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Education Strategy towards Digital Competences in Welcoming Society 5.0

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Abstract : The rapid evolution of information and communications technology is bringing drastic changes to society and education industry. The key to achieving mid- and longterm growth is to realize Society 5.0 that resolves various societal challenges by incorporating into every industry and social life the innovations of the 4th Industrial Revolution (e.g., IoT, big data, AI, robotics, sharing economy and so on) which have rapidly occurred. The aim of this paper is to shed critical light on education in the midst of digital transformation. There are seems to be a fundamental to be part as the changer of the human society evolution and reaching the future needs of human being. This paper discusses and elaborates on the current approach, and argues for understanding ICT skill and Digital competences from a broader perspective and educational needs in terms of preparing Society 5.0

Keywords : *education, digital competences, ICT skills, society 5.0 .*

I. INTRODUCTION

The rapid evolution of digital technologies are bringing significant changes to society. The environment and people's values are becoming increasingly diverse and complex. Therefore, the new concept of society called Society 5.0 sounded by Japanese. It is the goal of Society 5.0 to create a human-centric society in which both economic development and the resolution of societal challenges are achieved, and people can enjoy a high quality of life that is fully active and comfortable (Fukuyama, 2018). This alteration is also impact Indonesian education to be prepared on this digital transformation in welcoming Society 5.0. The nation need to prepare the alertness for this alteration, especially for higher education as a fundamental basic of human workforce making. Therefore, technology as a medium for preparing graduates in welcoming Society 5.0

Education is in the midst of digital transformation and its fundamental to be part as the changer of the human society evolution. Therefore, technology as a medium for preparing graduates in welcoming Society 5.0 and the need for provide digital skills between school/ universities, lecturer/ teacher, and infrastructure. Especially in higher education that supply workforce. According to Horn (2020), in today's tight labor market, there are about 7 million open jobs for which companies are struggling to find qualified candidates because applicants routinely lack the digital and soft skills required to succeed. In the face of rapid technological changes like automation and artificial intelligence, helping employees keep pace is challenging. As a result, education can no longer afford to wait for the traditional "system" to supply the graduates they hope will help shape their future. The need is too acute and too urgent, particularly given that many higher-education institutions remain in denial. The education concept must change how they educate both traditional college-age students. This essay aims to elaborates on the current approach and argues for understanding ICT skill and Digital competences from a broader perspective in terms of the need of preparing Society 5.0.

II. LITERATURE REVIEW

Society 5.0

According to Fukuyama (2018), society 5.0 put forward by the Japanese government is a clear concept. It was drafted in the 5th Science and Technology Basic Plan by the Council for Science, Technology and Innovation, and approved by Cabinet decision in January 2016. Looking back on human history, we can define different stages of societies. Society 1.0 is defined as groups of people hunting and gathering in harmonious coexistence with nature; Society 2.0 formed groups based on agricultural cultivation, increasing organization and nation-building; Society 3.0 is a society that promotes industrialization through industrial revolution, making mass production possible; and Society 4.0 is an information society that realizes increased added-value by connecting intangible assets as information networks. In this evolution, Society 5.0 is an information society built upon Society 4.0, aiming for a prosperous humancentered society (Figure 1).

