A practical tool to measure digital competences: Teamschamp

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Abstract: Digital competence is currently a widely-used term that refers to skills, abilities and capabilities that 21st century workers should demonstrate in order to overcome current challenges. Although it has been a researched concept in numerous studies, the literature and industry lack from practical studies and applications. The measurement of digital competences is a key dare that organisations must address with the aim of evaluating the digital behaviour and skills of their workforce. With this information, they will be able to design training programs for the employees to generate personal and professional development on them. Therefore, this study encompasses a theoretical review of several definitions and studies and presents a practical and real tool to evaluate digital competences.

Keywords: digital competence; digitalisation; digital skills; performance measurement; practical tool; competence measurement; skills evaluation; 21st century skills; professional development.

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1   Introduction

The global economy is now at the dawn of the Fourth Industrial Revolution and Digital Transformation process (Baller et al., 2016), which represents a new combination of technologies and infrastructures resulting in cutting-edge systems based on the digital environment. In addition to knowledge-intensive jobs, industrial jobs have been also affected by digital transformation process. Internet of Things, Industry 4.0, 3D printing drones or Big Data management are the latest breakthroughs in industry and have rapidly adopted a regular place in organisations (Murawski and Bick, 2017). According Price Waterhouse 2016 Global Industry 4.0 Survey, the most important factor for a successful implementation of digitalisation is the availability of digital competences, which are of increasing importance in 21st century work environments (Ensour et al., 2020).

Over the years, a strong interconnection between the online and offline world has emerged (Buffardi and Tadeo, 2017), so there is a need to investigate digital behaviour and the ability to manage identity on the internet (Boyd and Hargittai, 2010) or use media respectfully in an active way (Jenkins, 2009). The authors have the aim to cover this gap in the literature by offering a complete theoretical and practical view of this situation and its analysis.

The term 'digital competence' has been researched by many authors in recent years. It is rather imprecise and context dependent. It is considered as a single construct, different from IT skills (Murawski and Bick, 2017). Rapid digital transformation means that almost all jobs require a medium level of digital skills, which are increasing its importance and need of study (Ananiadou and Claro, 2009). In the current paradigm, information is so accessible that it can be a problem if it is not managed properly. Knowledge management and digital skills are needed in order to select and extract information effectively (Van Laar et al., 2017; Rey-Martí et al., 2020).

Following these approaches, a manner to study users' competence is to match digital behaviour to real situations at workplace, observing an measuring to which extend the users are capable to integrate the digital dimension with other competences such as interpersonal relationships or critical thinking skills (Buffardi and Tadeo, 2017). Despite the importance of the topic, not many studies are available in the fieldwork of its applicability in the organisation environment.

The results of the qualitative analysis and literature reviews published since the date, seem to reveal different digital capabilities and behaviours required to succeed in 21st century organisations, due to the preparadigmatic phase in which the study of

digital competences is settled. However, measuring behaviours is a challenging task due to the complexity and transversality of the concept of digital competence.

For this reason, the objectives of the present research are mainly twofold: first, to review the complete literature on the framework for studying digital skills and behaviours. On the other hand to analyse of a practical measurement system for digital skills and competences that allows an integration between online and offline behaviours through a platform. This paper will be divided as follows: after this short introduction, the theoretical framework will be developed. In that section a literature review on the concept of digital competence and how is it measured by different scholars. Afterwards it will come the methodology framework proposed by the authors in order to measure the digital competences and behaviours of employees in an organisation. This is represented by the software application TeamsChamp (www.teamschamp.com), developed by the Spanish consultancy organisation ENCAMINA.

Finally, some results and conclusions derived from the conducted research will be exposed, as well as future research lines.

On the practical side, the authors want to outstand its applicability in the organisation framework in order to measure, evaluate and test the behaviours and competences of the workforce. This will lead to the creation of an enhanced internal digital training program that will benefit both employees and organisation towards a common better future.

2   Theoretical framework

In this section the authors are going to address a review of several well-known literature on the subjects of digital competences and internet skills, plus their measurement using different scales and rubrics. The authors have considered the attempt to make a suitable designed selection, trying to minimise the possibility that the proposed measurement scale in the following section falls outside the accepted body of accepted knowledge in the academia.

