1		0.02	1	
	IGS	0.01	-0.07	1	-0.02	-0.04	1	0.00	0.01	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	-0.04	1		0.00	1		-0.08	1	
	IGS	-0.12	-0.07	1	-0.11	-0.05	1	0.00	-0.03	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.02	1		-0.09	1		-0.13	1	
	IGS	0.01	-0.05	1	-0.07	-0.04	1	0.07	-0.02	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.15	1		-0.10	1		-0.16	1	
	IGS	-0.01	-0.06	1	-0.02	-0.04	1	0.02	-0.04	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

Table A2d. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		J - Information and communication			K - Financial and insurance activities			L - Real estate activities		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.27*** **	1		**0.19*** **	1		**0.19*** **	1	
	IGS	0.06	-0.02	1	0.07	-0.03	1	0.05	-0.02	1
1 - Managers	ISiD	1			1			1		
	IDS	**0.26** **	1		0.21	1		**0.23* **	1	
	IGS	0.10	-0.03	1	0.09	-0.03	1	0.06	-0.02	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.57*** **	1		**0.38*** **	1		**0.36*** **	1	
	IGS	0.10	-0.03	1	0.12	-0.03	1	0.14	0.00	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.43*** **	1		**0.28** **	1		**0.23* **	1	
	IGS	0.10	-0.02	1	0.10	-0.03	1	0.10	-0.02	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.31** **	1		**0.30** **	1		**0.35*** **	1	
	IGS	0.07	-0.03	1	0.07	-0.02	1	0.06	0.01	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.17	1		0.11	1		0.18	1	
	IGS	0.06	-0.01	1	0.04	-0.03	1	**0.31* **	-0.05	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.10	1		-0.07	1		-0.17	1	
	IGS	0.09	-0.01	1	0.09	-0.11	1	0.05	-0.03	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	0.12	1		0.05	1		0.00	1	
	IGS	-0.03	0.02	1	0.01	-0.03	1	-0.06	-0.03	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.19	1		0.05	1		0	1	
	IGS	-0.09	-0.05	1	0.12	-0.03	1	0.00	0.00	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.04	1		-0.03	1		-0.02	1	
	IGS	0.04	-0.03	1	0.11	-0.03	1	-0.06	-0.06	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

Table A2e. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		M - Consultancy, marketing, accounting and legal services			M - Technical, engineering and R&D activities			M - Other professional activities		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.18***	1		**0.24*****	1		**0.22*****	1	
	IGS	0.03	-0.04	1	0.08	-0.01	1	0.08	-0.03	1
1 - Managers	ISiD	1			1			1		
	IDS	**0.22***	1		**0.23***	1		**0.23***	1	
	IGS	0.10	-0.03	1	0.14	-0.01	1	0.11	-0.03	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.42*****	1		**0.51*****	1		**0.47*****	1	
	IGS	0.13	-0.02	1	0.13	-0.02	1	0.11	-0.04	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.28****	1		**0.38*****	1		**0.35*****	1	
	IGS	0.10	-0.02	1	0.14	0.00	1	0.13	-0.02	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.28****	1		**0.29****	1		**0.31****	1	
	IGS	0.07	-0.03	1	0.05	-0.03	1	0.09	-0.04	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.09	1		0.20	1		0.08	1	
	IGS	0.03	-0.03	1	0.08	-0.01	1	0.08	-0.01	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.04	1		-0.04	1		0.04	1	
	IGS	0.00	-0.02	1	0.08	0.05	1	0.10	-0.15	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	0.03	1		0.12	1		0.01	1	
	IGS	-0.11	-0.05	1	-0.03	-0.01	1	-0.05	0.01	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.03	1		**0.23***	1		0.11	1	
	IGS	-0.11	-0.05	1	0.11	-0.03	1	-0.02	-0.03	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.08	1		-0.01	1		-0.09	1	
	IGS	-0.05	-0.07	1	0.06	-0.05	1	0.06	-0.03	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3. For the sectors, Consultancy, marketing, accounting and legal services includes NACE Rev.2 at 2-digits sectors M69 M70 and M73; Technical, engineering and R&D activities includes NACE Rev.2 at 2-digits sectors M71 and M72; Other professional includes includes NACE Rev.2 at 2-digits sectors M74 and M75.

