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AN INSTRUMENT FOR THE DIGITAL COMPETENCE ACTIONS FRAMEWORK

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Abstract

Most existing instruments for evaluating a person's digital skills and digital competence consider neither the full spectrum of digital skills, nor the new digital technology advances, nor the digital behavior of modern people. This paper proposes a comprehensive instrument to measure a person's digital competence across the actions he/she is able to do using digital technologies: access, search and find; use, store, manage, evaluate and terminate; communicate, collaborate and share; create, apply, modify, combine, solve and protect.

Keywords: Assessment, DiCAF, Digital Competence, Digital Literacy, Digital Skills, Evaluation, Questionnaire.

1 INTRODUCTION

Today, 90% of jobs require some level of digital competencies [1]. International, national and local companies are urgently looking for Information & Communication Technologies (ICT) skilled workers. However, 40% of businesses looking for ICT specialists have difficulties in finding the right candidates. In order to close this gap, European Commission put digital skills among the ten priority actions and launched the following plans: i) the "Digital Skills and Jobs Coalition" plan [2] for education providers to offer more short-term and long-term ICT training schemes, and ii) the "Digital Education Action Plan" [3] for supporting education systems to adapt to the digital age and integrate digital technologies in teaching, and simultaneously thereby increase the digital competencies among students.

According to the Digital Economy and Society Index Report (DESI) [4], in 2017, 43 % of the EU population had an insufficient level of digital skills. 17 % had none at all, as they either did not use the internet or barely did so. Also, about 10 % of the EU labour force has no digital skills, mostly because they do not use the internet. 35 % does not have at least basic digital skills, which are now required in most jobs. 74 % of internet users who were employed in the EU used computers or computerised equipment at work.

In addition, the Organisation for Economic Co-operation and Development (OECD) [5] declared to strive for all people to have the skills needed to participate in the digital economy and society promoting policies "that improve the capacity of educational and training systems to identify and respond to the demand for general and specialist digital skills; that facilitate up- and re-skilling through lifelong learning and on-the-job training; and that promote digital literacy as well as inclusive and effective use of ICTs in education and training".

The term 'digital skills' refers to a range of different abilities, many of which are not only 'skills' per se, but a combination of behaviours, expertise, know-how, work habits, character traits, dispositions and critical understandings [6].

The United Nations Educational, Scientific and Cultural Organization (UNESCO) Prague Declaration "Towards an Information Literate Society" states that "Information Literacy encompasses knowledge of one's information concerns and needs, and the ability to identify, locate, evaluate, organize and effectively create, use and communicate information to address issues or problems at hand" [7]. Similarly, the UNESCO Alexandria Proclamation on Information Literacy and Lifelong Learning states that "Information literacy empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals. It is a basic human right in a digital world and promotes social inclusion in all nations." [8,9] The American Library Association (ALA) pointed out that information literate people know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way

that others can learn from them [10]. They are prepared for lifelong learning, because they can always find the information for any task or decision at hand. Recently, the Chartered Institute of Library and Information Professionals (CILIP) defined information literacy as the “ability to think critically and make balanced judgments about any information we find and use. It empowers us as citizens to develop informed views and to engage fully with society.” [11]

The Norwegian Directorate for Education and Training defined that a person with digital skills should be able to use digital tools, media and resources efficiently and responsibly, to solve practical tasks, find and process information, design digital products and communicate content [12]. Recently, the World Economic Forum stated that digital skills encompass a “combination of behaviors, expertise, know-how, work habits, character traits, dispositions and critical understandings.” [13]

A competence is a broader concept that includes knowledge, skills and attitudes. Competence is formally defined by the European Centre for the Development of Vocational Training (Cedefop) as the “ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development” [14]. Ferrari defined digital competence as a set of knowledge, skills, attitudes, strategies and awareness which are required when ICT and digital media are used to perform tasks, resolve problems, communicate, manage information, collaborate, create and share content, and build knowledge in an effective, efficient and adequate way, in a critical, creative, autonomous, flexible, ethical and a sensible form for work, entertainment, participation, learning, socialization, consumption and empowerment [15].

The European Council stated that digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society [16]. Digital competence includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking”. It is one of the eight key competences in the EU for lifelong learning.

Recently, the European Training Foundation defined digital competence to encompass a set of basic digital skills, covering information and data literacy, online communication and collaboration, digital content creation, safety and problem solving [17]. Digital competence is about the ability to apply those digital skills (knowledge and attitude) in a confident, critical and responsible way in a defined context (e.g. education).