According Müller et al. (2014) and Gorbacheva et al. (2016), abilities inhered to individuals innatelly. On the other hand, knowledge means a theoretical understanding of a concept whilst skills are the practical application of that knowledge and could be trained. These concepts are sometimes mixed up when trying to provide a complete definition from different points of view, so it will be taken into account for its explanation throughout the section.

2.1   Digital competences and skills

The European Parliament and the Council (2006) defines 'competence' in the Key Competences Recommendation as "a combination of knowledge, skills and attitudes appropriate to the context". In 2006, they published a recommendation identifying Eight Competences for Lifelong Learning in which the Digital Literacy was included. There are a vast number of definitions of this term, and the authors could say that digital literacy is the broadest 'digital' concept and encapsulates the features of more modern digital skills definitions (Morrison and Rooney, 2017).

According the study of Ferrari, the term digital competence is defined as

> "the set of knowledge, skills, attitudes (thus including abilities, strategies, values and awareness) that are required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socialising, consuming, and empowerment." (Ferrari, 2012, p.3)

Vieru (2015) goes one step further and highlights the definition of the term as "the ability to efficiently and critically use information technology for employment, learning, self-development and participation in society". Gekara et al. (2019) defined digital skills as the combination of digital knowledge, cognitive knowhow, practical know-how, competence and digital attitude, areas of which employees need to demonstrate ability in the digital age.

From the analysis and understanding of these definitions, the authors are able to extract that digital competences not only apply to work environment but it is a multidisciplinar concept that affects all areas of an individual's personal and professional life, as well as their way of behaving, relating to others and facing the situations that occur to them on a day-to-day basis (Erjavec and Trkman, 2020).

Ala-Mutka (2011) proposed a conceptual model on digital competences based on three meaningful clusters: instrumental skills and knowledge, advanced skills and knowledge and attitudes. The first block compiles operational and medium-related skills and knowledge on technology, internet, and media devices. The second one includes media application, strategic and personal objectives such as information management, learning and problem-solving skills or meaningful participation. The last cluster refers to relevant and necessary attitudes for understanding and absorbing digital competences: interculturality, creativity, critical skills, responsibility or autonomy.

In order to divide and analyse the concept, Ferrari (2013) identified five specific sets of competence areas, that have been studied a posteriori by different academics, enhancing them from complementary perspectives.

- information management and collaboration

- communication and sharing skills

- creation of content and knowledge

- digital safety

- technical operations and problem-solving abilities.

The first dimension within digital skills is information management. Ferrari includes in this process the search, compilation, selection, analysis and evaluation of the information available on the internet, through search tools. In addition, digital hoarding, which is the over accumulation of digital content, is also defined and explained (Vitale et al., 2018).

Later it has been studied by Neave et al. (2019): the negative consequences that this behaviour provoques in users and in organisations has been examined, as it is extremely related to low underlying motivations in the workplace. It is also associated with a loss of perspective and control, resulting in stress and disorganisation. On the other hand, the collaboration refers to the synergy created in the internet among teammates or colleagues working towards a common goal (Ibrahim, 2013).

The second area of digital skills is communication, defined as the ability to communicate and share in digital environments. Within this capacity we differentiate several actions that can be carried out by users in both private and work environments. The ability to manage personal digital public profiles, or to actively participate in social networks or forums are of great importance. It is also highlighted cross-cultural collaboration, understanding and respect for other users with whom it is possible to interact thanks to new technologies (Dede, 2010).

The third dimension is content creation. In this section is included the creation and pure editing of new content to upload it to digital platforms such as blogs, websites, forums or public social media profiles. Create and edit new content (from word processing to images and video); integrate and re-elaborate previous knowledge and content; produces creative expressions, media outputs and programming; apply intellectual property rights and licenses are also personal and professional activities dealing with content creation (Wiese et al., 2020).

These first three dimensions defined by Ferrari (2013) explained above have a more linear character, while the last two dimensions that we will explain below have a more transversal nature.

The fourth dimension proposed is the digital safety. This security in the digital environment refers to the protection of both personal, company information, electronic devices and third parties on the network. For this, the user must be aware of the dangers and pitfalls that the internet can hide and protect himself accordingly. Cybersecurity measures and sustainable healthy use of the internet have a leading role to ensure the proper use of digital tools.

The last dimension proposed by Ferrari (2013) is related to the user's ability to solve problems in the digital Environment and perform technical tasks related to internet usage. It is important to identify digital needs and resources, make informed decisions on most appropriate digital tools according to the purpose or need, solve conceptual problems through digital means or solve technical problems. All this shows a proactive ability of the user to identify their competition and improve their knowledge and skills gaps when necessary.

