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Guest-Editorial

Special issue on Engineering and Management of IDTs for Knowledge Management Systems

An ongoing and main challenge for intelligent decision technologies is the need to support knowledge-intensive tasks that usually are surging in multiple domains of applications such as manufacture [13], finance and insurance [10], and generic knowledge-based service business [12]. Engineering and management systems have relied on knowledge generated from several related areas including Decision Support Systems, Artificial Intelligence and Operations Research. Most recently, in the last decade, a business management perspective realized through Knowledge Management (KM) approach has been incorporated to this research stream driven by a knowledge-based services economy [9,11]. Thus, a new type of IT system called Knowledge Management System (KMS) [2] has emerged to leverage "professional and managerial activities by focusing on creating, gathering, organizing, and disseminating an organization's "knowledge" as opposed to "information" or "data" (idem, p. 1).

While KMS are engineered and managed by using multiple IT, we consider relevant the development of KMS based on intelligent decision technologies and the enhancement of the decision-making process [6]. Through following the seminal directions [7,8] established by the eminent AI scientists Herbert A. Simon (1916–2001) and Alan Newell (1927–1992), and the system's emergent property established by the Theory of Systems [1,4], we support also the notion of a "*distinct computer systems level, lying immediately above the symbol level, which is characterized by knowledge as the medium and the principle of rationality as the law of behavior*" (Newell, p. 7) as a core conceptualization for the realization of such KMS.

We believe that the five invited and peer-reviewed research papers in this special issue in "*Engineering and Management of IDTs for Knowledge Management Systems*", advance our scientific knowledge on the state of the art of intelligent knowledge management systems in a context of decision-making process. One research paper reports an improved algorithm for an automatic joint of knowledge stored via ontologies. Three another research papers analyze deeply the KMS support challenges and the KMS emergent simulation-based design architectures and paradigms. Finally, a fifth paper, reviews the state of the art of KMS focused on the particular problem of improving the utilization of standards and models of process in the context of software and systems engineering.

In first paper, titled "*Automatic Fusion of knowledge stored in Ontologies*", Dr. Alma-Delia Cueva and Professor Adolfo Guzmán-Arenas (Computer Research Center, Instituto Politecnico Nacional, México), investigate the knowledge fusion problem which is a seamless process in human beings. However, for an automated system, authors report that algorithms of ontologies fusion lack of critical features such as the processing of synonyms, homonyms, redundancies, apparent contradictions, and inconsistencies. Authors, consequently presents a new method for ontology merging (OM), its algorithm and implementation to join two ontologies (obtained from Web documents) in an automatic fashion (without human intervention), producing a third ontology, and taking into account the problematic issues aforementioned, with a delivering result close to a human being performance. This paper contributes to the design of intelligent KMS with such a new method and algorithm.

In the second paper, titled "*Challenging Computer Software Frontiers and the Human Resistance to*

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Change", Professor Jens Pohl (California Polytechnic State University, USA) examines the problem of driving and opposing forces that affect the shift from a data-processing information technology environment - without software intelligence- to an information-centric environment. Author claims that these driving forces foster the generation and utilization of a huge quantity of data dare and its correct utilization faces a natural change human resistance. Consequently, the author describes current information-centric technology, proposes a vision of intelligent software system capabilities, and identifies four areas of necessary research. This research paper contributes with a clear identification of the need of intelligent software (e.g. KMS) to augment the capabilities of human decision makers and reduce the change resistance of using new IT.

The third paper is titled "*Predictive Knowledge Management Using Mirror Worlds*" by Professor Daniel E. O'Leary (University of Southern California, USA). In this paper, author addresses the time-framing problem (focused on past and present knowledge which is captured, converted and connected for KMS users). Consequently, decision makers that are responsible for using it for anticipating the organizational future are not totally supported. Author, thus develops a review of the "mirror worlds" approach for developing a new generation of KMS. Main interest is understanding how knowledge management systems will be able to accommodate anticipation of the future at the systems level. This paper, thus contributes to the KMS research stream, through a comparison of mirror worlds to other virtual worlds, an evaluation of state of mirror worlds and an examination of potential limitations of such constructs for predictive knowledge management.

In fourth paper titled "*Systems Social Science: A Design Inquiry Approach for Stabilization and Reconstruction of Social Systems*", Professor Barry G. Silverman (University of Pennsylvania, USA), explores innovative methodological research approaches – based in a Design Inquiry Approach- to help organizations better understand and solve complex socio-technical dilemmas. For this aim, author contrasts design inquiry with scientific inquiry. Based on such a methodological approach, author reports a meso-scale model of models methodology for design inquiry that synthesizes systems science, agent modeling and simulation, knowledge management architectures, and domain theories and knowledge. Author supports his claims with a vast repertory of real examples of such a research. This paper contributes to KMS research with the incorporation of a rich systemic methodological approach for designing and developing intelligent KMS.

The final paper – a particular focused research on KMS for standards and models of process in systems and software engineering – titled "*On KM, KMS and ontology-based KMS in the domain of SwE standards and models of processes: a conceptual survey*". Dr. Manuel Mora (Autonomous University of Aguascalientes, Mexico), Professor Francisco Cervantes-Pérez (CCADET, Universidad Nacional Autónoma de México, México), Dr. Leonardo Garrido (Center of Intelligent Systems, Monterrey Tech, Mexico), Dr. Fen Wang, (Central Washington University, USA), and Dr. Miguel Angel-Sicilia (University of Alcala of Henares, Spain), pose the hypothesis that IT systems where knowledge structures are explicitly codified, such as ontology-based knowledge management systems (o-KMS), can provide a plausible better solution for supporting the understanding of complex documents such as the standards and models of process in systems and software engineering – usually reported in HTML or PDF documents-. For supporting such a hypothesis, firstly a conceptual survey on KMS and KM foundations to describe the capabilities of KMS and supporting needs for KM processes is reported. Secondly, the profiles of standards and models of process, and review related research on KMS is presented. Authors complete this research with problem-solution links, and discuss how o-KMS might provide a better support. This paper advances KMS research stream, with a deep survey of IT for KMS and in specific for supporting the utilization of complex documents via posed ontology-based KMS.

With this special issue, we believe we have aimed the development of engineering constructs, frameworks and models, methods, processes and techniques, tools and instruments, and instantiations of systems and components, as well as of behavioral-oriented management constructs, frameworks, theories and models [5] based on IDT for realization of efficient, effective and trustworthy KMS in organizations. We encourage to researchers interested in this topic to pursue research recommendations and contribute to the development of better intelligent KMS.

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