

Information and data literacy skills development in Creative Industries Adult Education: the DigiCulture project

Promozione dell'alfabetizzazione digitale in contesti educativi delle Industrie Creative: una revisione sistematica della letteratura dal progetto DigiCulture

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abstract

This paper aims to analyse, from a theoretical point of view, the promotion of digital skills, in particular *Information and data literacy* (Carretero, Vuorikari & Punie, 2017), in a Creative Industries (CI) Adult Education context. Gaining digital skills and abilities, the promotion of which is often inadequate (European Commission, 2017), could improve the career opportunities of workers in the CI sector, providing access to new distribution markets, such as e-commerce, or adding new forms of digital expression (European Commission, 2018). The analysis of the literature promoting digital competences for CI workers aims to identify, from a pedagogical point of view, the most effective teaching and learning methodologies, didactic tools and evaluation practices for *Information and data literacy* development, defining the theoretical elements for the construction of future educational training paths in international education contexts. The content of the paper originates from the Erasmus+ KA204 “DigiCulture” project (*Improving the Digital Competences and Social Inclusion of Adults in Creative Industries*, 2018-2021).

Keywords: digital skills, information and data literacy, creative industries, adult education, literature review

Il presente contributo propone una revisione sistematica della letteratura di riferimento sul tema delle competenze digitali, in particolare quelle di *Information and data literacy* (DigComp 2.1, 2017), in percorsi educativi destinati a chi opera nell'industria creativa. L'acquisizione di competenze digitali, la cui promozione è spesso inadeguata (European Commission, 2017), potrebbe migliorare le opportunità di carriera dei lavoratori delle industrie creative, attraverso l'accesso a nuovi mercati di distribuzione, quali l'e-commerce, o a nuove forme di espressione digitale (European Commission, 2018). L'analisi sistematica delle ricerche empiriche pubblicate in letteratura nel campo della promozione delle competenze digitali per adulti operanti nell'industria creativa, qui descritta, si propone di identificare, in un'ottica pedagogica, le modalità di insegnamento e apprendimento, le metodologie, gli strumenti didattici e le pratiche valutative più efficaci per lo sviluppo delle competenze suddette, definendo la linea teorica per la costruzione di futuri percorsi educativi di formazione in contesti internazionali. I contenuti del contributo de-

rivano dal progetto Erasmus+ KA204 DigiCulture (*Improving the Digital Competences and Social Inclusion of Adults in Creative Industries*, 2018-2021).

Parole-chiave: competenze digitali, Information and data literacy, Industrie Creative, formazione degli Adulti, revisione sistematica della letteratura

1. Introduction

The Creative Industries Education context presents a low emphasis on the use of new digital technologies (European Commission, 2017), entrepreneurship promotion (project management), digital abilities and transversal skills development. Both newly graduates and existing employees, in fact, lack important skills (OECD, 2018) for their future careers. Creative Industries (CI) employees are often not involved with any formal institution, being freelancers, sometimes members of disadvantaged groups (with economic problems) or from minority groups. Gaining digital skills, they will improve their career opportunities with access to new distribution markets through internet access and ecommerce, new entrepreneurial tools or adding new forms of digital expression to their work (European Commission, 2018).

Starting from these assumptions, the Erasmus+ KA204 “DigiCulture” project (*Improving the Digital Competences and Social Inclusion of Adults in Creative Industries*, 2018-2021) aims to create a sustainable and efficient education program devoted to adult learners with low digital skills and low-qualified adults involved in the CI sector. The partnership of the project, composed by eight Educational Institution and Association from 7 different EU Countries, is involved in the design of the DigiCulture MOOC, whose main objective is to fill in the digital skills gap of people who operate in CI sector, promoting social inclusion, media literacy, intercultural competences and 4C skills (critical thinking, creativity, communication and collaboration; Trilling & Fadel, 2009). The DigiCulture MOOC will provide important new opportunities for adults to access knowledge, gain new digital skills and inter-cultural competences and improve their chances of finding employment or performing better in their current employment.