Other authors who have deeply analysed the concept and dimensions of digital skills are Van Laar et al. throughout several papers. Van Deursen and Van Dijk (2010) proposed a set of 'digital skills' conceptualisations, in which it is considered technical or media aspects (medium-related skills) and substantial or content aspects (content-related skills), more specifically operational, formal, information, communication, collaboration, problem-solving and critical thinking skills. They are called 21st century core digital competences or skills dimensions (Van Laar et al., 2017).

Their proposed practice-oriented skills could be divided as follows (Van Deursen and Van Dijk (2010):

- *Operational skills*: Set of basic skills in using technology or internet, such as computer usage or technological devices user level. The use of internet could increase this ability.

- *Information skills*: are the needed skills to read and process information found in the internet and be able to evaluate it. It could be subdivided in: formal information skills and substantial information skills. Content-related skills are learnt, according Van Deursen and Van Dijk (2010) in the context-based specific situation.

- *Strategic skills*: Skills and capabilities needed to reach personal and professional goals in internet age. The acquisition of this skills and attitudes are related.

Afterwards, communication skills and content creation skills are also included in their classification (Van Laar et al., 2018).

Van Laar et al. (2019) distinguish between core and contextual 21st century digital skills, which are broader than digital competences. Both concepts emphasise a broad spectrum of skills. But beyond skills, knowledge and attitude are viewed as essential to succeed in the knowledge society, not necessary underpinned by ICT.

In addition, together with the core 21st century skills mentioned above they defined contextual 21st century digital skills. Those skills that are required to use and take advantage of the core skills. For each skill, a conceptual definition with key operational components are provided.

- *Ethical awareness*: Skills and abilities that demonstrate that the individual behaves in a socially responsible way, demonstrating knowledge and ethics when using internet and digital devices (Jannsen et al., 2013).

- *Cultural awareness*: Abilities needed to show cross-cultural communication and empathy on the network (Yang et al., 2014; Lara et al., 2019). Higher levels of digital skills are related with higher degree of engagement with media forms, multimedia creation and civic engagement responsibility (Literat, 2014).

- *Flexibility*: Skills needed to adapt to situations of uncertainty, modifying individual behaviours and attitudes according to the required context.

- *Self-direction*: Useful set of skills for personal goal-setting and self-management, assessing own progress when using ICT in a proactive way (Quieng et al., 2015).

- *Lifelong learning*: Ability to learn to learn, constantly explore new opportunities and developed tolerance to failure (Uzunboylu and Hürsen, 2011).

These 21st century skills are increasingly demanded by companies and human resources professionals who want maximum digital skills and behaviours from their workers, to ensure their success in the current process of digital transformation (Martins, 2019).

2.2   *Measuring internet skills*

There is still no consensus in the academia on which indicators should be measured (Zhong, 2011). The Organization for Economic Cooperation and Development provided firstly in 2005 its conception of 21st century skills and its measurement, dividing them in three big categories: using tools interactively, interacting in an heterogeneous group and acting autonomously. Each category was subdivided in three levels of competence (from A to C), in which the users' involvement in each digital category increases being A the lowest and C the upper one.

Van Deursen et al. (2012) proposed a instrument in which a full range of internet skills, 21st century digital abilities and conditions were measured with a prepared questionnaire. The chosen skills were: information management, evaluation, communication expressiveness, sharing, building and networking; collaboration, critical thinking, creativity and problem-solving. In addition to those, there are other individual

factors that depend on the individual that are relevant in the study of digital skills and abilities (Fernández-Mellizo and Manzano, 2018; Kraus et al., 2018).

We will take as a reference for the method proposed in the following section the study of Ferrari (2013) in which he proposes a self-assessment grid in which the different areas of digital skills defined above are measured at three different skill levels, from A to C. It is based on the classification that is made for the evaluation of language skills, such as the CEFR for Languages frameworks.

Level A is used to point out a basic competence, in which the user has few notions about the competition, understanding for example in the information management dimension that not all information on the internet is truthful, and being able to use search engines to obtain it. The user who has a level A is aware of their limitations using technology and knows that there are users around them who know many more functionalities of the software, but are not proactive to learn.

