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THEMATIC REPORT:

How digital forms of assessment and self-assessment might place a new challenge and opportunity for assessment methodologies

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1 Introduction

Digitisation and technological change influence society in general and have also far-reaching implications for education and training. In view of this, the European Commission has launched several initiatives in recent years, including the following:

- In 2015, the European Digital Competence Framework (DigComp)[1] was launched as a common reference framework to support a common understanding of digital competences and has since been accompanied by several related initiatives (such as the development of the European Framework for the Digital Competence of Educators: DigCompEdu).
- In January 2018 (as part of initiatives to help work towards a European Education Area[2]), the Commission adopted the Digital Education Action Plan[3] that outlines how the EU can help people, educational institutions and education systems better adapt to life and work in an age of rapid digital change.
- The mandate of the ET2020 Working Group on 'Digital Education: Learning, Teaching and Assessment'[4] for the last work cycle (July 2018–June 2020) deals with the development of digital competences at all levels of learning, including informal education as well as quality assurance and the recognition of skills and qualifications acquired through digital and online learning. Moreover, this Working Group is expected to support the implementation of the Digital Education Action Plan.

Digitalisation also presents opportunities in areas such as non-formal learning and e-learning, and digital technologies are already used for skills obtained through non-formal and informal learning: As indicated in the European guidelines for validating non-formal and informal learning, the 'use of (online) self-assessment tools is widespread (and increasing) in Europe.'[5] Numerous initiatives and projects develop digital instruments in which the main focus is on the identification and documentation of competences but might also include assessment and might in some cases also be used for certification purposes.

This thematic report focuses on digital forms of assessment or digital assessment tools, which are understood here as a form or instrument for obtaining and presenting evidence for the assessment of learning outcomes managed using computer technology.

Digital self-assessment tools can, for example, be used as part of guidance or coaching offers, e.g. enabling individuals to take a first step towards validation. Such tools can be more or less standardised, include different forms of assessment (self-assessment or external assessment) and might be combined with face-to-face guidance sessions. These digital assessment tools can, for example, be used for supporting decisions related to the choice of further education programmes or career changes. These tools can refer to key competences (such as foreign language skills for which often self-assessment tools are provided based on the Common European Framework of Reference for Languages[6] or to digital competences), to competences related to a specific occupational field or they can be considered as comprehensive

[1] https://ec.europa.eu/social/main.jsp?catId=1315&langId=en#navItem-relatedDocuments

[2] https://ec.europa.eu/education/education-in-the-eu/european-education-area_en

[3] https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

[4] https://ec.europa.eu/education/policies/european-policy-cooperation/et2020-working-groups_en

[5] Cedefop, 2015, p.42

[6] https://www.coe.int/en/web/common-european-framework-reference-languages

skills audits covering various forms of competences and contexts in which they have been acquired.

The aim of this thematic report is to further explore the challenges and opportunities linked to digital assessment methodologies and to address the following topics and questions:

- Digital assessment in the context of validation: For which phase or phases of the validation process (identification, documentation, assessment, certification) are digital instruments used?
- Purposes, promoters and users: For which purposes and by whom are digital forms of assessment for validation set up and what is the profile of the users?
- Types: Which types of digital assessment forms are used for validation?
- Scope: Which types of skills are included in digital forms of assessment used in validation (e.g. occupation-specific knowledge, skills and competences or transversal ones) and for what skills levels are they most often used?
- Added value and impact: What is the added value of the various tools of digital assessment and self-assessment for the individual candidates? How are the results of these initiatives used, what is their currency and is there any evidence of impact?
- Challenges: What are the challenges and limitations of digital assessment forms used in validation and how can they be overcome?
- The future of digital assessment for validation: Can any future trends related to the use of digital assessment forms in validation as well as any plans or future strategies be identified?

2 Methodology

This is one of five thematic reports developed as part of the 2018 update to the European Inventory on validation of non-formal and informal learning (hereafter referred to as 'the European Inventory'). Data was mainly collected from the European Inventory country fiche database, in which the experts are required to respond to a number of questions with fixed responses and the European Inventory country reports for a selection of countries[7]: Denmark, Finland, France, Germany, Norway, Spain, UK-England-Northern Ireland, UK-Scotland, UK-Wales as well as Turkey, Kosovo, North Macedonia and Montenegro. Experts preparing the 2018 update were asked to answer specific questions related to this thematic topic and provide descriptions of examples of digital assessment approaches from their countries[8]. In some cases (Norway, UK-Wales, Kosovo, North Macedonia, Montenegro), no initiatives have been identified related to this thematic report. The following examples were identified in these countries and taken into consideration in this thematic report:

Country	Example for digital assessment
Denmark	My Competence Portfolio[9]
Finland	Osaan[10]
France	Digital initiatives within the framework of simplification and modernisation[11]
Germany	MYSKILLS[12]
Spain	Acredita[13]
Turkey	TQF portal[14]
UK-ENI	Skills Health Check[15]
UK-ENI	Career Smart including Career Smart Skills Audit[16]
UK-ENI	Public Health Skills Passport[17]
UK-SCT	My World of Work[18]

[7] The selection was based on a review of previous inventory reports and the resulting expectation that relevant examples will be available in these countries.

[8] The source of the information collected in this way is referred to in this report as the 'database' meaning the European Inventory country fiche database. Information taken from country reports is marked with 'Country report XX (country code)'.

[9] www.minkompetencemappe.dk

[10] https://osaan.fi

[11] http://simplification.modernisation.gouv.fr/wp-content/uploads/2017/03/61_nouvelles_mesures_de_simplification_pour_les_particuliers-1.pdf. The framework describes initiatives and plans for digitisation of assessment, not yet implemented up to now.

[12] www.myskills.de

[13] https://www.todofp.es/acreditacion/ServletEligeIt?opcion=1

[14] Turkey reports to be in the process of developing the infrastructure for validation of non-formal and informal learning and has developed the 'TQF portal'. This is work in progress and information reported in this thematic report is referring to the planned initiative which is not yet implemented. Further information is available here: https://www.myk.gov.tr

[15] https://nationalcareersservice.direct.gov.uk/skills-health-check/home

[16] https://careersmart.org.uk/tools/career-test-skills-audit

[17] https://www.healthcareers.nhs.uk/news/public-health-skills-passport-survey-user-needs

[18] https://www.myworldofwork.co.uk/

The 2014[19] and 2016[20] Inventory synthesis reports were also consulted for information related to this specific thematic topic. Moreover, policy documents and related literature were reviewed for identifying further examples, developments and plans in this regard. Additionally, interviews were conducted to complement the findings.

[19] European Commission; Cedefop; ICF International, 2014

[20] European Commission; Cedefop; ICF International, 2017

3 Digital assessment methods and tools in the context of validation

This section examines the links between digital assessment and the phases of validation. Digital instruments can be used:

- for the identification of knowledge, skills and competences (this can be supported by digital assessment instruments since some people may be confronted with new skills they had not considered earlier),
- for the documentation of skills and competences (supporting the recording of identified knowledge, skills and competences),
- as an emerging form of assessment in validation (including self-assessment),
- as basis for certification.

A distinction can be made between digital methods and tools that are strictly focusing on assessment (and are used in the validation process specifically for the assessment phase and possibly as basis for certification) and those that collect information for assessment or support the identification and documentation activities (usually based on self-assessment). Both are considered in this report.

3.1 Digital methods and tools used in the examples analysed

The picture that emerges from the country examples analysed clearly shows that digital assessment in most cases does not yet play an important role in certification processes. Most of these tools focus on supporting the identification and documentation of knowledge, skills and competences. Various digital tools comprise at least these two phases of validation: My Competence Portfolio (DK), Skills Health Check (UK), Career Smart (UK), Public Health Skills Passport (UK), Osaan (FI). In practice, there is often no strict distinction between phases and, in particular, identification and documentation are often tackled together.

The following paragraphs illustrate how digital tools are used in the different phases of validation.

Digital tools supporting identification and documentation

In some cases, the digital tools focus on helping individuals to capture their knowledge, skills and competences and to develop clear documentation. First of all, the systematic recording creates an orientation on the current state of knowledge, skills and competences in order to identify gaps or, if necessary, propose further training measures. These approaches therefore concentrate on the identification and documentation of knowledge, skills and competences and can form the basis for further phases in the validation process.

Some instruments focus on support in career guidance or career choice. Nevertheless, they collect important information for a validation process. The example in the box below illustrates a broad-based system of vocational orientation that is geared to the general population and also includes offers for individuals at the very beginning of their career.

Identification of skills and competences through understanding individual values, interests and personality – My World of Work (UK Scotland)

The 'My World of Work'[21] initiative is only focused upon the identification of skills and does not cover assessment and certification[22]. It provides an online tool for understanding values, interests and personality of individuals and for giving advice and guidance. The 'My World of Work' account helps individuals to discover careers which match their skills, interests, education and experience. Users are asked about their ambition and the tool helps them to find out how they can work towards it. The details in the account are used to suggest jobs, industries and 'Modern Apprenticeships' that match and inform about salaries, job growth and qualifications from profiles of different jobs. The tool 'My World of Work' additionally offers a 'subject choices tool' for school pupils to see where their favourite school subjects could take them[23].

The next step for the specification of knowledge, skills and competences, which goes beyond the identification of personal interests, is the comparison of one's own competences with concrete activities associated with concrete professions or a specific qualification. The orientation towards concrete qualifications promotes the identification of necessary further training steps and creates the basis for the validation of prior learning. *Acredita* (Spain) provides as example of this approach:

Identification of competences through self-assessment in view of obtaining a qualification – Acredita (Spain)

Acredita is an ICT-based assessment method to help candidates identify their competences[24]. Applicants are asked to choose from a list of activities which they believe they can carry out (for each activity there is a self-assessment test), and to indicate any training completed (for IVET, occupational certificates, or training developed by the public employment service). Once the form is completed, the platform provides a report with the following elements: competence units that do not need to be accredited, competence units that can be accredited, complementary training the candidate must undergo in order to obtain various IVET diplomas or occupational certificates[25].