The DigiCulture project has the following priorities:

- to enhance awareness of the need for adult training in digital skills for the CI;
- to design and validate cross-country Guidelines for Digital Competences for CI;
- to create an Integrated Virtual Learning Hub as an online and mobile MOOC platform for developing digital competences in the culture and heritage sector using Open Educational Resources (OERs), Tools and Practices;
- to design, develop and deliver a Digital Skills and Social Inclusion for Creative Industries Course, translated into all partners' languages, aimed at promoting digital competences and social inclusion in adults involved in the CI sector;
- to improve the achievement and recognition of digital skills through formal and informal learning by introducing Digital Skills e-assessment and Open Badges for adult education in CI;
- to provide engaging and effective learning experiences in the context of Digital Skills promotion for CI adult employers;
- to enhance collaboration between education providers, universities, cultural and heritage institutions and associations, cultural actors, workers and volunteers;
- to verify how achievement, assessment and validation of digital skills contribute to the uptake of new skills in adult learners.

The main objective of the present paper is to provide the phases and results of the Literature review of academic studies and publication about the promotion of the *Information and data literacy* Digital competence *dimension* within formal and non-formal educational contexts in the Creative Industries sector.

These results will be useful for the DigiCulture project in order to identify the most appropriate teaching and learning methodologies, tools, intervention strategies and evaluation tools for the promotion of the *Information and data literacy* dimension.

Starting from the above results, the project partnership will use the pedagogical and operational indications for the creation of effective educational interventions in the promotion of digital skills for Creative Industries workers. Furthermore, such data will be the starting point for the design and implementation of the DigiCulture MOOC course that will be developed within the project.

2. The role of Digital Competences in Lifelong Learning perspective

The idea of learning cannot be defined anymore merely as knowledge acquisition: learning means to acquire new competences and skills which are developed and benefited from all over one person's life. The idea of Lifelong Learning allowed the development of new research methods and approaches in which the learner's education is conceived a wide, complex and social process.

Digital competence is one of the eight competences required to the European citizens at the end of their compulsory school path in a Lifelong Learning perspective. Moreover, it is a pivotal transverse skill for employers. However, the promotion of digital skills is still undeveloped: the *European Digital Progress Report EDPR* (2016a), carried out by the European Commission, shows that 45% of European population has insufficient or no digital competences, causing delays or limitations in technological, social and cultural innovation. As Günther H. Oettinger, Commissioner for Digital Economy and Society, states, “the lack of digital skills is already hampering innovation and growth in Europe. Not just for ICT companies but for organizations in all sectors – private and public. We must remove this obstacle to make sure Europeans get the jobs they deserve and our businesses have access to a large pool of digital talent” (European Commission, 2016b). Ansip, Vice-President for the Digital Single Market, highlights that “Allowing more people to develop digital skills is like giving a ticket to the digital economy. We cannot build the Digital Single Market in Europe without addressing the digital skills gap. The launch of the Digital Skills and Jobs Coalition is a milestone in our joint effort to increase everyone's digital skills in Europe” (European Commission, 2016). For these reasons, the European Commission has launched the Digital Europe Programme (2021-2027) focused on building the “strategic digital capacities of the EU and on facilitating the wide deployment of digital technologies, to be used by Europe's citizens and businesses” (2019a, p. 2), such promoting the use of digital technologies across the European economy and society.

The digital transformation is changing the way European enterprise and companies operate within the economy. However, many of them, especially medium-sized enterprises (SMEs) “do not fully use this potential as they are lacking a digital transformation strategy, expertise and necessary capability” (European Commission, 2019b, p. 5) and have problems

in recruiting staff skilled in digital competences. The 55% of European companies admit that the shortage of Digital competences caused loss of competitive advantage, even if they lack the time to invest in digital skills training (European commission, 2019c). As Bridgstock states (2011), the CI workforce is dominated by a high number of small-to-medium enterprises and employees often freelance or performed on a short-term contractual basis: promoting digital skills in CI education should help CI economic growth and innovation opportunities. Moreover, the consolidation of Digital Transformation and Industry 4.0 demands that companies promote ICT, soft and hard digital skills, working more closely with training associations and institutions.

The promotion of Digital competences in today's workers is essential for the European economy development. The acquisition of digital competence does not solely derive from the ability to use digital tools: technologies evolve and change daily and people must be able to apply their own digital skills to deal with more recent and diverse tools. Furthermore, thanks to the new technologies and, in particular, to the tools provided by the Web, users have a wide range of information which everybody can produce, regardless of their specific and sectoral skills. Such a freedom increases the risk connected to the authoritativeness of the sources and contributes to the spreading of a kind of culture that lacks depth, since it is based on the rapidity and momentariness of data (Poce, 2015). Adults must learn to use ICTs to find, keep, assess, produce and share data and information, by communicating with other people on the Web as well as through the use of specific digital tools.