Level B is defined as an intermediate stage of knowledge and skill in which the user demonstrates a higher and more transversal mastery of digital skills. The B-level user is able to have moderate discretion when browsing the internet, is familiar with different multimedia tools, knows how to relate concepts of the world online and offline, and shows proactivity in learning and improving their skills. Furthermore, you are able to ask for help when you need it and turn to experts, creating a network of trust and collaboration with your surroundings.

Finally, at level C, user proficiency in digital skills is considered. The user at this level is able to detect their learning needs about digital skills and is able to obtain the necessary tools to solve problems. It has an informed stance in the use, impact, magnitude, problems and developments of software and is capable of making decisions related to this in a critical way, evaluating which are the safest and most reliable options. He is also a civic user and active in his participation online and in the networks, understanding cultural differences and empathising with his network.

The same user may have different levels in the different digital competences that we have talked about throughout this literature review. Although the scale proposed by Ferrari (2013) has been widely accepted in the literature, it is important to examine the work proposed by different authors.

Morrison and Rooney (2017) differentiated three categories of digital skills levels in order to discuss to which extent the existent supply of digital skills meet the requirements of companies in digital competences. The first level just covered a set of "basic digital literacy skills", needed to carry out basic activities such as communicating with others or navigate though the internet. The second one is called "digital skills for the general workforce" and includes also the first level plus an enhanced ability of processing information and creating content. The last and highest level is considered as 'digital skills for ICT professions'. It includes both categories below plus the specific skills required for professionals in the IT sector, such as skills linked with the creation of technological devices or the development of digital products and services.

Gekara et al. (2019) proposed five levels of performance in digital skills instead of three, and they are as follows:

- *digital skills literacy*: basic awareness and limited understanding of digital environment

- *digital skills competency*: basic ability to individually use digital tools

- *digital skills proficiency*: full-grown ability to use and apply digital tools and fulfil complex tasks

- *digital skills fluency*: advanced ability to work and live with digital tools

- *digital skills savvy*: master ability to work and live with digital tools, well-developed problem-solving processes with creativity, easiness and speed.

The concept of digital hoarding which is defined above, is measured by Neave et al. (2019) with a questionnaire of 10 items related to the individual's propensity to accumulate digital items, such as: unread emails, emails accumulated in the 'delete' folder, presentations, past text documents, photographs, or downloaded unclassified articles.

3   Methodology

TeamsChamp (www.teamschamp.com) is a software application that runs internally in any organisation and helps employees improve the adoption of the company's information systems (such as Microsoft 365) through business gamification techniques. TeamsChamp is an application that the user can run from a web browser or as an App within the Microsoft Teams platform.

TeamsChamp measures some digital skills of the company's employees, quantifies them and presents them in a friendly and fun format to every user in the organisation. In doing so, TeamsChamp aims to encourage employees to improve their digital skills on a daily basis through best practices, advices and the optimal use of the IT tools at their disposal (such as Teams, Skype, Yammer, Outlook, SharePoint, OneDrive, etc.). TeamsChamp uses these indicators, that are recalculated on a daily basis, to make public within the company the leader boards of the employees who are best performing in the use of tools such as Office 365 to, on the one hand, inspire healthy competition and, on the other, have them as a reference from which to learn (these advanced users are called Champions in the TeamsChamp methodology). In addition, users receive digital badges for their good use of the tools, their daily interaction points and even for the recognition they receive from their colleagues.

The performance indicators for which TeamsChamp employees or players compete and by which they are measured on a daily basis, are called Digital Collaboration, Digital Communication and Digital Operativity indicators, and have a lot to do with what we understand by digital competences according to, for example, Ferrari (2013).

TeamsChamp calls DIGITAL COLLABORATION the competence that combines Ferrari's (2013) Information Management and Collaboration skills. That is, the one that considers on the one hand the professional's ability to identify, locate, access, retrieve, store and organise information, and on the other, the ability to link with others, participate in online networks and communities and interact constructively.

For the former (Information Management), TeamsChamp measures each user's daily activity in related activities, such as the number of documents and files they view and edit, as well as the documents they view and synchronise and even the number of devices where they read their emails. For the second component (Collaboration skills), TeamsChamp measures the number of documents shared internally and externally by

each professional, the number of emails each user reads, the virtual meetings created with other professionals and even the number of online conferences organised.