The identification and consistent documentation of one's own competences not only helps users to select suitable training measures, but also to search for a suitable job. Digital tools can capture not only professional experience, but also completed education and training and provide an overall picture of the candidate's profile that is available to both potential employers and educational institutions as a basis for assessment. One example is the portfolio approach used in the Danish case 'My Competence Portfolio'. Portfolios are 'a goal driven, organized collection of items (artefacts) that demonstrate a learner's expansion of knowledge and skills over time'[26].

[21] http://www.myworldofwork.co.uk/

[22] See country report UK-SCT

[23] http://www.myworldofwork.co.uk/

[24] http://www.todofp.es/acreditacion/ServletEligeIt?opcion=1

[25] Country report ES

[26] Walti, 2004, p.157. Portfolio-based methods are more and more offered in digital forms, such as the German 'ProfilPass', www.profilpass.de; www.die-bonn.de/institut/dienstleistungen/servicestellen/profilpass.aspx?lang=en&

Identification and documentation in portfolios – My Competence Portfolio, DK[27]

The Danish example follows a formative learning approach[28] offering a portfolio, the 'My Competence Portfolio'[29]. 'My Competence Portfolio' is a digital tool for enabling persons, including immigrants, to create a systematic overview of their prior learning free of charge. The tool is available in Danish and English and allows persons to describe and document prior learning and previous education for various purposes including education/continuing education and training, recognition of competencies, or job search. The portfolio is divided into the following areas: educational background, job experience, experiences from leisure time, voluntary work and association activities, adult education, competences and documentation. It is not related to a specific qualification standard but includes certificates and other information on finalized education, employer contracts and statements, list of offices in trade unions and NGO's, from Folk High School and evening schools, statements from leaders in NGO's, including cultural and sport organisations. It is also possible to attach pictures of products or other artefacts of work. The profile created can be downloaded as a presentation and attached to a job application. Portfolio presentations can be customised to particular jobs, which means that users can select which items they want to include in a given portfolio in accordance with the job for which they are applying. 'My Competence Portfolio' can also be used by education institutions and there is a specific interface for education counsellors. Moreover, there is a specific portal for employers, who can use the tool for annual performance reviews or for planning their employees' continuing education and training. In addition to the competence portfolio a tool for documentation of and dialogue about personal competences is offered[30].

Digital tools supporting identification, documentation and assessment

Tools like skills passports or portfolios are set up with the objective to document skills and competences of individuals for different purposes. For example, in the UK at sector level[31], Skills Passports have been developed which aim to provide employees with a transferable record of their qualifications and experience and which can be easily assessed by future employers. A Skills Passport is a portable, online record of an individual's career history, current skills and training. The information in a Skills Passport can be independently verified and includes an individual's education, qualifications, competencies, employment history, training record and objectives. This is illustrated by the example for the UK health sector in the box below.

Public Health Skills Passport (UK)

The 'Public Health Skills Passport' is a private and secure on-line tool to plan, record and demonstrate individual learning and development in relation to a career in Public Health using the Public Health Skills and Knowledge Framework (PHSKF). The passport is used to record training in order to support individuals to move between roles and across organisations and employers delivering public health[32]. It is accessible securely using the internet at any time, from anywhere[33].

Some examples of activities that the passport might support include:

- self-assessment against the PHSKF

[27] OECD, 2017, p.39

[28] Country report DK

[29] www.minkompetencemappe.dk

https://www.daea.dk/themes/prior-learning/why-working-with-real-competencies/

[31] Examples include: Construction, Financial Services, Food and Drink, Manufacturing, Creative and Cultural, Hospitality, Nuclear, Process Industries, IT, Retail, Health, Sport and Active Leisure.

[32] Database

[33] Country report UK ENI

- storage of electronic copies of key documents (CV, certificates, testimonials, videos, references, reflective logs etc.)
- planning personal development
- creating a downloadable personal profile.
- accessing links to support development
- developing a habit of, and the skills for, portfolio building preparing for registration.

In this case, the assessment refers to a nationally defined competence framework for the sector, PHSKF.

While the methods and tools described above focus on the identification and documentation phases and on supporting individuals to gain clarity about their own knowledge, skills and competences as well as further training and certification opportunities in their country, other tools and methods focus even more on assessment. In the examples analysed, the digital assessment forms for validation are mainly based on self-assessment. The results are then largely further processed with third parties. This can be done by an evaluation by an employer (current or potential; as in the case of the Public Health Skills Passport, UK -see above) or in the form of a subsequent non-digital assessment by an assessment jury (e.g. planned by a French initiative or at Osaan, FI).

Although digital tools do not always focus on the assessment of knowledge, skills and competences that leads to certification, digital assessment can serve as a first step in this respect, as the Finnish example 'Osaan' shows in the box below.

Self-assessment for competence tests – Osaan, FI

The Finnish e-tool Osaan[34] combines the identification and documentation of knowledge, skills and competences. Learners can use the tool to reflect on the progress made in their competence development related to a specific vocational qualification. The e-tool comprises all 'Competence-based Qualifications' and the related assessment criteria. Candidates may conduct a self-assessment to verify if they have the required competences to take the competence tests to demonstrate their command of the vocational skills requirements[35].

A new approach is planned in France to support validation (VAE – Validation des Acquis de l'Expérience)[36]: There, knowledge, skills and competences will be collected in digital form and prepared for evaluation by a jury. On the basis of the documents, the jury decides whether an interview with the candidate is required for certification. In other cases, the results of the digital assessment are mainly used in the placement process, either in the public employment services (MYSKILLS, DE) or in the context of career planning by individuals and employers (Public Skills Health Passport, UK). In these cases, the process does not end with a certification, but with an internship or further training. The example in the box below illustrates the use of digital assessment in the process of job placement by public employment services in the German MYSKILLS initiative.

Assessment of vocational competences for job placement and identification of qualification requirements - MYSKILLS (DE)

[34] www.osaan.fi

[35] The test situation is monitored and assessed by a working life representative and a representative from education. The assessors decide and record the results accordingly. After the competence test the assessors and the candidate review the test situation and give feedback to the candidate. The VET training provider will award the qualification and the certificate.https://eperusteet.opintopolku.fi/eperusteet-service/api/dokumentit/4614532

[36] Country report FR

'MYSKILLS'[37] is a tool purely used for assessment of existing competences in a certain profession. The test consists of a long set of test items that have undergone statistical evaluation.[38] The results do not lead to any kind of certification but support the public employment service (PES) officer in the job placement (the tool can only be accessed in the offices of a PES and on request by a PES officer).

MYSKILLS is a digital, video- and picture based vocational skills test that permits persons without a professional qualification to identify and demonstrate their professional skills and competences. They can prove which typical job situations they are familiar with and whether they know exactly what to do in these situations. Each test lasts about four hours and is carried out in the job centre or the employment agency. The test is suitable for all job seekers who have several years of experience in one of the MYSKILLS professions[39] but who do not have a German VET qualification. It is voluntary and free of charge. Placement officers identify suitable candidates among their clients based on their prior professional experience and inform them about the possibility to take the respective MYSKILLS test. In case of an admission to the test, the placement officer discusses and explains the test result with the candidate and hands it over to him or her. Together they develop a strategy for the next steps towards internships, trial, work, a job, formal recognition or further education and training[40]. The test is used as part of the regular placement processes at the PES (public employment service). As of today, the test result is not intended to be handed out as a kind of certificate[41]. It also does not replace the assessment of practical skills or the demonstration of comprehensive professional competence in a profession required for a formal qualification. On the one hand, however, the participants can better understand for which typical vocational fields of application they have the corresponding skills in Germany and where they need a certain amount of further training. On the other hand, it supports the placement officer in identifying the next steps for their clients and provides potential employers with an initial assessment of the applicant's skills and information about possible areas of application in the company.

The standard process for MYSKILLS, used by 156 employment agencies that host a branch of the occupational psychological service, is illustrated by the following figure:[42]

[37] https://www.myskills.de/

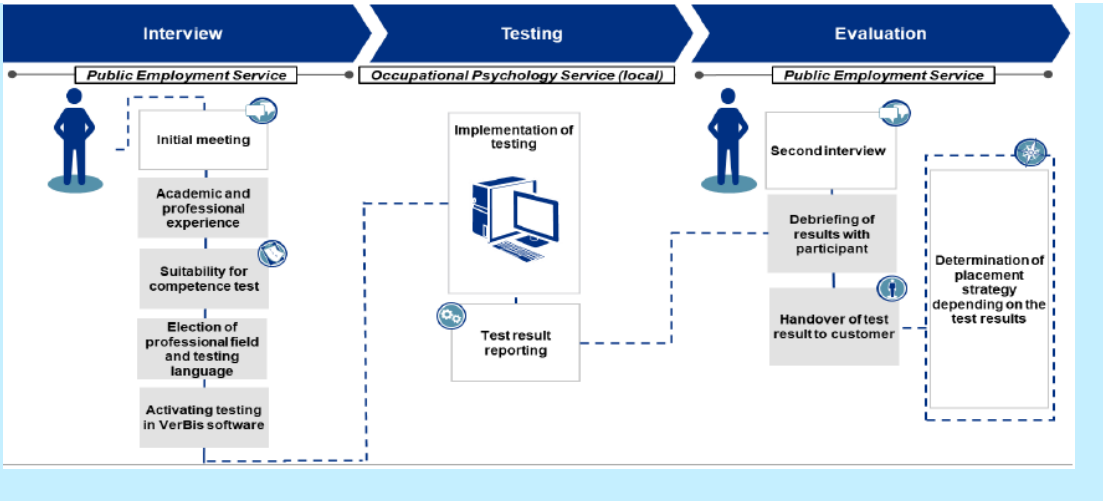
[38] More than 400 experts from chambers, vocational training institutions, companies and associations were involved in the development of the MYSKILLS tests. The development of competence models and items took place with scientific support.