The inclusion of new technologies in pedagogically rigorous didactic paths supports the adult users and allows them to learn how to critically use technology and digital tools. At the same time, it supports the development of other transversal skills, like communication, collaboration, creativity and critical thinking, especially in CI working field (van Laar et al., 2019).

In Lifelong Learning perspective, Digital skills acquisition allows adult learner to acquire new knowledge and develop ever-changing abilities, having the opportunity to continuously training themselves in the field of education and reducing the possibilities of exclusion from the labour market. In the same time, the promotion of Digital skills in young workers (22-36 years old) should reduce the risk of unemployment (Eurostat, 2017), social and cultural exclusion.

3. Creative Industries identification and definition

According to the UNESCO definition, Creative Industries are “industries that combine the creation, production and commercialization of products which are intangible and cultural in nature. These contents are typically protected by copyright and they can take the form of goods or services”¹. The present paper and the DigiCulture partnership adopted also the UK (Department for Culture, Media, and Sport – DCMS²) division of CI into nine segments to carry out research activities related to the project. According to this division, the CI sector is composed by the following categories:

- Museums, galleries and libraries;
- Music, performing and visual arts;
- Advertising and marketing;
- Architecture;
- Crafts;
- Design (product, graphic and fashion design);
- Film, TV, video, radio and photography;
- IT and computer services, software and web/mobile development;
- Publishing.

The DigiCulture project intends to investigate also the Tourism sector as one of the industrial categories in which the development of workers’ digital competences can contribute to improve employees’ career opportunities and social inclusion. This decision was made because of the strong connection between the tourism sector and some of the categories of the CI, such as Museums, Advertising and Design.

1 See <https://www.ico-d.org/connect/features/post/229.php> [02/05/2019]

2 Department for Culture, Media & Sport (2016). *Creative Industries: Focus on Employment*. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/534305/Focus_on_Employment_revised_040716.pdf [09/05/2019].

4. Context for a definition of Digital Competences: the DigComp 2.1 Framework

The Framework of digital skills classification and definition used within the present paper is *DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use* (Carretero, Vuorikari & Punie, 2017). The Framework defines 5 digital competences dimensions, as follows:

- Information and data literacy;
- Communication and collaboration;
- Digital content creation;
- Safety;
- Problem solving.

DigComp is a tool for improving European citizens' digital competence. The first edition was published in 2013 and it has been a reference point for many learning and training initiatives aimed at developing digital competence at European and Member State level. DigComp was developed by the Joint Research Centre (JRC) of the European Commission as a scientific project based on the participation and active contribution of a large number of stakeholders and policy makers from the fields of industry, education and training and labour market. The second version of the framework was published in 2016 (DigComp 2.0 – The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model) and contains updates on areas, descriptors and titles of competences. The third and final version of the Framework was published in 2017; it defines 21 digital competences.

The *Information and literacy* dimension, focused in the present paper, is defined as follows:

**Tab 1: Information and data literacy dimension in DigComp 2.1:
The Digital Competence Framework for Citizens
with eight proficiency levels and examples of use**

Digital competences dimension	Sub-skills	Definition
Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content	To articulate information needs, to search for data, information and content in digital environments, to access and navigate between them. To create and update personal search strategies.
	1.2 Evaluating data, information and digital content	To analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyse, interpret and critically evaluate the data, information and digital content
	1.3 Managing data, information and digital content	To organise, store and retrieve data, information, and content in digital environments. To organise and process them in a structured environment.

5. State of the art on Information and data literacy promotion in CI sector: methodology

The methodology used for the development of the paper presents four main activities, as follows:

1. Searching Criteria identification. The criteria applied for the analysis of papers are summarized in the Table 2. Some of these criteria were important not only for searching, but also for selecting or rejecting papers. For instance, if the paper was not directly relevant to the group of skills in CI adult education, it was not included in the list of papers to analyse.