Society 5.0

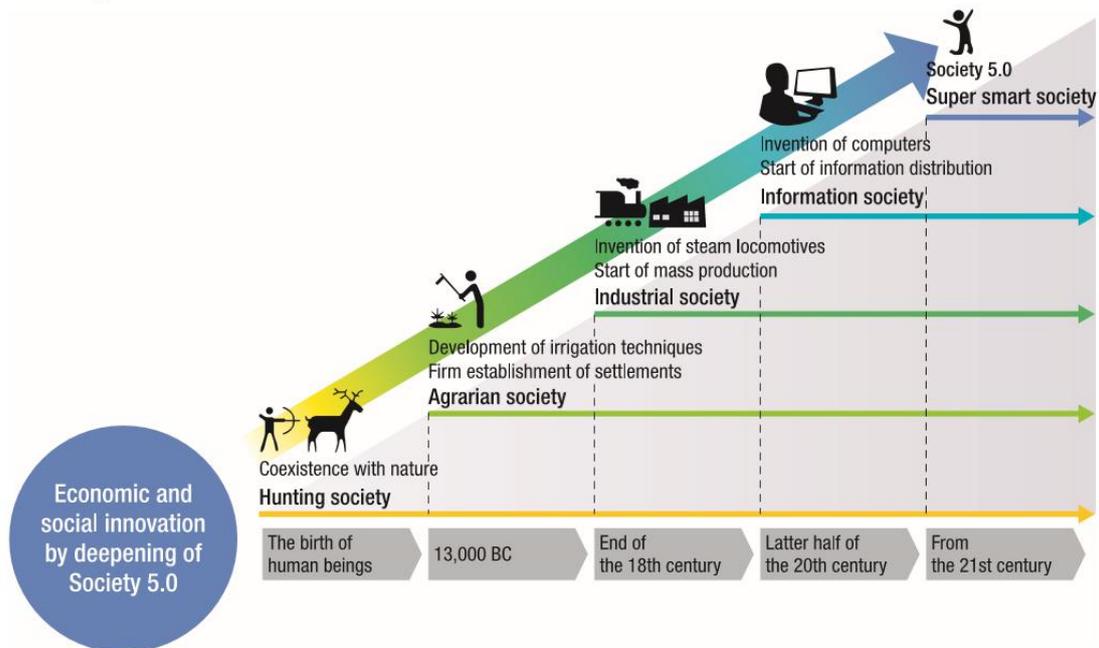


Figure 1. Society 5.0 Reprinted from "Aiming for a New Human Centered Society" by M. Fukuyama, 2018, *Japan Spotlight*, 1. (pp 47-50)

Moreover, Fukuyama (2018) states that it is the goal of Society 5.0 to create a human-centric society in which both economic development and the resolution of societal challenges are achieved, and people can enjoy a high quality of life that is fully active and comfortable. It is a society that will attend in detail to the various needs of people, regardless of region, age, sex, language, etc. by providing necessary items and services. The key to its realization is the fusion of cyber space and the real world (physical space) to generate quality data, and from there create new values and solutions to resolve challenges. This national vision raised by Japan is to strive for a new, human-centered society, at the same time resolving a variety of societal issues.

III. RESEARCH METHODS

The method of this study is literature and secondary resources review through books, journals, and web-based sources. Data gathered are descriptively analyzed the digital competences and ITC Skills transformation also elaborates on the current approach and argues for understanding ICT skill and Digital competences from a broader perspective in terms of the need of preparing Society 5.0.

IV. RESULTS AND DISCUSSION

Transformation of Digital Competence

In the late of the 20th Century, the notion of digital competence can be related to the concept of digital literacy, which is i.e. discussed by Tyner (1998). "Literacy" is basically the English word for the ability to read, but is currently used in an expanded and societal context (Buckingham, 2006). Even though it is not directly synonymous with the notion of literacy, the notion of competence is used in a similar way in a Norwegian context. In combination with the term "digital", both literacy and competence have gradually been extended to cover different areas. Tyner (1998) for example distinguishes between "tool literacy" and "literacy of representation". Tool literacy, also referred to as computer, network, and technology skills, compounds the instrumental aspects of the technology, i.e. skills in using various digital tools. Literacy of representation includes how technology can be understood in our time, and how to use digital tools in a broader context. Tyner's distinction has been important for the evolving understanding of the concept of digital competence.

Recent decades, in 2004, an official Norwegian definition was proposed in a White Paper, Digital literacy is the sum of simple ICT skills, like being able to read, write and calculate, and more advanced skills that makes creative and critical use of digital tools and media possible. ICT skills consist of being able to use software, to search, locate, transform and control information from different digital sources, while the critical and creative ability also imply an ability to evaluate, use sources of information critically, interpret and analyse digital genres and media forms. In total digital literacy can be seen as a very complex competence (Norwegian Ministry of Education and Research, 2004, p. 48).