[39] 30 professions were selected on the basis of previous knowledge about the professional experience of the target groups and the demand on the German labour market. The 'MYSKILLS' test is currently available for eight professions: building construction worker, cook, farmer, skilled metal worker, joiner, sales assistant for retail services, building and object coater, motor vehicle mechatronics technician. https://www.myskills.de/en/

[40] Country report DE

[41] Database

[42] Noack, 2018, p.27.



To sum up, the examples analysed show that digital methodologies and tools for validation primarily cover the phases of identification and documentation of knowledge, skills and competences. In a few cases, the tools are also used for assessment, while certification is rarely the central objective.

3.2 Emerging approaches of digital tools for documentation and assessment

Although new approaches, such as 'Open Badges' or 'Blockchains', do not necessarily refer to digital forms of assessment, they are linked to documentation, to the recording and providing evidence on learning achievements and, thus, can be used for collecting information in view of assessment and certification.

Open Badges

'Open Badges' are an inspiring example of using digital tools for the purpose of transfer and recognition of learning outcomes achieved during mobility. The Open Badge concept is based on the idea that learning happens everywhere, and valuable learning that takes place outside of formal settings should be captured and made visible. Open Badges are based on a simple (and international standardised) technology developed by Mozilla. Digital platforms like the 'Open Badge Academy'[43] offer a fully digitalised concept using this technology to recognise lifelong learning. Learners collect digital 'badges', hence digital symbols or pictures into which a set of (meta)data are embedded, including information about:

- the recipient of the badge;
- the issuer of the badge;
- the criteria for earning the badge;
- the supporting evidence matching the criteria for issuing the badge; and
- the endorsers of the badge.

The combination of those metadata constitutes a verifiable claim, i.e. something that can be claimed by the recipient of a badge and its authenticity/integrity verified by all those viewing that badge. It is not possible to modify the original content of a badge (but it is possible to add more to it, like endorsements or supplementary evidence). A badge is secured by certain keys to ensure it cannot be transferred to someone else.

[43] https://www.openbadgeacademy.com/

Conversely, it is not possible to pretend having earned a badge from a certain issuer[44]. Badges are stored in a personalised digital 'backpack' and can be shared between platforms[45]. The design of an open badge can be supported by the use of ESCO, the multilingual classification of European Skills, Competences, Qualifications and Occupations[46]: The ESCO Badge Builder[47] helps to create a badge based on the hierarchy of information in ESCO that identifies and categorises skills, competences, qualifications and occupations in a consistent way. It uses standard terminology in all EU languages and an open format that can be used by third-party software.

Open badges are, for example, used in the EDGE project[48]: There, they are e-tools (using the Mozilla opensource platform) that can be used to accredit learner achievement in the area of core skills acquisition, as well as a way of recognising informal and non-formal learning. Learners who are registered with an educational organisation that offers this type of certification use the e-learning platform and, after completing a number of tasks and providing sufficient proof to the assessor, receive the appropriate badge. The box below illustrates the use of badges in the context of Open Educational Resources in the UK.

Badges for use in the context of Open Educational Resources in the UK[49]

The Open University offers free educational resources through its 'OpenLearn' website. OpenLearn courses do not carry formal credits towards a qualification but learners can obtain a Statement of Participation or digital badge which they can use to show their learning achievements. Other universities also offer free online courses. For example, the University of Derby Online Learning (UDOL) offers Massive Online Open Courses (MOOCs) which lead to an e-certificate. In addition, each unit can be recognised through a universal Mozilla open badge.

In the context of validation, open badges and online portfolios seem to be a very promising technology since they offer the possibility of completing 'the steps related to the validation process over time: the existence of these online portfolios simplifies the possibility of completing the steps related to the validation process over time, as it is recorded and can be accessed at any point in time. Even if the person carries out a skills audit at a point in time when s/he does not wish to get these skills certified, the outputs of the skills audit process can be used by other parties for certification later in one's trajectory'[50].

Blockchain technology

Blockchain is the technology that supports Bitcoins, but also other services such as badges or credits. Technically, it is a database that is distributed across many computers, without central control. Everything is distributed, public, synchronized and encrypted. Each 'block' is transparent, but tamper-proof. A 'block' has a timestamp for recording transactions and provides an indelible proof of all.

'Blockchain is a distributed ledger[51] that provides a way for information to be recorded and shared by a community. In this community, each member maintains his or her

[44] https://ec.europa.eu/epale/en/blog/open-badges-recognising-informal-learning

[45] https://backpack.openbadges.org/backpack/welcome

[46] https://ec.europa.eu/esco/portal

[47] http://escobadges.eu/

[48] http:// edgeproject.eu

[49] Country report UK-ENI

[50] European Commission - DG EMPL, 2018, p.69

[51] 'Ledgers are tools by which one can determine the owner of an asset at any point in time. … In a system or society that has agreed to use a ledger to determine ownership of a particular asset, all that is required to transfer

own copy of the information and all members must validate any updates collectively. The information could represent transactions, contracts, assets, identities, or practically anything else that can be described in digital form. Entries are permanent, transparent, and searchable, which makes it possible for community members to view transaction histories in their entirety. Each update is a new 'block' added to the end of a 'chain'. A protocol manages how new edits or entries are initiated, validated, recorded, and distributed. With blockchain, cryptology replaces third-party intermediaries as the keeper of trust, with all blockchain participants running complex algorithms to certify the integrity of the whole'[52].

Blockchain technology can in principle be used in all cases where badges, credits and qualifications need to be stored securely or where data on learning outcomes relevant to others needs to be made available. It can therefore also support validation processes. For example, blockchain technology might be used for recording and permanently and reliably securing achievements, for automatically verifying the validity of certificates, for supporting data management. A blockchain could possibly be used as a lifelong learning passport: using blockchain technology, learners would store their own evidence of learning received from any source – whether formal, non-formal or informal – and when shared, a blockchain would be used for instant verification of the authenticity of these documents. The advantage of this scenario is effectively that every learner would have an automatically verifiable CV containing a record and evidence of all learning and employment they had received – significantly reducing CV fraud and workload for organisations and individuals that have an interest in verifying that CV[53].

ownership between two parties, is to make an entry in the ledger indicating that this has happened' (Grech & Camilleri, 2017, p.16)

[52] Grech & Camilleri, 2017, p.16
[53] Grech & Camilleri, 2017, p.98

4 Purpose, promoters and users of digital assessment approaches for validation

This section will examine who makes use of these digital tools and who offers them. It will also look at the different purposes for which the digital tools are set up.

4.1 Purposes

The purposes of digital assessment initiatives that can be identified for the individual include in particular, supporting labour market integration of those outside employment or in transition (including professional self-development of the individual and career planning or job applications) and educational advancement of those wishing to (re)integrate into education and training (including certification or receiving credits for parts of a qualification)[54]. These different purposes are illustrated in the following paragraphs.

Various digital assessment tools aim to **support individuals in their professional development** by helping them to generate ideas and **career development** plans. For example, My World of Work (UK-SCT) focuses on occupational orientation and supports individual self-development so that participants can better understand their own strengths and weaknesses, build self-confidence and present themselves to others in a professional context.[55] The Skills Health Check (UK-ENI) is a series of online questionnaires and activities designed to help people explore their skills, interests and motivations in a professional context. It will help them decide which type of job is right for them and **identify skills for which they may need training**[56]. Another example supporting career guidance is the '*Berufskompass zur Neuorientierung*'[57] ('career compass for re-orientation') offered by the PES Austria. It is an online self-assessment tool to support people who are interested in changing their career pathway. It is accessible for free and takes about 30 minutes. The compass combines the profile drawn up on the basis of the person's interests, training and professional experience with the job profiles of the professions and, on this basis, draws up a list of proposals for career changes. Other digital assessment tools are mainly targeted at more specific occupational fields and are used to support career guidance and decisions, as well as job search. For example, the Skills Health Check (UK-ENI) has no direct referrals to validation systems or training programmes. The participants can however make an informed decision about career options based on the results of their self-assessment. Based on their results, they can also further discuss their career options with advisors over the phone or through a webchat. No information is offered on vacancies the participants can apply for. The results are for personal use only[58].

The results of digital assessments can sometimes also be used as a supplement for **job applications**, as it is the case for the My Competence Portfolio (DK) or as the following example from Austria shows:

PLAYMIT, AT

The Austrian initiative PLAYMIT is targeted towards young people and aims at making their technical and general knowledge visible. The initiative is supported by the Ministry of

[54] Usually, one assessment tool serves several purposes.

[55] Database

[56] https://nationalcareersservice.direct.gov.uk

[57] http://berufskompass.at/neuorientierung/

[58] Database

Education, Science and Research and focuses on 'education for practice'[59]. PLAYMIT.com is a learning and quiz platform that deals with the competences demanded by future employers. The quiz aims at motivating young people to deal with practice-oriented contents and is used by schools especially in the area of vocational orientation. Users, especially pupils and job seekers (e.g. those looking for apprenticeship places, graduates looking for jobs) can develop a PLAYMIT certificate ('education for practice') by answering approximately 600 questions and attach it to their application. According to the information provided on the platform, several enterprises consider this as a sign of their commitment and support this initiative. PLAYMIT is free of charge and also available as a free mobile phone version.