Tab. 2: Searching criteria for the literature review

Journals	Peer-reviewed publications (journal and/or reviewed/edited books)
Years	(Include the years of the papers)
Database	ERIC and/or other databases from our universities
Keywords for searching	- (<i>add selected skills group</i>) - adult education - Creative Industries sector (1- Museums, galleries and libraries; 2- Music, performing and visual arts; 3- Advertising and marketing; 4- Architecture; 5-Crafts; 6- Design (product, graphic and fashion design); 7-Film, TV, video, radio and photography; 8- IT, software and computer services; 9- Publishing; 10- Tourism) - Interventions / strategies / practices
Main focus (content)	- Practices fostering (<i>add selected skills group</i>) development in CI adult education context

2. Research and selection of papers for analysis. The research was carried out only on Peer-reviewed publications. The databases used for the research were the following: Scopus, ResearchGate, Google Scholar, sba.uniroma3.it. All the articles identified in the databases have undergone a first process of revision by the author of the present paper: the researchers involved, through the reading of the papers, identified whether the articles found were in line or not with research objectives and areas of study. The following criteria were used to assess the exclusion of articles: absence of methodological criteria and no reference to the creative industries sector. In total, only 10 scientific papers were selected for the analysis.

3. Review, data extractions and papers analysis: the scientific papers were analysed through the analysis table (Table 3) identified by the Digi-Culture project partners. Each article was analysed by the author of the present paper. After a first analysis, an internal review process between the members of the research group was carried out, in order to resolve any doubts about the evaluation of the articles within the analysis tables. 10 scientific papers were analysed and 10 analysis tables were compiled.

Tab.3: Categories used for articles' content analysis

Dimensions	Categories for the analysis
<i>Type of study</i>	Qualitative Quantitative
<i>Type of educational programme</i>	Ex. formal context, training, informal context, refresher course, etc.
<i>Skills under investigation</i>	Refer to the skills identified by DigComp 2.1 (2017)
<i>Activities foreseen (if relevant)</i>	
<i>Teaching strategies (if relevant)</i>	Ex. Problem solving (inquiry), Lecture discussions (argumentation), etc
<i>Learning material (including tasks) described (if relevant)</i>	
<i>Evaluation of learning (exam) (if relevant)</i>	
<i>Learning results (are the aims reached?)</i>	In terms of skills developed
Reported difficulties	
Brief overall evaluation of the paper in terms of <i>originality, significance, quality, clearness, relevance</i>	<p>Original: the paper explores a new idea, project or issue; discusses existing research with promise of new insight, discusses new research; or presents new ways of considering existing information</p> <p>Significant: the paper raises and discusses issues important to improving the effectiveness and/or sustainability of education efforts, and its contents can be broadly disseminated and understood</p> <p>Quality: claims are supported by sufficient data; claims draw upon relevant literature; and limitations are described honestly</p> <p>Clear: the intended outcomes of the paper are easily understood</p> <p>Relevant: the paper addresses one or more of the themes of the "Conceptual Framework of Digital Competences for Culture and Creative Industries"³ (1. Potential role of competences, within the context of 21st century learning; 2. Potential role of digital resources in cultural and CI adult education).</p>

4. Summary of results and production of the report. The data resulting from the analysis of the selected articles have been used for the elaboration of the research report presented in the paper. Particular atten-

tion was paid in the identification of the most useful educational interventions for the promotion of the *Information and data literacy* dimension and skills, in accordance with the research carried out.

6. Results of the review about Information and data literacy in CI adult education

The results of the Literature review led to the identification of 20 scientific publications about the *Information and data literacy dimension* promotion for Creative Industries adult workers. A first review process was carried out on these 20 articles through the complete reading of them, in order to identify if they were properly in line with the research activity and DigiCulture project objectives. This pre-selection process led to the elimination of 10 scientific publications, caused by the following elements:

- Absence of specific methodological criteria (4)
- Absence of specific CI sector (3)
- Absence of specific learning results (3).

Only the remaining 10 were analysed through the use of the analysis table.

The articles selected for the analysis of the effective educational interventions in the *Information and data literacy dimension* promotion for Creative Industries adult workers were found in the following research databases (Table 4).

Tab. 4: Databases used for “Information and data literacy” dimension

	Research-Gate	Scopus	Google Scholar	Academia.edu	Total
No. Scientific paper	3	3	3	1	10

Most of the articles refer to educational practices for the workers in the *Museums, galleries and library* category (5 articles out of 10); 2 articles refer to the *Design area* (*product, graphic and fashion design*); 1 article refers to the *Architecture* area and 1 to the *IT, software and computer ser-*

VICES area. An article does not report the area of work of the adults involved in educational activities.