In the 21st Century competence (21 Century skill), it can be strengthened related to digital skills according to Van Der Dijk (2012) that "there are 6 digital skills that must be possessed by citizens in the digital era, namely operational, formal, information, communication, strategic, and content creation. The explanation of every skill that must be possessed by citizens is: the ability to operate technology means to be able to use technological devices (operational); the next step is able to browse and navigate (formal); selecting the browsing and navigating results and evaluating information obtained from digital media (information), the ability to communicate through social media (communication), being professional in using digital media (strategic), contributing in digital media (content creation) (Van Der Dijk, 2012). The 21st century competencies that often referred to as "rainbow 21st-century knowledge skills", namely:

1. "Life and career skill" competence state that education must be able to prepare teenagers having the skills to live and have a career. It means students should have the skills to live independently and ready for the world of work later.
2. Competence of "learning and innovation skills" means education must be able to create a learning process that develops young people's learning and innovation skills.

3. "Information media and technology" competence, namely education must prepare youth as students to have skills in the use of information and technology media or information and technology media literacy.

From the transformation of digital competences, we can assumed that digital competence involves the ability to use digital tools and have an adequate understanding of the technology and thereby be able to work in and influence society to strive for a new concept, human-centered society or simply called Society 5.0 concept. From this somewhat historical review of the notion of digital competence illustrates a motion towards a broad, holistic definition, emphasizing the role of ICT in learning. Therefore, ICT Skills have to adopt by higher education in the curriculum to supply the qualified workforce to welcoming Society 5.0.

ICT Skills Framework in Curriculum

The Skills Framework for the Information Age (SFIA) is a standardised approach for defining Information and Communications Technology (ICT) skills and the level of autonomy and responsibility at which ICT professionals practice them (SFIA Foundation, 2011). Skill frameworks and competency standards similar to SFIA are well defined by many professional bodies. Such professional competencies have been mapped to higher education curriculum, institutional graduates attributes, and the assessments used to measure their attainment. Rather than being a tic-the-box exercise, embedding professional skills and competencies into the curriculum should be done as part of a holistic educational design. In the case of ICT, for example, it has been argued that SFIA should shape learning activities and assessments that provide for the practical application of skills. According to von Konsky et al. (2013) , a broad model for embedding SFIA skills into the ICT curriculum is depicted in Figure 2. This model will be further elaborated as a result of workshops and focus groups involving ICT educators and industry representatives in conjunction with this research project. The preliminary model involves a feedback loop with four stages.

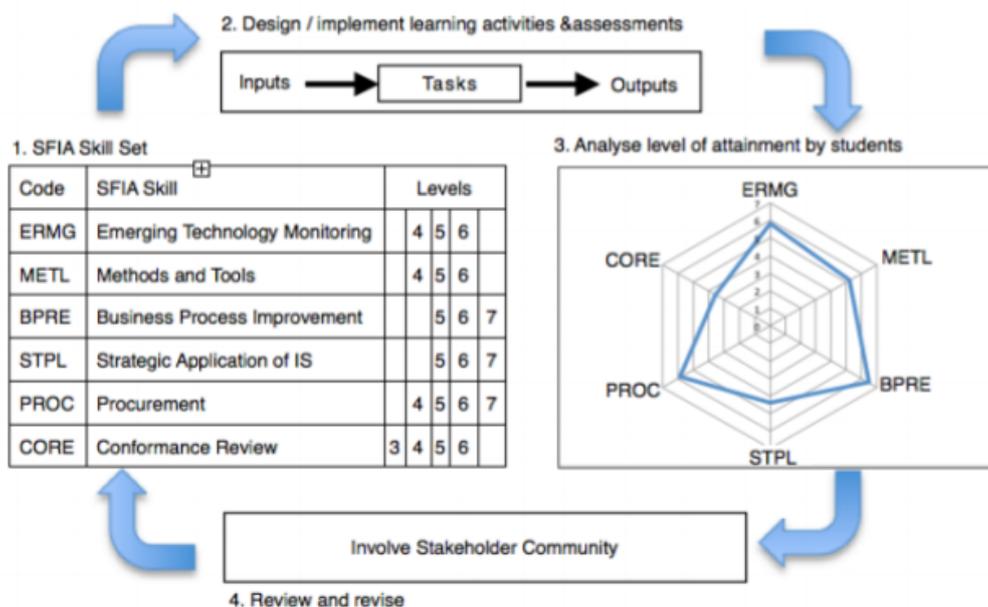


Figure 2. Using SFIA in designing and communicating higher education. Reprinted from “ Embedding professional skills in the ICT curriculum ” by von Konsky, B. R., Jones, A., & Miller, C. , 2013. *ASCILITE- Australian Society for Computers in Learning in Tertiary Education Annual Conference* (pp. 883-887).

