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Information Technology Trends for a Global and Interdisciplinary Research Community Book Preface

This book, entitled *Information Technology Trends for a Global and Interdisciplinary Research Community*, is a multidisciplinary and interdisciplinary work, which has a broad scope of application areas, to face up the complex Knowledge Society problems and challenges we currently have to solve (García -Peñalvo, 2015b, 2015c). It is a volume that continues the orientation that began with (García-Peñalvo, 2018c) and, obviously, the pandemic influences it by the COVID-19 disease (Apuke & Omar, 2020; Beaunoyer, Dupéré, & Guitton, 2020; Daniel, 2020; Fardoun, González-González, Collazos, & Yousef, 2020; García-Peñalvo & Corell, 2020; García-Peñalvo, Corell, Abella-García, & Grande-de-Prado, 2020a, 2020b).

The book comprises 14 chapters that are organized in three main sections: COVID-19 related papers (Czerniewicz et al., 2020; UNESCO, 2020), educational technologies (García-Peñalvo, Casado-Lumbreras, Colomo-Palacios, & Yadav, 2020; Herold, 2016; Robinson, Molenda, & Rezabek, 2008; Spector, 2015) and data-driven intelligent ecosystems (Bogdanova & Ackovska, 2010; Cruz-Benito, Therón, & García-Peñalvo, 2016; Fonseca, García-Peñalvo, & Camba, 2020; García-Holgado & García-Peñalvo, 2019).

1. COVID-19

The coronavirus SARS-CoV-2 has caused the COVID-19 disease worldwide pandemic that affects both health and economy. The COVID-19 outbreak has a considerable impact on all business domains worldwide, almost with negative consequences. The digital transformation was already a requirement for all governments and institutions that this pandemic has accelerated to solve the confinement and the limitations to work and share the same spaces (Gobble, 2018; Negreiro & Madiega, 2019).

The COVID-19 part of the book is composed by two chapters.

García-Peñalvo et al. reflect about the effect of COVID-19 in higher Education, specifically in face-to-face universities. After having closed one of the processes that have had the most significant impact on universities, the time has come to reflect and draw conclusions that will serve to face these institutions' future. A crisis always represents risks but also opportunities to change from a disruptive situation. Authors comment about universities' future from a Strengths-Weaknesses-Opportunities-Threats approach with the perspective of the experiences lived during the end of the 2019-2020 academic year by some face-to-face universities in Spain.

Argüelles et al. present a review of information and communication technologies, associated with the drive for health-related areas, automotive manufacturing, robots, self-driven cars and retail sales, to conclude with education with a special focus on the impact of digitalization on these areas, their strengths and weaknesses.

2. EDUCATIONAL TECHNOLOGIES

Educational technology is defined as the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Richey, 2008).

The Association for Educational Communications and Technology (AECT) denoted instructional technology as the theory and practice of design, development, utilization, management, and evaluation of processes and learning resources (Januszewski & Molenda, 2008).

Educational technology and instructional technology are terms that are often used interchangeably, and there are a growing number of people who recommend adopting a label that includes the word "learning" (Lowenthal & Wilson, 2010).

Taking this into account, educational technology is an inclusive term for both the material tools and the theoretical foundations for supporting learning and teaching. Thus, it refers to all valid and reliable applied education sciences, such as equipment, processes, and procedures derived from scientific research, and in a given context may refer to theoretical, algorithmic, or heuristic processes. This means that educational technology is not restricted to high technology and is anything that enhances learning in a blended or online context (García-Peñalvo, 2015a; Herold, 2016).

Nevertheless, a modern motion of technology education means electronic and plays and important role in current society (Selwyn, 2011). Education technology or EdTech, refers to an area of technology devoted to the development and application of tools (including software, hardware, and processes) intended to promote education (Lazaro, 2014).