Labour market integration of those outside employment or in transition is supported also by another group of digital assessment tools carrying out a very specific assessment in relation to clearly defined job profiles and providing information on qualification requirements and formal validation possibilities (e.g. MYSKILLS, DE and Osaan, FI). The references are qualification requirements (e.g. Osaan, FI) or qualification profiles (MYSKILLS, DE). For example, MYSKILLS[60] provides multilingual electronic tests that assess competences of job seekers with several years of experience but without formal certificates as well as of migrants without formal qualification or proof of their competences. MYSKILLS helps employment agents to gain a better picture of a person's competences in the 4-7 occupational fields of application of the profession in question[61]. The accompanying tool, 'my professional experience'[62], is used for awareness raising, can serve as a first step and is currently being implemented and further developed by Bertelsmann Stiftung[63]. It enables individuals to assess how relevant their work experience is to the German labour market. This website provides an overview of employers' expectations of twelve important occupations in Germany. Users can find out which of these skills are already included in their own skill set[64].

Supporting career development and job placement is also an important purpose of the Public Health Skills Passport (UK-ENI), which takes an individualized approach, as described in the box below.

Public Health Skills Passport (UK) as a tool for human resource management

Essentially, the individual completes an online skills check to determine whether his or her skills level corresponds to the current position. The person then discusses the next career optiions with their supervisor and identifies learning and experience gaps that need to be addressed in order to make steps towards their next career. The line manager then negotiates a joint development plan between the individual and HR management. The individual then works towards goals set out in the plan[65].

In a few cases, digital assessment is directly used **for certification or for receiving credits for parts of a qualification**. For example, the postgraduate university course, *Bildungs- und Berufsberatung*[66] (educational and vocational guidance) offered at the Danube University Krems (AT), aims to certify the competence level of people with professional experience in educational and vocational guidance but without formally recognised qualifications. Additionally, further training modules are offered to

[59] www.playmit.com; https://bildung.bmbwf.gv.at/schulen/schule40/playmit.html
[60] https://www.myskills.de/en/
[61] Country report DE
[62] https://www.meine-berufserfahrung.de/
[63] Country report DE
[64] By the end of January 2019, 26 935 visitors had used the tool.
[65] Database
[66] http://www.donau-uni.ac.at/bbb

enhance competences and receive an academic degree. The assessment methods include an online-test for assessing competences related to the professional field independent of where they have been acquired (in formal, non-formal or informal learning contexts). 15 ECTS can be obtained by passing the online-test (of the 60 ECTS required to obtain the degree 'Academic Expert' and 90 ECTS required to obtain the degree 'Master of Arts').

4.2 Promotors of digital assessment for validation

The promoters of the digital assessment tools for validation of non-formal and informal learning are mainly governmental organisations, education and training providers, employment services and trade unions. In the country examples analysed, youth organisations, chambers of industry, commerce and skilled crafts or employer organisations or individual employers do not play a role.

In most of the practices analysed, digital assessment initiatives are set up by ministries: For example, the new version of 'My Competence Portfolio' (DK) was launched in 2017 by the Danish Ministry of Education[67]. This tool was developed by the National Agency for IT and Learning, which is also responsible for the day-to-day operations. The tool has been revised as an initiative in connection with the Danish Government's Growth Package 2014 and was re-launched in 2017[68].

Ministries are also the promotors of digital assessment tools in Spain and Turkey. In Spain, it is the Ministry of Education, Culture and Sport that has set up Acredita[69]. The Turkish Ministry of Family, Labour and Social Services is currently involved in the development of an online portal that should process applications for the assessment of knowledge, skills and competences, provide information and results of the assessment to the candidates and issue certification documents.

Another type of public organisation promoting digital assessment for validation are national agencies. This is the case for Skills Development Scotland (Scotland's national skills body)[70], UK National Careers Service, run by the Education and Skills Funding Agency's[71] (Skills Health Check), the Finnish National Agency for Education ('Osaan') and the French State Secretariat for State Reform and Simplification[72].

As shown by the German example MYSKILLS, employment agencies promote digital assessment with the purpose of facilitating integration into the labour market and the documentation of competences in order to provide more focused guidance by employment service agents. Tests are administered at the 156 Vocational and Career Psychology Service Centres (BPS) of the federal employment agency on behalf of a job centre or an employment agency[73].

Trade unions can promote digital assessment for validation as an information and advisory service for members and a platform to access new potential members. Such is the case of Prospect, an independent trade union that provides advice and support to members at the workplace. This trade union is running the online-tool 'Career

[67] Country report DK

[68] https://www.minkompetencemappe.dk/MinKompetencemappe/Om

[69] Database

[70] https://www.skillsdevelopmentscotland.co.uk/about/

[71] https://nationalcareersservice.direct.gov.uk/about-us/home

[72] '61 mesures pour simplifier la vie des français'; Content published under the chairmanship of François Hollande from 15 May 2012 to 15 May 2017, https://www.gouvernement.fr/simplifier-transformer

[73] Country report DE

Smart' (UK) which aims for individuals to be informed and confident in their career choices and decisions, using data from official 'big data' sources and including the self-assessment tool 'Career Smart Skills Audit'[74].

4.3 Profile of users

Target groups for digital forms of assessment in validation include – apart from more general populations interested in career guidance or in the validation of their skills – young people, (higher education) students, refugees and asylum seekers, and low-skilled adults.

Many digital assessment tools are geared towards life-long learning and designed for the general population (such as Acredita in Spain or Career Smart in the UK). Apart from that, an outstanding target group are **young people**. Numerous initiatives aim to reach them as users, especially those addressing more general competences and skills (e.g. My World of Work, UK-SCT; the planned Turkish initiative; Skills Health Check, UK). In general, those digital assessment tools that are designed for the identification of existing knowledge, skills and competences, vocational orientation and career guidance define young people as a target group and offer information, partly in youth adequate language. For example, the Scottish 'My World of Work' platform offers separate sections for primary school pupils, secondary school pupils, college and university students, employed and unemployed people[75].

Especially for young people, 'ProfilPASS for young people' (DE) provides a digital form of the recording of their skills and competences as an introductory offer[76], as shown in the following box.

Identification of skills and competences of young people – ProfilPASS for young people (DE)[77]

The ProfilPASS for young people helps those aged thirteen and over to identify their skills, strengths and interests. In particular, young people discover knowledge and skills that are not reflected in school grades. By completing the information for the digital workbook (or accompanied by certified ProfilPASS consultants), the young people look at all areas of their lives that are important to them: Activities at school are just as important as hobbies, being together with family and friends or voluntary activities. The ProfilPASS makes it clear that learning and the acquisition of skills and competences does not only take place in school. Young people who work with the ProfilPASS experience that they can do much more than they are aware of. They are strengthened in their self-esteem and enabled to communicate their strengths confidently to other people. ProfilPASS for young people is also available in simple language. The project development was funded by the German Federal Ministry of Education and Research.

Massive Open Online Courses (MOOCs)[78] can be offered in the non-formal learning context and sometimes they can also be completed based on validation of non-formal

[74] https://careersmart.org.uk/

[75] https://www.myworldofwork.co.uk

[76] https://www.profilpass-fuer-junge-menschen.de/media/ppj_workbook_barrierefrei_formulare.pdf

[77] https://www.profilpass-fuer-junge-menschen.de/fuer-eltern/ziele-nutzen/

[78] MOOCs are known from the higher education sector. They create and make widely available materials and conditions for participatory learning and creative space dedicated to open education. MOOCs were developed to provide open, meaning unrestricted, online courses without higher education cost constraints to learners. Kennedy, 2014

and informal learning. In these cases, another specific target group of digital assessment for validation **are learners in higher or adult education participating in MOOCs.** Participation in MOOCs can be linked to digital learning badges (see section above), as the following example shows:

Technology based assessment in MOOCs and digital learning badges – EBmooc for adult educators (AT)[79]

The 'EBmooc' is an online course for adult educators (non-formal learning context), where participants learn using short videos, written instructions and self-test quizzes, and that aims at developing digital competences. In this six-week course (total duration: 18 hours) teachers and trainers, consultants and education managers can acquire important basics and tools for digital adult education. The videos, documents and quizzes are also available as self-learning material. After its first implementation in 2017, the MOOC was slightly adapted and relaunched as 'EBmooc 18' in Spring 2018.

If participants complete the course positively, they will receive a digital learning badge for each module or for the entire course. If they have completed all quizzes and completed the final survey, they can download a certificate of participation issued by the Graz University of Technology.

The above-mentioned postgraduate university course, *Bildungs- und Berufsberatung*[80] (educational and vocational guidance) offered at the Danube University Krems (AT), that certifies competences of people with professional experience in educational and vocational guidance, includes an online-test (for assessing competences related to the professional field). At present, however, digital assessment methods in higher education are likely to be used to a limited extent, except in individual cases in the context of MOOCS, to assess skills and competences acquired through previous informal and non-formal learning processes.