Formal education is the most present educational context in the analysed articles (5 papers out of 10).

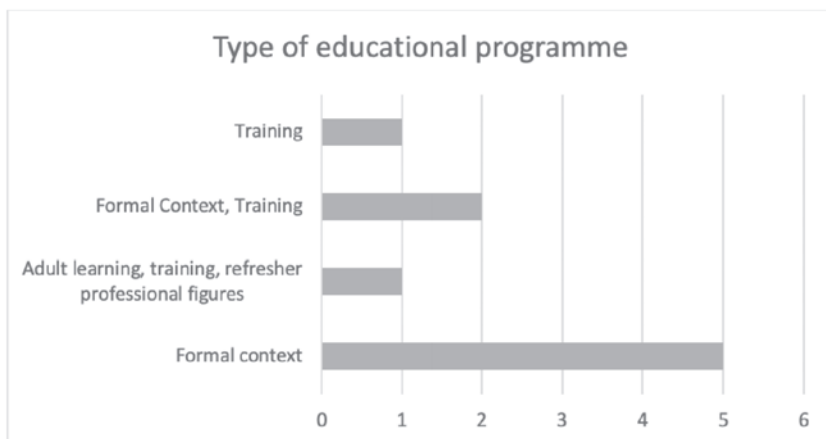


Figure 1. Type of educational programme presented in the papers under analysis

Taking into consideration the sub-skills of the *Information and data literacy* dimension (*Browsing, searching and filtering data, information and digital content; Evaluating data, information and digital content; Managing data, information and digital content*), the research papers result to be divided according table 5. Two papers highlight the promotion of two sub-skills at the same time.

Tab. 5: Number of papers identified for each sub-skill of the Information and data literacy dimension

	Browsing, searching and filtering data, information and digital content	Evaluating data, information and digital content	Managing data, information and digital content	Browsing, searching and filtering data, information and digital content & Evaluating data, information and digital content	Evaluating & Managing data, information and digital content
No. Scientific paper	2	4	2	1	1

The educational activities presented in the analysed papers are varied. Most of them are linked to the creation or evaluation of digital products, promoting activities of visual programming, 3D design, archiving, MOOCs (Massive Open Online Courses) and OERs (Open Educational Resources) production and evaluation, digitalization. This result is quite evident, due to the digital skills promotion purpose of the educational pathways proposed in the research papers.

Discussion activities and critical analysis of the digital products are embedded in many educational pathways described in the papers, especially in relation to the promotion of the subskill Evaluating data, information and digital content (5 scientific papers out of 10).

The use of certain educational activities is always to be considered in relation to the context of the Creative Industries sector of reference: digitalization and archiving concern the Museums, galleries and libraries and IT, software and computer services categories; 3D design refers to the Architecture area, the visual programming to the Design area (product, graphic and fashion design).

Only the activities of construction and evaluation of open resources, such as MOOC and OERs, could be used in other educational contexts and creative industry sectors, as they are not specifically related to the Museums, galleries and library sector which the articles analysed refer to. In the same way, the didactic tools are in line with the student's field of work and the designed didactic activity.

The educational activities proposed within the papers also aim to promote digital and transversal skills, such as *Communication* (4 articles), *Critical thinking* (2 articles), *Team working* (3 articles), *Management* (2 articles).

The promotion of the *Information and data literacy* dimension is also associated with *Creativity*, *Collaboration* skills and the transversal attitudes of *Motivation* and *Curiosity* (1 article).

7. Information and data literacy interventions results

The educational interventions aimed to promote the *Information and data literacy* dimension have different characteristics. As far as educational strategies are concerned, e-learning activities are the most used in the articles analysed (4 out of 10 articles): this is probably due to the fact that

is easier for workers to attend courses remotely, so as to combine work and training activities. The *Learning by doing* methodology is considered useful within the learning path presented in the papers (2 articles out of 10), together with the *Cooperative learning* (2 articles out of 10) and the *Peer-tutoring* methodology.

Other teaching strategies include *Problem-solving* and *Discussion activities*. The reference to interdisciplinary knowledge is also an educational intervention that seems to be effective in the evaluation of software and digital products: taking into account the context of digital tools construction allows the students to develop a greater awareness and a deeper analysis of the tool itself.