Educational technology encompasses different approaches in the literature: eLearning (García-Peñalvo, 2020b; García-Peñalvo & Seoane-Pardo, 2015; Gros & García-Peñalvo, 2016), instructional technology (Molenda, 1997), information and communication technology (ICT) in education (García-Peñalvo, 2008a), EdTech (Lazaro, 2014), learning technology (Berlanga & García-Peñalvo, 2005a, 2005b), multimedia learning (García-Peñalvo & García Carrasco, 2005), technology-enhanced learning (TEL) (Kirkwood & Price, 2014), computer-based instruction (CBI) (Kulik & Kulik, 1991), computer managed instruction (Day & Payne, 1987), computer-based training (CBT) (Williams & Zahed, 1996), computer-assisted instruction or computer-aided instruction (CAI) (Suppes & Morningstar, 1969), Internet-based training (IBT) or Web-based training (WBT) (Driscoll, 1997), flexible learning (Hill, 2006), virtual education, online education or digital education (García-Peñalvo, 2008b; Seoane Pardo & García-Peñalvo, 2014; Tinoco-Giraldo, Torrecilla Sánchez, & García-Peñalvo, 2020), collaborative learning (Dillenbourg, 1999a, 1999b), distributed learning (Oblinger & Maruyama, 1996), computer-mediated communication (Walther, 1996), cyberlearning (Frechette, 2006), multi-modal instruction (Steil, Röthling, Haschke, & Ritter, 2004), personal learning environments (Wilson et al., 2007), networked learning (Goodyear, 2005), virtual learning environments (VLE) or learning platforms (García-Peñalvo & García Carrasco, 2002; García-Peñalvo, Rivero-Ortega, Rodríguez-Conde, & Rodríguez-García, 2020), m-learning (Casany et al., 2012; Ramírez-Montoya & García-Peñalvo, 2017; Sánchez-Prieto, Olmos-Migueláñez, & García-Peñalvo, 2014), ubiquitous learning (Conde González, Muñoz Martín, & García-Peñalvo, 2008; Joo-Nagata, Martínez Abad, García-Bermejo Giner, & García-Peñalvo, 2017; S. J. H. Yang, 2006), artificial intelligence applied in education (Rodríguez-García, Moreno-León, Román-González, & Robles, 2020; Sánchez-Prieto, Cruz-Benito, Therón, & García-Peñalvo, 2020; Z. Yu, 2020), learning analytics (Fidalgo-Blanco, Sein-Echaluce, García-Peñalvo, & Conde-González, 2015; García-Peñalvo, 2020a; Hernández-García, Conde, & Chaparro-Peláez, 2020; Martínez-Monés et al., 2020), gamifica-

tion (Cordero-Britto & Mena, 2020; Rojas-López, Rincón-Flores, Mena, García-Peñalvo, & Ramírez-Montoya, 2019; Torres-Toukoumidis, Ramírez-Montoya, & Romero-Rodríguez, 2018), or Massive Open On-line Courses (MOOC) (García-Peñalvo, 2015d; García-Peñalvo, Fidalgo-Blanco, & Sein-Echaluce, 2018; López Meneses, Vázquez-Cano, & Román Graván, 2015; Martínez Abad, Rodríguez Conde, & García-Peñalvo, 2014; Martínez-Núñez, Borrás-Gene, & Fidalgo-Blanco, 2016).

This book comprises eight chapters related to the educational and learning technologies.

Yang et al. provide a comprehensive overview of the six leading international frameworks about teachers' digital competence published from 2010 until now. This work aims to make it easier to integrate an assessment digital competence framework for teachers in other regions of the world that do not have their framework.

González-Izard and Juanes-Méndez analyze the influence of augmented reality and virtual reality techniques for the Human Anatomy subject, oriented to health science students.

Cabezas-González and Casillas-Martín introduce an innovative teaching proposal to develop children's digital competence using artificial intelligence. This proposal is being developed through an educational program called DigiCraft.

Alonso de Castro and García-Peñalvo present the main data collected from educational projects that are related to eLearning and related methodologies in Erasmus+ Project Results platform. It also defines which ones will be selected so as to be able to undertake an adequate analysis that allows the definition of a methodological guide to be carried out.