Although in the majority of European countries, immigrants are not a dominant group in the area of validation[81] and most of the existing validation arrangements in Europe are not targeted to migrants[82], many tools for **low-skilled adults** (such as the My Competence Portfolio, DK; MYSKILLS, DE; and the planned approach in Turkey) are designed for the target group **migrants and refugees and also asylum seekers**. Along with unemployed people and low-skilled adults in general, migrants, asylum seekers and refugees are currently at a disadvantage in European societies and could greatly benefit from improved access to validation services and from more holistic validation arrangements. Addressing this vision, the Erasmus+ project VISKA (Visible Skills for Adults), a policy experimentation project (with Belgium - Flanders, Iceland, Ireland and Norway as partners) is trying to extend and/or adapt tools used in validation, including digitisation as well as customisation for use with specific beneficiary groups and enhanced quality assurance of validation processes[83]. Improved validation arrangements relying on enhanced tools (e.g. digitisation, criteria for assessing transversal skills) and improved access for specific adult learner audiences (e.g. through digital means) are among the expected outcomes[84].

[79] https://erwachsenenbildung.at/ebmooc/

[80] http://www.donau-uni.ac.at/bbb

[81] Souto-Otero & Villalba-Garcia, 2015

[82] Cedefop, 2016

[83] http://viskaproject.eu/project-description/

[84] Husa & Gylfadóttir, 2017

The digital tool MYSKILLS (DE), which has already been described above, focuses on these target groups by offering large capacities and multiple languages, as shown in the box below.

Low threshold offer in several languages – MYSKILLS (DE)

The portal 'MYSKILLS' enables a low-threshold entry into the documentation of competences gained through experience for formally low qualified people and migrants. The free digital self-assessment tool aimed to reach 50 000 users by the end of 2018, when all 30 professions should be online[85]. The MYSKILLS assessment implemented by the German PES will have capacities for 120 000 cases per year[86]. The tests are available in six languages – German, English, Arabic, Farsi, Russian and Turkish.

In addition, there are initiatives that are limited to specialised sectors, such as the health sector: The 'Public Health Skills Passport' defines **public health sector workers** as users of its service. There is a similar initiative for prospective and current employees in the rail industry: The National Skills Academy Rail SkillsID is an online record of an individual's skills, competencies, qualifications and training plans that is accessible by both the employer (sponsor) and the individual and with verified records updated by the employer (sponsor) and NSAR accredited training & assessment providers[87].

[85] Country report DE
[86] Country report DE
[87] Country report UK-ENI

5 Types of digital assessment used for validation

The types of tools used varies greatly depending on the context and purpose of their use. Digital tools are usually adapted to the precise use and target group[88]. Among the most frequently identified types of digital assessment are self-assessment, often offered as automated assessment, peer assessment, and supervised assessment.

Self-assessment encourages learners to identify their strengths and weaknesses and may stimulate interest in learning and professional development. In higher education, for example, self-assessment refers to the involvement of learners in making judgements about their own learning, achievements and outcomes of their learning[89]. In the context of validation of non-formal and informal learning, self-assessment means that candidates seeking validation provide information about their own knowledge, skills and competences based on their own judgement and personal criteria (e.g. by answering the question 'How good are you at this? for the 'Career Smart Skills Audit', UK). Self-assessment is the most frequently used type of assessment in the examples analysed, such as Skills Health Check (UK), Career Smart (UK), Acredita (ES) and Osaan (FI).

The following boxes illustrate some examples of how self-assessment is implemented. Starting with the Finnish tool Osaan, the box below shows a case of self-assessment as a preparatory step for a possible later competence test and the recognition of qualification units.

Self-assessment based on VET qualifications Osaan (FI)

Osaan is an e-tool (www.osaan.fi), which covers all VET qualifications and the respective assessment criteria. The candidate can carry out a self-assessment to verify if s/he has the required competences to take the competence tests. The candidate is also asked to provide all evidence of his/her competences in relation to the learning outcomes of the qualification concerned.

In cases where the candidate has a reliable documented proof of competence (e.g. from non-formal learning settings), the documentation is handed over to the assessors. They may recognise one or more qualification units or the whole qualification on the basis of the evidence. In cases where there is no documented evidence or where competence cannot be demonstrated from the documentation, competence tests take place[90]. In addition, the tool provides very specific information on what kind of competences candidates already have in relation to a particular qualification. The tool has a numerical (1-4) self-assessment part and users can justify the answer in writing. The report is a form of documentation of the individual's competences[91].

The assessment of one's own abilities and their significance for personal and professional development is another way to carry out a self-assessment. An example of this approach is the Career Smart Skills Audit (UK), which covers 40 activities from ten different skills areas. The following box shows the details on this type of assessment.

Career Smart Skills Audit (UK)

The online test helps users to identify the skills areas which they believe they most need to develop or which are most important for them to develop further. The tests audit existing skills

[88] Most of the tools analysed are designed to be self-explanatory and require no or little guidance.

[89] Boud & Falchikov, 1989, p.529

[90] Country report FI

[91] Country report FI

and identify skills areas in need of development by asking users to rate how good they think they are at 40 activities and how important they consider the skills are in relation to their progress. During the audit the user is presented with 40 short items and asked to rate each item twice, once for *'How good are you at this?'* (Good, Okay, Bad) and once for *'How important is it for you develop this skill?'* (Very, Quite, Not). Based on the responses, the Career Smart Skills Audit recommends skills areas to develop further. The results include a breakdown of the activities that are included in those skills areas and give further advice on how to prioritise personal and professional development[92].

In Germany, a quick **automated self-assessment tool** ('My professional experience') is combined with a **supervised assessment**, as shown in the box below.

Automated assessment: MYSKILLS (DE)

Self-assessment of vocational experience is offered by the tool 'My professional experience'[93]. This tool can function as a quick (3-5 minutes) screening tool for the identification of suitable candidates for the MYSKILLS tests. It is freely available online and asks the users (in one of the six MYSKILLS languages) how many times they have already carried out each of the 20-40 typical professional actions using pictures. The extent of the prior experience in any of the 30 reference professions will then be documented for the 4-7 occupational fields of application[94].

MYSKILLS complements the self-assessment with a first third-party-assessment since it objectively assesses vocational skills and can be used to validate the self-assessments of clients of employment agencies and job centres[95]. MYSKILLS and the accompanying online self-assessment tool, are two of the very few ICT-based assessment tools within validation applying a scalable digital test for eight respectively twelve professions (up-scaling to 30 professions is planned). The MYSKILLS tests are based on closed item formats allowing for a statistical analysis of the results. They present the assessment participants with typical job situations in order to see to what extent they are familiar with such situations and whether they know exactly what to do in these situations. The test is available in six languages – German, English, Arabic, Farsi, Russian and Turkish. It uses a simple language and a culture sensitive approach. Participation is only possible at local PES offices and a test supervisor is present.

Peer assessment, i.e. the assessment of one's skills by peers, is also sometimes used with digital tools in the context of validation. Conceptually, it is an educational arrangement where learners judge a peer's product or performance quantitatively and/or qualitatively. Products to be assessed may include written texts, oral presentations, portfolios, test performance, or other skilled behaviours[96]. While peer assessment as a pedagogical strategy is not necessarily linked to digital forms of assessment, the use of web-based interfaces uses the power of peer assessment to provide effective and timely feedback for more complex tasks that involve a heavy workload for assessors[97]. According to research done on MOOCs, self-evaluation may in many cases over-estimate actual knowledge, skills and competences, as

[92] https://careersmart.org.uk/tools/career-test-skills-audit

[93] https://meine-berufserfahrung.de/index.php?&lang=en; my-professional-experience.org

[94] Country report DE. https://www.meine-berufserfahrung.de/index.php?&lang=en. At present (end of January 2019) it is possible to assess one's own experience in twelve occupations; within the next few months this should be possible for all 30 occupations.

[95] https://www.arbeitsagentur.de/myskills

[96] Topping, 2009

[97] Paré & Joordens, 2008

digital examination outcomes tend to be poorer, whereas peer-review results match the final outcomes better[98].

Self-assessment is, for example, combined with peer assessment and supervised assessment in the case of the 'Public Health Skills Passport' (UK) by including HR managers in the assessment. In addition, popular social networks also offer the opportunity to make competences and skills visible by making use of the possibilities of peer assessment. A specific form of peer assessment is the endorsement of another person's skills, such as offered at the LinkedIn platform, as illustrated in the box below.

Peer Assessment by endorsement: LinkedIn platform

LinkedIn, a social network for professionals that operates via websites and mobile apps, has enabled users to 'endorse' each other's skills[99]. This is seen as a contribution to strengthening one's own profile and increasing the likelihood of being discovered for opportunities related to the skills acquired. This feature also allows users to efficiently provide commentary on other users' profiles – network building is reinforced. However, there is no way of flagging anything other than positive content. However, the value of confirmations on LinkedIn has also been questioned because it is so easy to support someone. In addition, it is important that the endorsements one gets really reflects one's skills and experience: LinkedIn solicits endorsements using algorithms that generate skills members might have. Members cannot opt out of such solicitations, with the result that it sometimes appears that a member is soliciting an endorsement for a non-existent skill.

Peer assessment is also one of the assessment forms used with open educational resources, such as MOOCs that can be completed based on informal and non-formal learning[100]. Due to a high number of participants and the instructional approach (peer learning), assessment of participants is made through multiple choice tests, online assessment tests and peer assessment. Automated grading systems are generally used[101]. Online examinations – sometimes combined with face-to-face assessment – can, for example, be designed as self-assessment, as peer assessment, or as assessment that is based on answering a series of multiple-choice questions and involves a proctor to verify the candidates' identity[102].

For example, in the MOOC platform EdX, typical open forms of assessment are peer- and self-assessment. They are based on rubrics created by course creators that include criteria that each answer should meet and categories of how well each answer meets the criteria. These rubrics serve as guidelines for MOOC participants to assess themselves and others. Another important platform, Coursera, offers assessment by peer assessment and automated Multiple-Choice Questions (MCQs)/Quizzes. High levels of agreement between learner-assigned scores and instructor assigned scores are reported[103].