Tab 6: Teaching strategies

	<i>Learning by doing</i>	<i>Lecture discussion</i>	<i>Digital simulation</i>	<i>Problem solving</i>	<i>E-learning</i>	<i>Cooperative learning</i>	<i>Interdisciplinary approach</i>
No. Scientific paper	2	2	1	1	4	2	1

The reference to specific pedagogical models within the papers for the development of certain didactic methodologies is really interesting: Eilenberg’s method (Knight, 1999) (analysis, transformation, synthesis) is appointed as the framework of reference for HCI (Human-Computer Interaction) activities and for classroom argumentation activities; Polya’s model (1945) (Understanding the problem; Planning a solution; Carrying out the plan; Checking the results) is instead used for the construction of Problem solving activities.

The evaluation of digital competences, in particular of the *Information and data literacy* dimension, is extremely complicated from a pedagogical point of view and it is generally poorly developed. Even if the educational pathways directly nominate digital skills and sub-skills, these are never evaluated through appropriate assessment tools.

The evaluation aspect of the papers under analysis is the most under-representative characteristic. Some articles (3 out of 10) report how to evaluate the knowledge acquired during the course through the use of standardised tests, or how to evaluate the technical skills promoted. As regards the quality of learning products, an article presents the assess-

ment indicators of the digital product made by the students of the course: *Functionality; Efficiency; Liability; Portability; Usage; Maintenance*. For what concerns the assessment of digital tools and data, the learning results of 4 out of 10 analysed papers, only 2 papers present in detail the analysis of the tool used by students during their activities. The absence of specific evaluation information limits the replicability of the learning and teaching experiences analysed.

As regards the difficulties encountered in the educational pathways, the information is limited. The only suggestion given, maybe too generic from a pedagogical point of view, is the correct and careful planning of each educational activity, in order to allow a learning experience as effective as possible.

8. Conclusions

The systematic literature review of *Information and data literacy* digital competences promotion in CI sector, presented in this paper, shows a limited attention by experimental educational research in the field of CI Education. In particular, despite the pivotal educational need to promote digital skills in CI workers, a limited number of scientific papers on the subject provide few information on the most effective learning methodologies, tools and paths for achieving these learning objectives. Researchers and educators, especially from informal educational contexts, should develop more empirical research activities in the field and define, together with companies and stakeholders in the cultural sector, the profiles required by the labour market and useful for the promotion workers' social and economic inclusion.

As shown by the analyses carried out, a strong connection between *Information and data literacy* and Communication and collaboration skills is underlined by the learning activities of the papers analysed: the construction of learning pathways promoting both digital dimensions seems to be effective in terms of promoting competences. The *Managing data, information and digital content* skill should be fostered especially at basic level, in order to encourage the promotion of more complex skills such as *Digital content creation* and *Communication and collaboration*.

Digital competences are often associated with other 21st century skills, such as Communication, Collaboration and Critical thinking: the

design and realization of learning paths aimed at promoting different transverse competences fostering the learners' cultural and social inclusion and support the active citizenship in Lifelong learning perspective. Collaborative activities, also online, should be useful in this context.

The use of digital tools is pivotal for the promotion of Digital competences within the 21st century learning context: different kind of OERs, also for evaluation activities, software and social media should be selected in a coherent way in order to design an effective learning path in terms of knowledge, abilities and skills.

The learning path evaluation should be designed with the support of different tools and activities, also collaborative ones, with the aim of assessing and monitoring the overall education experience of learners.

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Scientific paper analysed

Abasi A. R., Taylor M. C. (2007). Tackling the issues and challenges of using video data in adult literacy research. *Australian journal of Adult Learning*, 47(2): 289-307.

Bawen D., Vilar P., Zabukovec V. (2005). Education and training for digital librarians: A Slovenia/UK comparison. *Aslib Proceedings*, 57 (1): 85-98.

Carvalho A., Ribeiro Matos A. (2018). Museum Professionals in a Digital World: Insights from a Case Study in Portugal. *Museum International*, 2018: 36 – 47.

Lawson K.G. (2005). Using eclectic digital resources to enhance instructional methods for adult learners. *OCLC Systems & Services: International digital library perspectives*, 21 (1): 49-60.