Stage 1: Identify the SFIA skills set for each unit in the context of the subject content. Consider the design of a hypothetical new unit on green ICT broadly based on the CPeP Green Technology Strategies. Six specific SFIA skills for the unit are shown in Figure 1, along with the levels for which each skill is defined in the SFIA framework (Konsky *et al.* 2013).

Stage 2: Design and implement learning activities and assessments that develop the identified SFIA skills. This can be facilitated by a noun and verb analysis of the SFIA skill descriptors. An analysis of verbs in the descriptors suggests tasks. Nouns are related to the inputs into and outputs from learning tasks (Konsky *et al.* 2013).

Stage 3: Analyse student attainment of SFIA skills. Learning activities should be designed to target specific SFIA levels. For example, CPeP generally targets SFIA level 5 or 6. An analysis of student reflections and learning artefacts should be conducted to determine the extent to which the intended objectives have been met. This analysis can be conducted visually as described by von Konsky (2013), Hay and Hart (2008) or Armstrong (2011).

Stage 4: Review and revise the curriculum. Developing ICT as a profession requires the involvement of all stakeholders (von Konsky, 2008). While they should be involved throughout the design, implementation and review of higher education programs, it is particularly important to involve them when reviewing and revising the curriculum. It is indicated that SFIA has the potential to promote effective communication amongst stakeholders, and will be the subject of further research by the authors.

After the SFIA skills adapt in higher education curriculum possessed as a strategy. The graduates will be supply the workforces and facing the challenge to prove their digital capability and meet the demand industry and society 5.0. Therefore european commission create a digital assement to become a framework to identify the competences and proficiency levels of digitalization to enter the demanded future job vacancy.

Buckingham (2006) presents a critical notion of digital literacy, including a conceptual framework of elements for mapping the field. According to Buckingham (2006), a literate person must understand how the language works, be able to evaluate the material encountered, know who is communicating with whom, and understand their audience. Digital Literacy is “the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze, and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process” (Martin and Grudziecki, 2006).

Later, Allan Martin (2009) proposed three “levels” or stages for the development of digital literacy (Figure 3). Martin (2009) argued that this definition suggested discussing digital literacy only at levels II or III; digital competence is a requirement for and a precursor of digital literacy but it cannot be described as digital literacy.