[98] Admiraal et. al, 2015

[99] https://www.linkedin.com/help/linkedin/answer/31888/skill-endorsements-overview?lang=en

[100] MOOCs are known from the higher education sector. They create and make widely available materials and conditions for participatory learning and creative space dedicated to open education. MOOCs were developed to provide open, meaning unrestricted, online courses without higher education cost constraints to learners. Kennedy, 2014

[101] Baturay, 2015

[102] Witthaus et al., 2016

[103] Witthaus et al., 2016, p.27-29

Peer assessment is, thus, an important type of assessment in open learning and MOOC and one way of visualizing the results can be the use of badges instead of certificates, as illustrated in the following example in the box.

Peer assessment in MOOCs

The French National Ministry of Education launched a national platform for MOOCs through its Digital University, namely France Université Numérique (FUN)[104]. The guidelines for the platform suggest that credentials should be given for attendance and contribution, but not for meeting learning objectives, citing the difficulties involved in supervising online assessment. Due to their perspective, learning in MOOCs can only be assessed through automation or peer assessment. Automation only assesses superficial information and facilitates plagiarism. Peer assessment, however, is part of the workload. MOOC providers on the platform are advised to issue digital badges, mainly as a way of encouraging participation, and to introduce an element of gamification to increase learners' motivation[105]. Badges can be used to encourage participants to interact in forums, 'but could have a growing importance in the process of reward for work done over the years'[106]. In actual fact, many of the MOOCs on the platform offer completion certificates rather than badges, none were found to be offering ECTS credits[107].

[104] Now called: France Digital University. http://www.france-universite-numerique.fr/

[105] Witthaus et al., 2016, p.19

[106] Cisel, 2013, p.28

[107] Witthaus et al., 2016, p.18

6 The scope of digital assessment for validation

With regard to the proficiency levels expressed in the descriptions of learning outcomes, it can be observed that some tools focus on high level and medium level skills – such as My Competence Portfolio (DK), Public Health Skills Passport (UK), Osaan (FI), whereas the tool Career Smart (UK) includes low skills and the German example MYSKILLS includes skills at low and medium level.[108]

Different types of learning outcomes are included in digital forms of assessment; e.g. occupation-specific knowledge, skills and competences, transversal ones, key competences for lifelong learning[109] and in particular 21st century skills and competences or skills and competences for the Digital Era[110], such as creativity, entrepreneurship, learning-to-learn, digital competence[111]. The use of these terms is not very consistent, so that some competences are labeled differently in the examples (e.g. digital competences are sometimes subsumed in transversal competences). The remaining part of this section discusses the types of learning outcomes included in the examples analysed.

The majority of the tools focus on occupation specific knowledge, skills and competences, such as My Competence Portfolio (DK), Public Health Skills Passport (UK), Acredita (ES), MYSKILLS (DE), Osaan (FI). Reference frameworks and assessment criteria result from the national qualification regulations and job descriptions, as the following box shows using the example of the Spanish digital tool Acredita.

Competence units as reference point for digital assessment, Acredita (ES)

Once candidates are registered in the accreditation procedure, the digital tool 'Acredita' is specially designed to help them find the professional competences they could try to accredit on the basis of their professional experience, individually and always as a guide. In this system, each qualification is organised in units of competence.

The unit of competence is the minimum aggregate of professional competencies, subject to recognition and partial accreditation. Each unit of competence is associated with a training and/or professional module, which describes the training required to acquire that unit of competence. A set of units of competence form the professional qualification that are the references to elaborate later the formative offerings leading to titles of Vocational Training and/or certificates of professionalism[112] and therefore to the digital assessment as well.

Reference point for the professional qualifications covered by 'Acredita' is the National Catalogue of Professional Qualifications[113] that orders the professional qualifications subject to recognition and accreditation, identified in the productive system according to the competences appropriate for the professional exercise. It includes the most significant professional qualifications of the Spanish productive system, organised into professional families and levels.

Nationally defined job descriptions and qualification standards thus may form the basis for the digital assessment for validation and provide assessment criteria. Similarly, the MYSKILLS test (DE) is based on actual professional practice and the

[108] Database

[109] European Parliament & Council of the European Union, 2006; Redecker, 2013.

[110] European Commission, 2018

[111] https://ec.europa.eu/jrc/en/research-topic/learning-and-skills

[112] http://todofp.es/acreditacion/ServletEligeIt?opcion=1

[113] http://incual.mecd.es/catalogo1

current German training standard, divided into various fields of action. For example, for the profession of metal technician, test questions range from manufacturing components with hand-held tools and machines, turning and milling individual parts, assembling and disassembling assemblies and metal structures, forming and cutting sheet metal and tubes, to welding components and assemblies of all kinds.[114] The box below illustrates the linkage between the digital assessment and the national standards of qualification, which includes social, personal and vocational skills.

Digital assessment of vocational skills based on national qualification standards – MYSKILLS (DE)

Particularly for migrants and refugees, instruments have been developed that focus on the identification and documentation of social and personal skills, but also vocational skills in 30 occupations[115]. In order to identify the candidates for the assessment, my-professional-experience.org offers a pre-check through a quick digital self-assessment screening-tool for MYSKILLS[116].

The test participants use computers to answer complex questions relating to everyday situations in one of 30 training occupations. The questions are supplemented by pictures and videos. Per profession, the tests of about 120 items each take about four hours to complete[117]. The result of the test includes a summarised assessment of the vocational knowledge of action in the various fields of action of an occupation.[118] The tests have been specifically designed not to assess language knowledge and general competences. They are culturally sensitive and apply an easy language in order to focus on competences gained at the work place. However, also here the German national standards on the different professions have been used as reference in order to design the tests at the level of a completed apprenticeship. Nevertheless, since the tests distinguish between different areas of a certain profession, it is possible to test parts of professions as well (e.g. for warehousing there are different test elements for picking and sending goods, in order to allow for the assessment of competences gained in a specific field of a profession only)[119].

In terms of skills and competences covered, the digital assessment tools 'My Competence Portfolio' (DK) and Osaan (FI) seem to be the most comprehensive ones among the examples analysed. In addition to occupation specific aspects, they contain communication skills in mother tongue and foreign languages. Digital competences (defined in different ways) are included in the assessment in several examples, such as 'My Competence Portfolio' (DK), Osaan (FI), Skills Health Check (UK) and Career Smart (UK). In these examples, digital competences are assessed alongside mathematical, scientific, technological and occupation specific competences. In addition, there are a number of examples of digital tools that allow the evaluation of digital competences without directly being linked to validation. In the following, some examples of such tools will be given for illustration:[120]

- Education & Skills Online: '…is an assessment tool designed to provide individual-level results that are linked to the OECD Survey of Adult Skills (PIAAC) measures

[114] https://industrieanzeiger.industrie.de/management/personal/berufliche-faehigkeiten-entdecken-und-nutzen/

[115] There is currently a MYSKILLS test for eight professions: building construction worker, cook, farmer, skilled metal worker, joiner, sales assistant for retail services, building and object coater, motor vehicle mechatronics technician. https://www.myskills.de/en/

[116] Country report DE

[117] Country report DE

[118] https://www.arbeitsagentur.de/myskills

[119] Database

[120] Please note: it is not clear to what extent these tools are actually used for validation.

of literacy, numeracy and problem solving in technology-rich environments. All results are comparable to the measures used in PIAAC and can be benchmarked against the national and international results available for the participating countries. In addition, the assessment contains noncognitive measures of skill use, career interest, health and wellbeing, and behavioural competencies'[121].

- Skillage: an online test for young people to assess their understanding of and readiness for ICT skills at the workplace[122].
- Digital Literacy Challenge: an online tool that evaluates 10 core digital competence components[123].
- Digitals Skills Accelerator: an online self assessment tool providing users with an overview of their digital competences in line with the DigComp Framework. The tool is closely aligned to the major EU research project, DIGCOMP, deriving from the European Parliament's inclusion of digital competence, as one of the eight core competences for lifelong learning[124].

The consideration of values, personality and interests is the focus of 'My World of Work' (UK-SCT), while other tools also include soft skills (e.g. Career Smart Skills Audit, UK). The example in the box below illustrates how personal attributes are included in a quite broad assessment of skills and competences.

A wide scope of digital assessment for validation – Skills Health Check (UK)[125]

The online tool is designed to help participants explore their skills, interests, motivations, problem solving skills and how they work with information. It focuses on soft skills, mathematical, logical and scientific competence and digital competence by generating a report from the answers provided by the participants to the two sections of the skills assessment: personal skills and activity skills. The report gives information on the participants' key strengths, as well as psychosocial work preferences. It also identifies areas for improvement, where the participant could benefit from further skills training[126].

Working through the personal assessments should help participants to get ideas about jobs and careers which interest them[127]. The section on 'Personal Skills' offers four quizzes with an estimated duration of 15 minutes each. They refer to:

- Skills: Identify activities you're good at.
- Interests: Explore areas of work you're interested in.
- Personal style: Understand how you prefer to work.

The 'Activity Skills' assessments are supposed to help participants get a better understanding of how they work with information and solve problems in the workplace and what work-related skills they are good at[128]. Understanding what activity skills the participant possesses should help in the process of job application and interviews. The section comprises six quizzes with an estimated duration of 15 - 25 minutes each:

- Working with numbers: Explore how you make judgements using numbers.
- Working with written information: Explore how you make judgements using written information.