Claudia Orozco describes the experience of a group of students using Open Educational Resources (Ramírez-Montoya, 2015; UNESCO, 2019) for vector learning and its applications. The apps promote learning because students establish a direct relationship between at least two types of three proposed registers.

Conde et al. introduce RoboSTEAM project, which is an Erasmus KA2 project that proposes the application of Challenge Based Learning methodologies (Conde, Rodríguez-Sedano, Fernández-Llamas, Gonçalves, et al., 2020; Conde, Rodríguez-Sedano, Fernández-Llamas, Jesus, et al., 2020) combined with the use of robots and physical devices in order help learners to develop computational thinking in pre-university education environments.

Lemoine et al. propose to answer these questions, can social media be used in higher education to improve learning through student and faculty collaboration?, are there less than desirable results in the interaction of social media and higher education?

Ramírez-Montoya et al. analyze different innovation types in two scenarios of graduate classes aimed at innovation and entrepreneurship. The question that guided the study is: what kind of educational innovation do students perceive as principal in graduate courses that integrate virtual reality? The method used is based on the analysis of two groups of graduate students participating in a class that integrated virtual reality and the strategy of horizons architecture. Through these observations, authors analyze the perception of educational innovation by students who had the task of building innovative entrepreneurial projects to contribute to sustainable development (ODS) (United Nations, 2019).

3. INTENSIVE-DATA INTELLIGENT ECOSYSTEMS

A technological ecosystem is a metaphor to express a needed evolution of the traditional information systems (García-Peñalvo, 2016, 2018a, 2018b). These are solutions based on the composition of differ-

ent software components and services that share a set of semantically defined data flows. The result is a complex ecosystem that provides a set of services that each component separately does not offer and can evolve as a whole in a better way when its components do or when some components are dropped out or when new components are included. Moreover, the technological ecosystem is thought to offer a better user experience so that users are also part or components of the ecosystem.

The technological ecosystems' internal structure is more complicated than a traditional information system (García-Holgado & García-Peñalvo, 2017a, 2017b). This issue implies that these solutions should be taken into account in those axes in which the knowledge management (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2014, 2015) and solution-making processes are based on heterogeneous and complex data-driven architectures (García-Peñalvo et al., 2015).

The technological ecosystem metaphor comes from the Biology field, and it has been transferred into software development because it reflects so well the evolutionary nature of software. Several authors use the definition of natural ecosystem to support their technological ecosystem definition systems (Chen & Chang, 2007; Dhungana, Groher, Schludermann, & Biffl, 2010; Mens, Claes, Grosjean, & Serebrenik, 2014; E. Yu & Deng, 2011). This way, a technological ecosystem may be defined through mapping with the main elements that appear in every natural ecosystem (García-Holgado & García-Peñalvo, 2014, 2016), i.e., the organisms or biotic factors, the physical environment in which they inhabit or abiotic factors and the relationships between organisms and organisms with the environment. Specifically, within a technological ecosystem, there are a set of persons and software components that represent the role of the biotic factors; a set of elements that allow that ecosystem runs (hardware, communications, etc.), these are the abiotic factors; and a set of data flows that mean the relationships among the software components and these components and the involved users.

This part of the book presents four chapters.

Pérez Vizcarra et al. offer a general review of the presence of the risks present in today's society and their impact on the daily life of the citizens and propose the use of Safe Paths; a mobile application focused on risk prevention based on social collaboration to identify dangerous areas and give alerts based on their users' location and the risks around to them.

Chamoso et al. review the state-of-the-art technologies aimed at improving employability and analyze the technological advances in this sector.

Joo-Nagata et al. have developed a teaching process linked to territorial information on the architectural and historical heritage corresponding to the cities of Salamanca (Spain) and Santiago (Chile).

Padilla-Zea et al. make an overview of the Social Seducement Erasmus+ project, which aims to improve adults' social inclusiveness in risks of social exclusion by training them in the social economy.

Francisco José García-Peñalvo
University of Salamanca, Spain

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