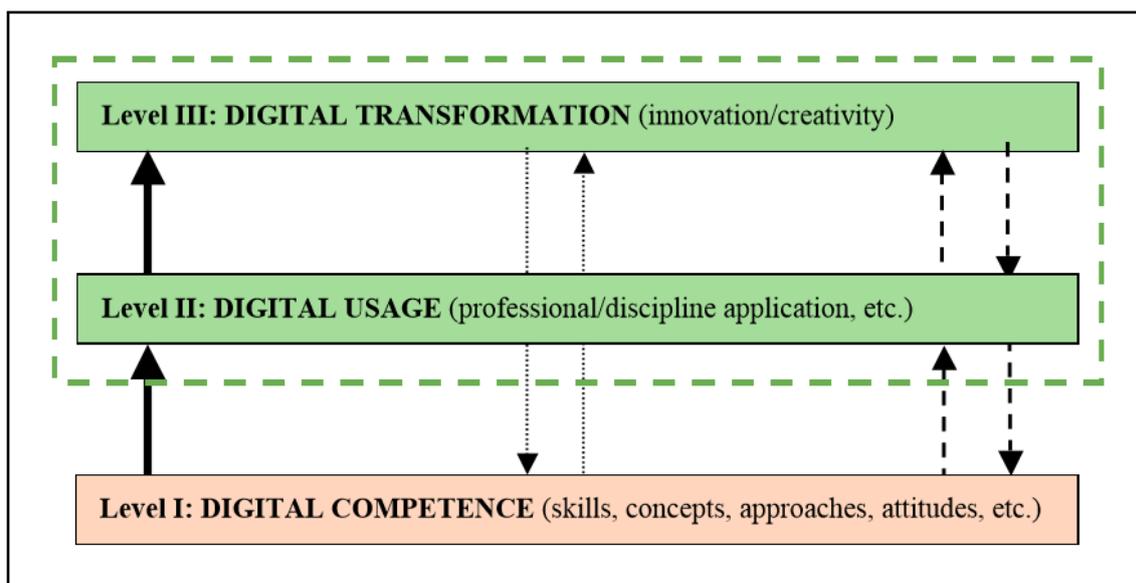


Figure 3. Leves of Digital Literacy. Reprinted from “ Digital Literacy for The third Age : Sustaining Identity in An Uncertain World” by A. Martin, 2013. *eLearning Papers* (12,p-8).

From a media literacy perspective he hereby emphasizes the need for critical reflection as an important part of digital competence. Johannsen *et al* (2014) argue that such awareness is to be nurtured in all aspects of the students’ digital competence, and as such, be an essential part of a teacher’s competence. It is one of the importhant strategy to escalating gradutes with digital competency in the next level and meet future digital vacancy.

According to Johannsen *et al* (2014), when discussing digital competence in the context of the national curriculum, the use of ICT in learning can be divided into the use of technology for learning, learning to use technology, and critical reflection. Learning to use technology corresponds with the use of general definitions, while the use of technology for learning can be regarded as production. Critical and conscious reflection of technology-use can certainly be related to the term *bildung*. On the other hand, Johannsen *et al* (2014) argue that the two sets of understanding of digital competence given from general definitions, and the national curriculum and policies, constitute a stepping-stone for understanding the teacher competences that are needed. Of course, there is more to these categories than what has been somehow superficially presented and related here. Still, Johannsen *et al* (2014) believe that the relationships, as illustrated in the Table 1, can serve as a means for overviewing the holistic picture and illustrating the arguments for a threefold understanding of teachers’ digital competence.

Table 1. Teacher digital competence

General definitions	Curriculum and policies	Teacher competences
Using	Learning to use technology	Teaching of ICT
Producing	Using technology to learn	Teaching with ICT
Bildung	Critical reflection	Teaching about ICT

Futuremore, Johannsen *et al* (2014) mentioned in the third column, the digital competences for teachers and teacher trainers are presented, and categorized as teaching of, with and about ICT. The teaching of ICT is related to the use aspects of digital competence and with the idea of learning to use technology. Teaching with ICT is related to the production of digital competence and the pedagogical idea of using technology for learning. Teaching about ICT is related to the bildung aspects of digital competence and the idea of the critical evaluation of technology from the national curriculum.

Further work is undertaken by the European Commission to address specific challenges related to capacity building for digital education and training transformation and the changing requirements for lifelong learning competences in general. Last but not least, shifting from education professionals to the institutional level, a European framework for digitally competent educational organizations (DigCompOrg) was published to promote effective digital age learning (European Commission, 2019). According to International Telecommunication Union (ITU) in their publication 2019, DigCompOrg is now turned into SELFIE, a tool for schools' self-reflection of their digital capacity.¹³ It was launched in October 2018 and is currently available in the 24 official languages of the European Union, with more languages to be added over time. Other work supporting institutions include a framework for opening-up higher education institutions (OpenEdu) which was also published in 2016, supporting higher education institutions dealing with the challenges and opportunities related to open education (e.g. Open Educational Resources, open science).

Moreover, ITU (2019) noticed that moving from individuals to professionals in the area of lifelong learning, a digital competence framework for educators has also been developed. DigCompEdu is directed towards educators at all levels of education & training. It describes what it means for educators to be digitally competent and provides a general reference frame to support the development of educator-specific digital competences in Europe. DigCompEdu details 22 educator-specific competences for teaching in a digital society along 6 competence areas. Current work is focused on a self-assessment instrument.