TeamsChamp calls DIGITAL COMMUNICATION the competence that Ferrari (2013) calls Communication and sharing, that is to say, the ability to communicate through online tools and to converse through different digital formats following the best practices and safe rules of the established online communication standards. TeamsChamp measures the daily activity of professionals by counting the number of published messages through public and private chats, published posts and posts read on the company's Enterprise Social Network, as well as the number of likes given to other colleagues in the organisation's ESN, and the number of attended online conferences.

TeamsChamp calls DIGITAL OPERATIVITY the competence that Ferrari (2013) calls Technical operations and problem-solving abilities, which are the one related to the ability to use technology and media and perform tasks through digital tools. TeamsChamp measures the daily activity of professionals by counting their use of tools such as SAP or Office 365 tools. In the first case, for example, the system measures the number of daily transactions in SAP that users execute or the amount of memory that the system consumes in their queries. In the second case, it measures the number of information items (documents, emails, messages, conversations, posts, etc.) with which each user operates on a daily basis.

The design of TeamsChamp's indicators takes into consideration the digital traces each user leaves when using the different tools that are directly related to each of the selected digital competences.

The way in which TeamsChamp measures these signals of use and activity of professionals is articulated through interfaces (APIs) (https://docs.microsoft.com/en-us/graph/api/overview?view=graph-rest-1.0) that respect the privacy of users, as the content of messages, conversations or documents is never accessed, nor the recipients involved or any other sensitive information. TeamsChamp only accesses the number that adds all the daily activity of a user for each of the signal types or digital traces explained above.

An interface like OfficeGraph offers added values of use of Office 365 tools with a very varied typology of digital traces, but TeamsChamp only uses those that are related to each digital competition. In other words, a digital trace such as the number of posts a professional publishes is a good clue as to his or her digital communication competence, but the number of permissions on SharePoint directories that a user is assigned says nothing about any of his or her digital competences and therefore is not exploited by TeamsChamp in any way.

The final detail on how TeamsChamp calculates the indicators of these digital competences is solved by a formula in which each one of the aggregated values of each activity are combined and weighted according to the context of each organisation (for example, not all companies use the same tools or in the same way). The exact detail of the final formula is a sum with a certain statistical complexity, but in which, in practice, the final value is greater the greater the activity level of each user is with respect to each of the types of activities chosen to be measured.

In short, the authors can say that the TeamsChamp system takes advantage of some of the many 'digital traces' available by powerful systems such as Office 365 or SAP to obtain a quantified and comparable level of the company's employees on certain digital skills, as we can find defined by the scientific literature. TeamsChamp and the big data system and algorithms that support it are designed and developed by ENCAMINA S. L. The company ENCAMINA is a Spanish consultancy and software development

organisation with more than 20 years of experience and international reach, mainly in Europe and America. They develop and deliver collaborative, intelligent and productivity solutions that digitally transform medium and large companies, and are specialised in the most advanced Microsoft products and technology.

4   Discussion and conclusions

Digital competence today is necessary (Ala-Mutka, 2011) for developing formal and informal tasks and overcoming future challenges in organisations. For its good management and implementation it should be measured and evaluated. The digital competence landscape is multi-layered, and an all-encompassing widely applicable and agreed single definition is difficult, if not impossible, to achieve. However, in this manuscript the authors have shed some light on the discussion of these definitions and the appliance of the studied dimensions and concepts.

As seen, digital competence is a transversal concept in which operational skills, communication skills and collaboration abilities are key success factors that complement and create synergies with each other. Without one of the three, the worker is not capable of having a complete and solid digital competence for his work within any company and his formal and informal relationships with his internet environment. Skills, knowledge and abilities are mixed-up in the 21st century and internet framework, and a balanced overview. Furthermore, these competences must be ensured at an appropriate level (Siiman et al., 2016).

To sum up, it is interesting to highlight the importance and effectivity of platforms such as TeamsChamp from ENCAMINA in order to evaluate digital competences of the workforce with a non-intrusive proceeding, based on the daily activities they perform. Only with this measurement and control, companies will be able to design training programs in digital competences to enhance the capabilities of their workers.

A limitation of this study is the lack of empirical research using the explained software in order to check some results of this usage. This study, however, could be considered as an introductory step and for future research lines, the authors could extract some such as studying in depth the case study of an organisation in which TeamsChamp is applied. An empirical longitudinal study could be also proposed in order to check the validity and gains of this tool for companies and employees.

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