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Emerging Information Technology Trends

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Recently from JITR scope, the book "Global Implications of Emerging Technology Trends" has been published (García-Peñalvo, 2018b). It is focused on the Information Technology Research as a fully multicultural, multidisciplinary and interdisciplinary research filed, which has a broad scope of application areas, with the aim to face up the complex Knowledge Society problems and challenges we currently have to solve (García-Peñalvo, 2014, 2015b, 2015c, 2013) and several JITR authors have participated in its contents.

The book comprises fourteen chapters that are organized in three main sections: information, media and coding literacy (Lee & So, 2014; National Research Council Committee on Information Technology Literacy, 1999; Vee, 2013), educational and learning technologies (Herold, 2016; Robinson, Molenda, & Rezabek, 2008; Spector, 2015) and data-driven intelligent ecosystems (Bogdanova & Ackovska, 2010; Cruz-Benito, Therón, & García-Peñalvo, 2016).

Information literacy may be defined as the capacity of people to recognize their information needs; locate and evaluate que quality of information; store and retrieve information; make effective and ethical use of information; and apply information to create and communicate knowledge (Catts & Lau, 2008), or the ability to recognize the need for information and knowing how to access, evaluate, synthesize and communicate it (Moeller, Joseph, Lau, & Carbo, 2011).

This situation presents an increasing approach for introduce digital or information technology (IT) literacy from the early beginning of the individual development (Bers, Flannery, Kazakoff, & Sullivan, 2014; Kazakoff & Bers, 2012; Pinto-Llorente, Casillas-Martín, Cabezas-González, & García-Peñalvo, 2017). The most frequent approach to teaching digital literacy has been to gradually encourage the learning of programming, and the term code-literacy (diSessa, 2000; Prensky, 2008) has been coined to referrer the process of teaching children programming tasks, from the simplest and most entertaining to the most complex.

A code-literate person means that can read and write in programming languages (Román-González, 2014), computational thinking is referred to the underlying problem-solving cognitive process that allows it. Thus, coding is a

key way to enable computational thinking (García-Peñalvo & Mendes, 2018; Lye & Koh, 2014) and computational thinking may be applied to various kinds of problems that do not directly involve coding tasks (García-Peñalvo, 2016c; García-Peñalvo & Cruz-Benito, 2016; García-Peñalvo, Reimann, Tuul, Rees, & Jormanainen, 2016; Wing, 2006). An example of this is TACCLE 3 – Coding European Project that is devoted to promote computational thinking and coding in pre-university studies, specially in primary schools, all around Europe (García-Peñalvo, 2016a; García-Peñalvo, Hughes, et al., 2016; TACCLE 3 Consortium, 2017), taking into account the teacher training (Villalba Condori, 2018; Villalba Condori, Castro Cuba, Deco, Bender, & García-Peñalvo, 2017).

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).

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, as well as processes and procedures that are 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 & 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), 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), 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; Yang, 2006) and 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).

A technological ecosystem is a metaphor to express a needed evolution of the traditional information systems (García-Peñalvo, 2016b, 2018a). These are solutions based on the composition of different 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 is able to evolve as a whole in a better way when its components does 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 in the way that users are also part or components of the ecosystem.

The internal structure of the technological ecosystems is more complex than a traditional information system (García-Holgado & García-Peñalvo, 2017a, 2017b), this implies that these solutions should be taken into account in those cases in which the knowledge management (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2014, 2015; Rubio Royo, Cranfield McKay, Nelson-Santana, Delgado Rodríguez, & Occon-Carreras, 2018) 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. There are several authors that use the definition of natural ecosystem to support their own technological ecosystem definition systems (W. Chen & Chang, 2007; Dhungana, Groher, Schludermann, & Biffl, 2010; Mens, Claes, Grosjean, & Serebrenik, 2014; Yu & Deng, 2011). This way, a technological ecosystem may be defined through a 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 among these components and the involved users (Cruz-Benito et al., 2018).

This JITR issue is comprises ten research papers.

Chen et al. (2018) model a multilevel object template set that can be stratified by different updating time spans in order to solve visual tracking problems by linearly representing objects with a few templates.

Balasaraswathi and Kalpana (2018) present a technique that performs classification on huge data using PSO.

Krishna Kumar Mohbey (2018) uses utility as the preference of the accessed mobile web services. In particular, the proposed approach obtains more accurate and filtered mobile web service sequences. The experimental results show that the proposed approach has a good performance in terms of execution efficiency and memory utilization.

Kumar and Kumar (2018) investigate the initial center selection process for the categorical data and after that present a new support based initial center selection algorithm. The proposed algorithm measures the weight of unique data points of an attribute with the help of support and then integrates these weights along the rows, to get the support of every row. Further, a data object having the largest support is chosen as an initial center followed by finding other centers that are at the greatest distance from the initially selected center.

Chandani and Gupta (2018) have the objective to make requirement analysis phase exhaustive by estimating risk at requirement level using requirement defect information and execution flow dependency as early as possible to inhibit them from being incorporated in design and implementation. The proposed approach works as a two-fold process which computes risk involved with each requirement twice. The whole process is divided into a three-layered framework to finalize requirements with clear vision and scope of a project.

Vidyarthi and Jha (2018) apply a hybrid heuristic using College Admission Problem and Analytical Hierarchical Process for stable matching of the users' job with cloud's virtual machine.

Suruchi Chawla (Chawla, 2018) proposes a method that uses hybrid of genetic algorithm and trust for generating the optimal ranking of trusted clicked URLs for web page recommendations.

Gupta and Gupta (2018) present a systematic approach to prioritize requirements and estimate risk associated with each requirement. It first aims at providing a short training to both developers and stakeholders to bridge the gap of understanding and comprehending requirements so that a refined priority value for each requirement can be obtained. Secondly, it presents a requirement risk and re-prioritization estimation model to make sure that a right decision has been taken by stakeholder and developers.

Kumar and Sarkar (2018) have designed a hybrid prediction model for medical domain data sets by combining the decision tree based classifier (mainly C4.5) and the decision table based classifier.

Finally, Kim and Kim (2018) present a method of developing a text warehouse that provides a machine-learning-based text classification service.

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