Table A2f. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		N - Administrative and support service activities			N78 - Employment activities			O- Public administration and defence		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.19***	1		**0.18*****	1		**0.24*****	1	
	IGS	0.07	-0.02	1	0.05	-0.03	1	0.04	-0.02	1
1 - Managers	ISiD	1			1			1		
	IDS	0.20	1		0.18	1		**0.27****	1	
	IGS	0.09	-0.03	1	0.07	-0.03	1	0.10	0.01	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.43*****	1		**0.39*****	1		**0.48*****	1	
	IGS	0.13	-0.02	1	0.09	-0.03	1	0.09	-0.03	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.29****	1		**0.29****	1		**0.33*****	1	
	IGS	0.10	-0.02	1	0.07	-0.02	1	0.05	-0.03	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.30****	1		**0.29****	1		**0.33*****	1	
	IGS	0.07	-0.02	1	0.10	0.00	1	0.05	-0.03	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	0.08	1		0.08	1		0.16	1	
	IGS	0.06	-0.02	1	0.06	-0.02	1	0.03	0.01	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.03	1		0.04	1		-0.13	1	
	IGS	0.16	0.00	1	-0.01	-0.08	1	0.02	-0.07	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	0.03	1		0.00	1		0.12	1	
	IGS	0.00	-0.04	1	-0.04	-0.04	1	-0.05	-0.03	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	0.05	1		0.03	1		0.11	1	
	IGS	0.12	-0.03	1	-0.01	-0.05	1	0.01	-0.05	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.04	1		-0.08	1		-0.02	1	
	IGS	0.05	-0.04	1	0.05	0.01	1	-0.01	-0.02	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

Table A2g. Correlation between Incidence of skills in demand (ISiD), incidence of digital skills (IDS) and Incidence of green skill (IGS), within sectors (NACE Rev.2) and by occupation (ISCO-08), EU27, Q3_2022 – Q2_2023

		P - Education			Q - Human health and social work activities			R - Arts, enterteinment and recreation		
		ISiD	IDS	IGS	ISiD	IDS	IGS	ISiD	IDS	IGS
All ISCO	ISiD	1			1			1		
	IDS	**0.17*** **	1		**0.12*** **	1		**0.15*** **	1	
	IGS	0.01	-0.02	1	0.05	-0.03	1	0.03	0.00	1
1 - Managers	ISiD	1			1			1		
	IDS	**0.22***	1		0.18	1		0.15	1	
	IGS	0.05	-0.03	1	0.13	-0.01	1	0.12	0.01	1
2 - Professionals	ISiD	1			1			1		
	IDS	**0.34*** **	1		**0.32*** **	1		**0.41*** **	1	
	IGS	0.03	-0.03	1	0.08	-0.02	1	0.08	-0.02	1
3 - Technicians and associate professionals	ISiD	1			1			1		
	IDS	**0.30** **	1		0.19	1		0.20	1	
	IGS	0.04	-0.03	1	0.12	0.00	1	0.06	-0.01	1
4 - Clerical support workers	ISiD	1			1			1		
	IDS	**0.36*** **	1		**0.34*** **	1		**0.37*** **	1	
	IGS	0.02	0.01	1	0.09	0.04	1	0.07	0.08	1
5 - Service and sales workers	ISiD	1			1			1		
	IDS	-0.01	1		-0.05	1		-0.02	1	
	IGS	-0.05	-0.03	1	0.05	0.00	1	-0.02	-0.02	1
6 - Skilled agricultural, forestry and fishery workers	ISiD	1			1			1		
	IDS	-0.07	1		-0.17	1		-0.20	1	
	IGS	0.02	0.00	1	0.24	0.02	1	-0.21	0.10	1
7 - Craft and related trade workers	ISiD	1			1			1		
	IDS	-0.02	1		-0.01	1		0.01	1	
	IGS	-0.08	-0.02	1	0.03	-0.02	1	0.01	-0.01	1
8 - Plant and machine operators, and assemblers	ISiD	1			1			1		
	IDS	-0.01	1		-0.05	1		-0.02	1	
	IGS	-0.13	-0.04	1	0.01	-0.08	1	-0.02	-0.05	1
9 - Elementary workers	ISiD	1			1			1		
	IDS	-0.10	1		-0.11	1		-0.10	1	
	IGS	-0.04	-0.04	1	-0.05	-0.08	1	-0.01	0.02	1

Source: own elaboration on ESCO and Skills-OVATE.

Note: calculation have been performed at ESCO Level 3.

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