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Digital Competences Assessment

Since 2013, European Commission has been published Digital Competences (DigComp 1.0) and in 2016 the latest version of the Digital Competence Framework for Citizens (DigComp) 2 which was elaborated by the Human Capital and Employment Unit (Joint Research Centre) on behalf of the Directorate General for Employment, Social Affairs and Inclusion of the

European Commission. Key components of digital competence were identified in terms of the knowledge, skills and attitudes required to be digitally competent were established. Later, in version 2.0 of the framework (Carretero *et al.*, 2017) , 8 ability levels were specified for each digital ability. This update intended to provide a more detailed description of the characteristics of each level (in terms of knowledge, skills and attitudes) and what requires for moving on to the next level. Indeed, it can be used for the definition of accreditation pathways for competence profiles which require specific digital competences and levels. Carretero *et al.* (2017) provided 21 competences identified with 8 proficiency levels grouped in 5 competence areas on the Table 2 below.

Table 2. Competence areas of digital competences in DigComp 2.0

Competence Areas	Competences
1 Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2 Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3 Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licences 3.4 Programming
4 Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5 Problem solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps

DigComp will help people with insufficient digital skills to recognize the most important skills for improving their personal and professional lives, reflecting on the points needed, and being aware of their progress. Similarly, jobseekers can define and explain their digital competence in their CV. They may directly use self-assessment tools or performance-based e-assessment tools such as the one being built in this project. Moreover, employers and jobs providers should use a specific 'language' to help describe the skills in their vacancies in the production of job description. Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication and evolving society for the next level.

Creating an instrument to measure and certify citizens' digital competence is illustrated by a large-scale project initiated by the French Ministry of Education. A digital platform called PIX10 was developed from 2016 and today, any French speaker can use it to evaluate one's level of digital competence. The competence framework is based on the DigComp competences with slight modifications and the learning outcomes are developed in eight proficiency

levels¹¹. The assessment approach taken by the PIX platform is task-based, which results in authentic online activities that users take at their own pace and time, solving one practical problem using digital tools in an online environment at a time. This offers individuals an opportunity to practice and revise their digital competence in a rather playful manner.

The PIX platform will also be used for the purpose of certifying one's digital competence, both by employers and educational establishments (ITU, 2019). For secondary school students in France, for example, by the school year of 2019 to 2020, the PIX certificate will replace the current Internet certificate (called D2i). The idea is that all secondary students can access PIX through their school's digital learning platform, and at a given point in time, starting from June 2019, schools will be able to organize a testing session which will lead to a certification. Similarly, employee organizations are given an option to use the PIX platform, for the purpose of digital competence acquisition by employees, and also to assess and further certify workers' digital competence. The PIX certificate is recognized by the National Committee for Professional Certification (CNCP)¹² (ITU, 2019).

According to ITU (2019), creating professional digital profiles in different sectors of industry is yet another use case of the DigComp framework. In the Basque country of Spain, such work is carried out in collaboration with the Basque Government (Directorate of Entrepreneurship, Innovation and Information society), local university, manufacturing companies and other stakeholders with a long-term goal of digital transformation of the local economy.

Currently, ITU (2019) noticing that 15 professional digital profiles exist, many of which focus on the new industry 4.0 jobs (e.g. 3D designer). Since 2012, the Basque country government has implemented various activities using DigComp for the digital competence needs of citizens, enterprises, civil servants and others. For example, a digital competence assessment tool, which is based on DigComp, has been taken up by over 50 000 citizens already. The results of the assessment are linked to career and training guidance in order to improve the personal skills and employability of unemployed people for welcoming Society 5.0

V. CONCLUSION

From historical review of the notion of digital competence before 21st Century illustrates a motion towards a broad, holistic definition, emphasizing the role of ICT in learning. Therefore, ICT Skills have to be adopted by higher education in the curriculum to supply the qualified graduates. One of a standardised approach for defining ICT skills is called The Skills Framework for the Information Age (SFIA) by SFIA Foundation (2011). The SFIA skills could be adapted in higher education curriculum as a strategy to graduates' future workforces. For the next step into meeting the demanded tech job vacancy, workforces could use the current digital competences (DigiComp 2.0) and DigiCompEdu published by European Commission. DigComp framework which contributed to well-defined criteria, facilitating acknowledgment in a hiring process. Besides, users will be able to progress in their selected profiles according to the pathways. Thereby, it will improve the quality of the learning opportunities guiding the learners/teachers/trainers and facilitating as education practitioners adapted learning pathways in welcoming Society 5.0.

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