Finally, Perifanou and Economides defined that “Digital competence is the person’s knowledge, skills and attitude to ‘efficiently’ access, use, create and share digital resources, communicate and collaborate with others using digital technologies in order to achieve specific goals” [18]. ‘Digital resources’ include content, software, hardware, and networks. ‘Efficiently’ includes effectively, appropriately, responsibly (e.g. legally, ethically), securely (e.g. safely, healthy), critically, reflectively, creatively. ‘Others’ include persons, groups of persons, avatars (digital agents), and organizations. They also propose the Digital Competence Actions Framework (DiCAF). In the current paper, we provide an instrument based on DiCAF that can be used by anyone to self-assess and self-reflect on her/his digital competence, as well as set goals for taking corresponding training.

2 POPULAR INSTRUMENTS FOR DIGITAL COMPETENCE FRAMEWORKS

Initial attempts to measure one’s digital skills were tried to assess her/his technical digital skills. Later, researchers included critical thinking skills, behavior and attitude. DigComp is one of the most well-known digital competence frameworks [19]. Consequently, its corresponding instrument attracted a lot of attention. Recently, the UK Essential Digital Skills proposed a new instrument [20]. Similarly, Eurostat regularly surveys the ICT usage in households and by individuals [21]. In the next Table 1, we give examples items of these instruments.

Table 1. Item examples from various instruments.

DIGCOMP *item examples*:
I can use different search engines to find information.
I can produce complex digital content in different formats (e.g. text, tables, images, audio files).

I can use advanced features of several communication tools (e.g. using Voice over IP and sharing files).

I can solve most of the more frequent problems that arise when using digital technologies.

I have installed security programs on the smart device(s) that I use to access the Internet (e.g. antivirus, firewall).

UK Essential digital skills framework *item examples*:

I can turn on the smart device and enter any account information as required.

I can set up a group on messaging platforms, such as WhatsApp or Messenger, to talk to friends or family members.

I can understand that not all entries in online encyclopedia, such as Wikipedia, are true or reliable.

I can set up online accounts for public services such as with your local council or a government department.

I can use the internet to find specific information related to life tasks that need to be carried out, for example finding a recipe, or finding information that helps plan travel.

I can make sure that online login information is not shared with anyone.

EUROSTAT *item examples*:

Did you use the internet several times during the day?

Did you use storage space on the internet (cloud computing) to save documents, pictures, music, video or other files for private purposes in the last 3 months (e.g. Google Drive, Dropbox, Microsoft OneDrive, iCloud, Amazon Drive)?

However, the existing instruments do not consider the full spectrum of digital competence. New digital technologies have emerged and skills related to these new innovations should be considered too. For example, social media and mobile technologies have spread all over the world. Furthermore, digital competence is a multidimensional concept that includes not only technical skills, but also critical thinking, problem solving as well as self-reflection, creativity, openness and social responsibility, among others. Therefore, in the next section we develop a new digital competence instrument that is based on the Digital Competence Action Framework [18] and incorporates such innovative skills.

3 DICAF

In this section, we propose a new instrument for assessing digital competence that is based on the Digital Competence Actions Framework [18]. First, let define the following terms:

Smart device= smartphone, tablet, laptop, desktop, server, printer, projector, camera, navigator, game console, smart glass, smart watch, smart TV, smart home, drone, etc.

Content= data, information, knowledge, news, message, article, picture, photo, audio, song, video, movie, map, infographic, presentation, spreadsheet, database, blog, website, open educational resource (OER), course, practices, methods, procedures etc.

Object= content, software, app, product, person, group, service (e.g. e-banking, e-government, e-commerce), business/ organization, event, etc.

Social Media= social networks, blogs (also, microblogs), forums, wikis, collaborative projects, instant messaging, content sharing (distribution, publishing), online communities, conferencing, social bookmarking, multiplayer games (virtual game worlds), virtual social worlds, etc.

Table 2. Instrument for Digital Competence self-assessment

To what extend do you agree with the following statements*:*

Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

1 Access, Search and Find

I can search and find a specific object or similar objects using various search engines and databases, using appropriate keywords and advanced criteria and filters.

I can search and find a specific object or similar objects in various social media using various smart devices.

I can search and find a specific open/free resource or similar open/free resources in various open repositories.

I can search and find possible partnerships and collaborators on various social media.

I can search and find a specific person on various social networks using various techniques.

I can search and find groups on a specific topic on various social media.

I can search and find information in an object using appropriate keywords and advanced criteria and filters.

I can navigate in the real-world using the advanced features of a navigator.

I can watch (read, listen, view) content in various formats on various smart devices.

I can monitor the usage of various smart devices.