Mu.Sa Sector Alliance – Greece, Portugal, Italy - (2017). Museum Professional in the Digital Era. Agents of Change and Innovation. In <<https://melting-pro.org/wp-content/uploads/2017/07/Museum-professionals-in-the-digital-era.pdf>> (last accessed 05/08/2019).

- Padilla S., Orzechowski P. M., Chantler M. J. (2012). Digital Tools for Creative Industries. Proceedings from *Digital Futures 2012*, October 23-25, 2012, Aberdeen, UK.
- Poce A., Agrusti F., Re M. R. (2017). MOOC design and heritage education. Developing soft skills and work-based skills in higher education students. *Journal of e-Learning and Knowledge Society*, 13(3): 97-107.
- Selvaggi A., Pesce F., Surace R. (2017). Museum of the future: Digital skills for change and innovation in Italy. This paper is part of the Mu.Sa. – Museum Sector Alliance Projects -research.
- Smeureanu I., Isaila N. (2014). Adult Users' Familiarisation With Graphical Interface Elements For Digital Competences Acquiring. *Social and Behavioral Sciences*, 131: 517-520.
- Stavric M., Wiltsche A. (2007). Didactical integration of analog and digital tools into architectural education. Proceedings from *International Conference on Computer-Aided Architectural Design, CAADfutures 07*, Sydney, Australia, 11/07/07-13/07/07.

References

- Bridgstock, R. (2011). Skills for creative industries graduate success. *Education & Training*, 53(1): 9–26.
- Carretero S., Vuorikari R., Punie Y. (2017). *DigComp 2.1: The Digital Competence Frame-work for Citizens with eight proficiency levels and examples of use*, EUR 28558 EN, doi:10.2760/38842. Available at <[http://publications-jrc.ec.europa.eu/repository/bitstream/JRC106281/web-digcomp2.1pdf_\(online\).pdf](http://publications-jrc.ec.europa.eu/repository/bitstream/JRC106281/web-digcomp2.1pdf_(online).pdf)> (last accessed 25/10/2019).
- European Commission (2016a). Europe's Digital Progress Report 2016. Available at <<https://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2016>> (last accessed 25/10/2019).
- European Commission (2016b). Commission launches Digital Skills and Jobs Coalition to help Europeans in their career and daily life. Available at <https://europa.eu/rapid/press-release_IP-16-4081_en.htm> (last accessed 25/10/2019).
- European Commission (2017). *Europe's Digital Progress Report EDPR 2017*. Available at <<https://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2017>> (last accessed 25/10/2019).
- European Commission (2018). *Digital Education Action Plan*. Available at <<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:22:-FIN>> (last accessed 25/10/2019).
- European Commission (2019a). EU budget for the future. Digital Europe Pro-

- gramme: a proposed 9.2 billion of funding for 2021-2027. Available at <<https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027>> (last accessed 25/10/2019).
- European Commission (2019b). *High-Tech Skills Industry. Increasing EU's talent pool and promoting the highest quality standards in support of digital transformation*. Luxembourg: Publications Office of the European Union.
- European Commission (2019c). *Digital Skills. New Professions, New Educational Methods, New Jobs*. Luxembourg: Publications Office of the European Union.
- European Union (2017). Sustainable development in the European Union: monitoring report on progress towards the SDGs in an EU context. Available at <<https://ec.europa.eu/eurostat/web/sdi/publications>> (last accessed 25/10/2019).
- Knight T. (1999) *Applications in architectural design, and education and practice*. Report for the NSF/MIT Workshop on Shape Computation, MIT Cambridge.
- OECD (2018). *Education at a Glance: OECD Indicators*. Paris: OECD Publishing.
- Poce A. (2015). Developing Critical Perspectives on Technology in Education: A Tool for MOOC Evaluation. *European Journal of Open and Distance Learning*: 51-62.
- Polya G. (1945). *How to solve it*. Princeton: Princeton University Press.
- Trilling B., Fadel C. (2009). *21st Century Skills: Learning for Life in Our Times*. San Francisco, CA: John Wiley & Sons.
- van Laar, Ester & Deursen, Alexander J.A.M. & Van Dijk, Jan A.G.M. & Haan, Jos. (2019). *Twenty-first century digital skills for the creative industries workforce: Perspectives from industry experts*. *First Monday*. 24. 10.5210/fm.v24i1.9476.