[121] OECD nd; http://www.oecd.org/skills/ESonline-assessment/

[122] http://www.skillage.eu

[123] https://futureedge.grovo.com/

[124] http://www.digitalskillsaccelerator.eu/learning-portal/online-self-assessment-tool/

[125] https://nationalcareersservice.direct.gov.uk

[126] Country report UK

[127] https://nationalcareersservice.direct.gov.uk/skills-health-check/your-assessments

[128] https://nationalcareersservice.direct.gov.uk/skills-health-check/your-assessments

- Checking information activity: Try a clerical checking activity.
- Solving mechanical problems: Work through some mechanical problems.
- Working with shapes: Explore some spatial problems.
- Solving abstract problems: Try some abstract problems.

In a very similar approach, the digital 'Career Smart Skills Audit' (UK) covers a broad spectrum of transversal competencies, ranging from digital competencies to soft skills in the form of communication competencies and self-management competencies, as illustrated in the box below.

Assessment of a wide range of transversal competences – Career Smart Skills Audit (UK)

The online test helps users to identify the skills areas that they believe are most in need of development or are most important to them for further development. This career test audits ten skills areas:

- Numerical
- Information Technology
- Managing Self
- Communication Skills
- Customer Focus
- Team Working
- Managing Others
- Influence and Persuasion
- Commercial Awareness
- Personal Development Planning

Based on the responses, the test gives recommendations as to which of the relevant skills areas are most in need of development[129] .

An example of digital assessment related to very specific occupational knowledge, skills and competences is provided by Osaan (FI)[130], as illustrated in the box below.

Competence identification as basis for individual development plans – Osaan (FI)

In Finland in general, vocational competences are assessed by means of a practical test in which learners demonstrate, in performing practical work tasks, how well they have acquired the essential skills or knowledge defined in the requirements. The design and implementation of the skills demonstrations is guided by the national requirements defined for vocational qualifications, which have been identified in cooperation with companies and relevant work organisations[131]. Learners can participate in the tests regardless of the way they have acquired the skills[132]. The identification and assessment of acquired skills and competences can be supported by the e-tool Osaan, designed to reflect on the progress made in competence development related to a specific vocational qualification. The tool offers assessment of skills and competences related to different types of qualification: vocational qualifications (secondary level), further and specialist vocational qualifications[133]. The tool is offered for 566 qualifications in total[134]. The tool also offers links to training providers for persons interested

[129] https://careersmart.org.uk/tools/career-test-skills-audit

[130] https://www.oph.fi/koulutus_ja_tutkinnot/tutkintojen_tunnustaminen/patevyys_ammattiin

[131] www.osaan.fi

[132] https://eperusteet.opintopolku.fi/#/fi/opas/4343283/tekstikappale/4395828

[133] www.osaan.fi

[134] Number of degrees offered by 14/01/2019 at www.osaan.fi

in completing a qualification. The result of the assessment is a report that helps the individual to set up the Personal Competence Development Plan together with the training provider.

Another type of skills and competences assessed by digital tools is 'functional skills'. The term mainly refers to language, mathematics and ICT skills and is applied by the 'Excellence Gateway', a resources portal by the Education and Training Foundation (UK) that advocates for the use of 'skills checks and screening tools' and offers guidance and materials for carrying them out[135]. The following box gives a brief description of the scope of this assessment.

Assessment of functional skills – The Excellence Gateway (UK)[136]

The Excellence Gateway promotes the government's 'functional skills' policy by providing a 'starter kit', which is composed of practical guidance and resources to support providers in their delivery of functional skills (practical skills in English, mathematics and information and communication technology that allow individuals to operate confidently, effectively and independently in life and work). The starter kit is said to be useful for managers, teachers and workplace assessors new to functional skills or in transition from adult literacy and numeracy provision, as well as those currently delivering functional skills.

The 'assessment of functional skills' component of the starter kit links to a three-hour programme on assessment for learning, and a programme on improving initial and diagnostic assessment for functional skills.

[135] https://www.excellencegateway.org.uk

[136] Country report UK

7 The added value and impact of digital assessment for validation

Digital assessment tools are expected to bring a number of advantages to providers and users, including cost efficiency (given a critical mass of tests) and time effectiveness for administrative procedures and through whole or partially automated assessment[137].

The expected added value of using digital tools for (self-) assessment lies on the one hand in the fact that these tools can be used by a high number of people at different locations. The results can usually be stored for later use or printed (e.g. as attachment to a job application). Although the costs for their design and maintenance need to be considered, their usage is less costly than face-to-face sessions. Furthermore, these tools can be considered as low-threshold offers since they can be designed to provide easy access to validation approaches based on the needs of different target groups (e.g. they can also be offered in different language versions or in 'easy-to-read' versions). They may help to save time and resources, for example, within the framework of a wider guidance or validation setting (e.g. MYSKILLS used by German PES).

Individuals, job counsellors and employers are among the possible beneficiaries of digital assessments used in validation procedures:

- The individual benefits from realistic feedback on the relevance of the skills acquired to the national labour market, appreciation of work experience and skills, and better job perspectives.
- The benefits for career counsellors are reliable and comprehensive information on professional competencies of clients, improved matching and job placement, lower costs and faster processes.
- Employers benefit from a potentially larger talent pool and a clear idea on individual development prospects. They get a differentiated picture of the professional knowledge that an applicant brings with them based on their experience, even if they lack recognised certificates[138]. This allows employers to better assess whether someone fits into an open position in their company. All this applies with the restriction that digital assessments in particular are in most cases strongly based on the self-assessment of individuals, do not assess practical abilities and therefore serve more as an indication of competence (this is, for example, a restriction of the German MYSKILLS initiative)[139].

In general, digital forms of assessment of skills and competences are expected to also offer the following advantages:

- Improvement of assessment validity and reliability: digital assessment enables the use of more types of materials such as audio/video files, dynamic graphs[140]. If the activity is a fair measure of skill and understanding, it can help track assessment validity through the use of rich media rather than just text. It also provides improvements in reliability of scoring and robust data sets for deeper analysis[141]. Moreover, computer-based assessment allows for adaptive test and IRT scaling,

[137] European Commission, 2017a, p.3

[138] https://www.bertelsmann-stiftung.de/de/unsere-projekte/berufliche-kompetenzen-erkennen/projektbeschreibung/

[139] Noack, 2017

[140] European Commission, 2017a, p.3

[141] Oldfield et. al., 2012, pp.11-12

which means that we can reduce the time and increase reliability[142]. Computerized adaptive testing means, that 'the examinee's skill level is re-estimated after each item is administered. The next item to be administered is then chosen based, in part, on that updated skill-level estimate, so that examinees are branched to easier or harder questions based on their performance on prior questions'[143].

- Authenticity and complexity in enabling new ways of creative problem solving[144]: in that sense, digital assessment can provide more authenticity to the assessment situation presenting challenging problems and ways to assess complex skills like problem-solving, decision making, and testing hypotheses, which is argued to be more authentic to future work experiences and what skills and knowledge will be required after formal education[145].
- Fits to digital learning: digital assessment can help ensure that assessment matches the increasingly digital learning and teaching environment of schools, higher education and all other teaching contexts[146].

The above-mentioned intended benefits and advantages can be illustrated by the examples analysed:

In various initiatives, it is above all the **supportive character of digital tools for users** that is emphasized. Individuals receive support for their self-development, self-confidence, a better understanding of their own strengths and weaknesses and for a better presentation to others in a professional context (My World of Work, UK). Participants gain orientation, understand their own skills, interests and motivations better and explore their personal working style and motivation (as indicated for the 'Skills Health Check', UK). As a result, they receive a summary assessment with recommendations on which skills they should focus on as well as additional useful advice and information (such as tips on interviewing techniques, starting a new job, getting a promotion, appraisals and reviews, etc.) and where to find training providers (this is the case, for example, with the 'Career Smart', UK).

The benefit of the Finnish approach 'Osaan' is, that participants gain insight into the requirements of the qualifications they aim at and are able to collect evidence and plan the skills demonstrations in advance according to these requirements. The results are used mainly at the planning phase (either for supporting the decision process on which qualification to choose or for compiling the Personal Competence Development Plan together with a counsellor).

Easy and all-time access to assessment and results through a portal is one of the main benefits identified **for users** (this is the case, for example, in the planned TQF[147] Portal in Turkey). Digital assessment tools can be designed as a low-threshold entry into the documentation of competences gained through experience (e.g. MYSKILLS, DE for formally low qualified people and migrants). Digital tools can be used for a very large number of users in rather short time. For example, MYSKILLS is available as a free digital self-assessment tool in six languages and aims to reach 50 000 users by the end of 2018[148]. The tool will have capacities for 120 000 cases per year[149].

[142] Scheuermann & Björnsson, 2009; Scheuermann & Guimarães Pereiram, 2006.

[143] Redecker, 2013, p.17

[144] European Commission, 2017a, p.3

[145] Oldfield et. al, 2012, p.11-12

[146] European Commission, 2017a, p.3

[147] Turkish Qualification Framework

[148] Country report DE

[149] once all 30 tests are available - country report DE

Facilitating administrative processes is the aim of the French plan for the simplification of validation of non-formal and informal learning[150]. As a last step of the validation process, a portfolio (VAE request[151]) that demonstrates that the candidate possesses the necessary competencies required for a targeted qualification is assessed by a jury, leading (or not) to the award of the certification[152]. The plan for simplification puts forward proposals to promote the digitisation for candidates and jury members. Digitised validation files, made available through a collaborative tool, could allow jury members to give their opinion on the candidate's file and on whether or not an interview is necessary for the certification process. This new possibility would limit the number of interviews before the jury, thus speeding up the processing of VAE requests for validation. The evaluation mission on VAE[153] evokes the possibility of documenting competences in a passport where, with different levels of trust, the blocks of competences recognised by a certifier, those recognised by an employer or those recognised by peers can be found. The recommendation is to build methods of validation and especially capitalisation of skills recognised by ministries, professional branches, employers during professional interviews and peers. A personalised and secure online profile would make it possible to upload official certificates and recognised skills that the owner could communicate to third parties of his or her choice[154].