I can monitor the usage and speed of an Internet and/or a WiFi connection.

I can monitor the Internet presence and activity of a person or a company/ organization.

2 Use, Store, Manage, Evaluate and Delete

I can record and save content in various formats using various smart devices and digital tools.

I can download content and save it directly to the relevant folder.

I can store and synchronize content on the Cloud.

I can bookmark content using a bookmarking service.

I can save and keep on content in multiple storage devices.

I can install and keep on updated software and apps on various smart devices.

I can backup content and software using various digital tools.

I can use the advanced features of various smart devices, software and e-services.

I can organize content in a hierarchical folder structure.

I can classify content using tags to build a folksonomy.

I can organize a meeting using various digital tools.

I can manage projects using the advanced features of various digital tools.

I can manage my personal finance using the advanced features of various digital tools.

I can manage the settings of software.

I can manage my digital identity and/or group on various social media.

I can evaluate an object and/or a smart device using appropriate quality criteria.

I can critique an object and/or a smart device on relevant social media.

I can evaluate whether some information is hoax, fake, scam, or fraud.

I can identify the intellectual property rights (IPRs) of content that I have found on Internet.

I can evaluate whether an email is spam, adware, phishing, or fraud.

I can critically evaluate information on Internet regarding people and businesses/ organizations.

I can evaluate whether a website is secure and trusted.

I can measure the speed of an Internet connection, and/or the strength of a WiFi or cellular network connection.

I can delete my account on various social networks and/or e-services.

I can delete some of my connections/ friends in various social networks.

I can uninstall software from various smart devices.

3 Communicate, Collaborate and Share

I can communicate with people and/or organizations using various synchronous and asynchronous communication tools and smart devices.

I can responsibly participate in activities in various social media using their advanced features.

I can ask questions and give answers in various social networks and/or e-communities

I can collaborate with people using various smart devices, platforms and digital tools.

I can critically share content on various media.

I can buy and/or sell a product and/or service using various smart devices, platforms and digital tools.

I can teach an e-course or an e-seminar, give a lecture or make a presentation using various digital tools.

I can connect a smart device to a WiFi network.

I can share smart devices, software, Internet connection, and WiFi.

I can upload and share software or app that I have developed on various media.

I can responsibly disseminate on various social networks my location, activity, accomplishments and emotions.

4 Create, Apply, Modify, Combine, Solve and Protect

I can create complex content in various formats using various digital tools.

I can creatively create a virtual object using various devices and digital tools.

I can create a summary of a large content.

I can responsibly create a digital identity and/or a group in various social media.

I can write a program (code) in a programming language.

I can creatively design and/or develop a website using various digital tools.

I can create a product and/or service using various digital tools.

I can apply Creative Commons licenses to content or software that I have created.

I can apply simulation software in order to understand the behaviour of a system.

I can apply statistical techniques using appropriate software in order to make forecasting or predictions.

I can apply business analytics software in order to drive business planning.

I can modify multimedia content using various digital tools and smart devices.

I can translate content into another language using translation tools.

I can convert content from one format to another format.

I can regularly change my passwords and settings of my smart devices and Internet accounts

I can creatively combine content from various sources using various digital tools.

I can creatively combine digital tools to solve a problem

I can solve technical problems that arise when I use a smart device or software.

I can solve a problem by finding information and tools on the Web.

I can solve real-life problems using appropriate digital tools.

I can protect the intellectual property rights (IPRs) of content that I have created.

I can protect various smart devices and critical content using security software.

I can protect various smart devices and e-accounts using different passwords and frequently changing them.

I can protect myself and others from fake information, fake persons, fake businesses/ organizations.

I can protect myself and others against identity theft, harassment, bulling, or slander.

I can protect myself and others against spam and phishing messages.

I can protect my privacy in the digital society.

I can protect my health using various digital tools.

4 CONCLUSIONS AND FUTURE RESEARCH

This paper proposed a new comprehensive instrument for Digital Competence evaluation. It is based on the Digital Competence Actions Framework [18] and considers new digital innovations (e.g. social media, smart devices) as well as ethical and responsible behaviour. In a future paper, we will investigate different levels of competence (beginner, average, expert). Further research will examine the reliability and validity of this instrument.

The proposed instrument could be used by anyone for self-assessment and self-reflection. Using this instrument, anyone could identify his/her weaknesses and plan appropriate self-development training in the corresponding competence areas. Organizations and businesses could use the instrument to assess and identify their staff's digital competence level, to recruit new staff with appropriate digital competence, to plan training for developing their staff digital competence, and much more. Finally, educational institutes can design curriculum and deliver training on digital competence.

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