Evidence of the actual impact of digital assessment tools in the validation process is scarce. For example, the beta-version of my-professional-experience.org (DE) was tested with 40 counsellors who provided very positive feedback on the usability and the impact of the tool. Their clients (mainly formally low qualified, with rather poor command of German language and 1-3 years of professional experience) usually enjoyed working with the tool and emphasised that it enables faster evaluation of clients‘ professional experience, facilitates decisions regarding further competence diagnostics and helps finding internships and jobs for clients[155]. An evaluation of MYSKILLS is planned to be carried out over the course of 2019/2020. Until then only anecdotal evidence is available, which is usually positive, as the video statements from participants, employers and representatives of PES show[156].

[150] ‘61 mesures pour simplifier la vie des français’; Content published under the chairmanship of François Hollande from 15 May 2012 to 15 May 2017, https://www.gouvernement.fr/simplifier-transformer
[151] VAE - *Validation des acquis de l’expérience* (VAE)
[152] Country report FR
[153] IGAS-IGANR, 2016
[154] Country report FR
[155] Noack, 2018
[156] The videos are available here: https://www.bertelsmann-stiftung.de/de/unsere-projekte/berufliche-kompetenzen-erkennen/. Another indication of the success of the instrument is the fact that some countries (e.g. Austria) are interested in transferring it into their national context.

8 Challenges in digital assessment for validation

This section explores the challenges and limitations of digital assessment. Potential challenges are related to the following aspects:

- Costs: although it may be possible to save costs later, there may be high initial set-up costs for scientific, pedagogical and technological development and possibly also high maintenance costs.
- Scope: digital forms of assessment might not be able to cover all types of knowledge, skills and competence. In addition, the distinction between formal and non-formal learning can be difficult for users when everything is handled on one platform (as the experience from Smart Career in the UK shows[157]).
- Authenticity of the assessment, validity and reliability issues: a particular challenge of digital forms of assessment and self-assessment is the question of the validity of their outcomes for third parties (e.g. employers and education and training institutions). In many cases it can be observed that, although the results might have motivational effects for the individuals, they are not valued or trusted by third parties. For example, the accuracy and reliability of results that are not verified or approved by an external assessor might be doubted or the value of approaches that are not based on specific standards or do not include occupation- or job-specific competences in a sufficient way might be scrutinized. A perceived lower value of online assessments was also identified as one of the barriers to recognising non-formal, open learning by the OpenCred research study on 'Validation of Non-formal MOOC-based Learning'[158]. Also in the case of MYSKILLS (DE) it has been observed trust of the tool might become a problem which is already today visible by stakeholders who are very skeptical[159].
- Assuring honest results: similar to the challenges of digital assessment in formal education, the use of digital devices raises a number of new concerns. A key aim of assessment is to measure students' personal aptitude, competence or knowledge. Although cheating during tests has always been a problem in education, new technologies offer new opportunities. Policy makers and practitioners are in particular concerned that students might access information saved on their devices or online and use this information to answer questions that are meant to indicate their own ability[160]. In any case, the majority of online tools in the context of validation rely on self-assessment and supports the identification of competences, where cheating is of little use to users.
- Target groups: for specific target groups (e.g. who are less technology- or internet-savvy), digital tools might not be suitable. Another potential challenge is the acceptance by the target group, and the possible additional resources needed for a digital tool to live up to its full potential. In the case of self-evaluation of refugees or other groups not used to the self-evaluation concept, for example, additional guidance is necessary, as participants are often not aware of their skills and need time to realize what they are capable of[161]. For example, there are some criticisms of the Danish 'My Competence Portfolio' as it is perceived as too difficult for the low-skilled: Obviously, they need more advice and guidance for the description of competences. The documentation format is too much relying on the user's own description and their writing skills. The systematic approach is not equally logical to all groups. Whilst no formal evidence is available, it is the impression that 'My

[157] Database
[158] Witthaus et al., 2016
[159] Database
[160] European Commission, 2017a, p.4
[161] According to interviews carried out for two separate initiatives analyzed for a Skills Audit project

Competence Portfolio' is not widely used by individuals, and neither is it regularly part of educational institutions' validation efforts[162].

- Security of personal data and verification of identity: a further challenge to digital assessment is to really assess those candidates who are supposed to be assessed. Determining the identity of individuals and at the same time complying with data protection regulations is just as challenging as in other contexts, e.g. higher education distance learning. But also in that context, online proctoring is seen by some as a lesser form of validation than an examination in a physical location. Some MOOCs set on-site examinations in order to supervise learners and verify their identities or use specific technologies, which match learners' photo IDs with webcam photographs or employ keystroke biometrics and online proctoring services[163]. Especially for certification in the context of non-formal and informal learning it is important to determine the authenticity of documents and the identity of the candidates. For possible solutions one can look around for similar problems and their solutions, such as identity verification systems at universities. Currently, in initiatives that also cover the assessment phase (UK Public Skills Passport, DE My Skills), however, the results are evaluated and processed with officers of public employment services (MYSKILLS, DE) or HR managers. In France, for example, data protection and identity verification are reasons why the digitization of applications and documentation is not directly implemented[164].

[162] Database

[163] Witthaus et al., 2016, pp.68-71

[164] Country report FR

9 The future of digital assessment for validation

In the last ten or 20 years, technologies have increasingly been used to support and shape assessment processes. Digital assessment for validation is expected to benefit from developments in innovative assessment tools in general.

One possible future scenario for digital assessment of competences and skills is the implementation of assessments in virtual space. Augmented and virtual reality can enrich the examination situation and provide new possibilities that go far beyond the self-assessment of the candidates. Augmented reality refers to the layering of information over a view or representation of the normal world, offering users the ability to access place-based information in ways that are compellingly intuitive. Augmented reality is considered a promising technology for enhancing education, because it can be used for visual and highly interactive forms of learning; it responds to user input; and allows for dynamic processes, extensive datasets, and objects too large or too small to be manipulated to be brought into a student's personal space at a scale and in a form easy to understand and work with[165].

Google glasses (or similar devices) can be used for assessment purposes at an authentic working environment. The assessor can monitor the performance online at their desk and observe the possible actions and interactions of the candidate. Several benefits are expected from this: in traditional settings, the presence of the assessors can distort the assessment situation and make the candidate nervous. In addition to cost savings, e.g. by eliminating travel costs, the digitised recording of the assessment and the evaluation of the detailed data offers the assessors the possibility of reviewing the examination situation afterwards and re-evaluating it, if necessary, in order to achieve more reliable results[166].

In the same sense, another promising methodology is the assessment by simulation. 'Simulations present students with an authentic scenario that, ideally, requires them to behave as they would in the real world, testing their theories and applying their knowledge to complete complex tasks. Data gathered in simulation-based assessments can measure not just the correctness of one final answer, but multiple aspects of the student's ability to apply skills to solve problems; for example, efficient use of information and tools, systems thinking, as well as accuracy in decisions made at each step'[167].

Currently, virtual laboratories and simulations are primarily used (if at all) as learning, rather than testing environments. Recent advances in simulation, data collection, and data analysis are making it possible to gain insights into learners' thinking from their progress through the tasks in a simulation and thus use behaviour displayed in a virtual environment as a basis for formative and summative assessment. By using simulations and virtual laboratories, for certain skills and competences, the whole process of conducting and evaluating work processes can be integrated into the assessment task. While these skills can also be assessed using real-life experiments as assessment tasks, virtual environments increase the variety and scope of experiments that can realistically be conducted by learners themselves, with limited time and resources[168].

Currently, many different networks already provide users with a way to record their achievements. However, except for 'Open Badges', none of these provide ways to

[165] Redecker, 2013, p.34
[166] Database, example FI
[167] ETS, 2012
[168] Redecker, 2013, p.38

verify the experience and credentials described and included within these systems – therefore these systems operate as a digital counterpart to a box full of paper certificates – deriving, little to no additional benefits or efficiencies from the process of digitisation. As mentioned earlier, also the application of the blockchain technology in education is rather new. It can be considered as a new infrastructure to secure, share, and verify learning achievements (formal and non-formal credentials)[169].

Following this trend and in order to make it easier for education providers and employers to access reliable and trustworthy information on qualifications, action 3 of the 'Digital Education Action Plan' refers to the development of a blockchain-based framework for digitally-signed qualifications[170]: These are electronic statements issued by an awarding body to an individual to provide proof of their learning outcomes and confirm the awarding of a qualification or other credentials. It is envisaged that storage and sharing infrastructure will be available through the new Europass platform by the end of 2019. As these credentials can also be awarded for learning outcomes acquired in non-formal and informal learning situations (including records of employment or voluntary activities or certificates acquired outside the formal system), it will be interesting to see how these developments influence validation and, in particular, accelerate the development of digital assessment methods and tools in the context of validation.

[169] However, there are also many open questions and points of criticism, for example in connection with the enormous energy consumption by blockchain technology.

[170] 'Provide a framework for issuing digitally-certified qualifications and validating digitally-acquired skills that are trusted, multilingual and can be stored in professional profiles (CVs) such as Europass. The framework will be fully aligned with the European, Qualifications Framework for Lifelong Learning (EQF) and the European Classification of Skills, Competences, Qualifications and Occupations (ESCO)'. https://ec.europa.eu/education/education-in-the-eu/european-education-area/digital-education-action-plan-action-3-digitally-signed-qualifications_en

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