

Guest Editorial Preface

Special Issue on Systems Analysis and Systemic Thinking: Research and Teaching Issues

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This special issue was motivated by some ideas about the integration of software engineering and systems engineering discussed in Boehm (2006). Barry Boehm provided further elaboration on why such integration was necessary in an interview for IJITSA as follows “... the systems that we are trying to engineer these days are getting a lot more complicated than the ones that were done before in that they are trying to pull together existing systems that have different owners and are operating on different timescales, different objectives, and different management chains. And somehow we need to make these things come together and operate as some kind of unified whole. At the same time these things are becoming more software intensive...” (Lane et al, 2008).

Our understanding of the role of systems thinking in software development is influenced by Boehm’s writings and by the broad view of Systems Analysis and Design (SA&D) promoted by Alter and Browne (2005). It is illustrated with a typology of Information Technology project contexts proposed by them that has two dimensions. The first is about the relative weight of social emphasis versus technical emphasis in a project. The second dimension is the extent of change in work practices, ranging from a goal of fixing the technology without changing existing work practices through achieving significant changes in work practices. Alter and Browne (2005: 984) use this framework to identify six project situations for applying SA&D that are mapped along the two dimensions in a continuum:

1. SA&D for software or hardware maintenance;
2. SA&D projects for software or hardware upgrades that lie at an intermediate position between focusing on work practices and focusing on technology, although the primary focus is still on the technology;
3. SA&D for monitoring and patching existing work practices via process improvement and Six Sigma with a focus more on work practices than on technology;
4. SA&D for the creation or major modification of IT-enabled work systems that may involve the creation of new software;
5. SA&D for the creation or major modification of IT-enabled work systems that may involve the configuration and installation of commercial application software;
6. SA&D for organizational change or reengineering that brings the most direct focus on work practices.

We may note that in some of these situations SA&D is concerned with developing software while in others it is aiming mostly at improvement of work practices. The latter aspect goes beyond the traditional understanding of SA&D applied to software development (the latter is defined very clearly in Iivari et al., 2005).

The objective of this special issue is to disseminate high quality research that links systemic approaches and systems analysis and design and shows how that can be practiced in complex IT projects or how such ideas can be taught to IT students. In evaluating the relevance of the submitted papers for this special issue we were following a similar broad view of the role of systems ideas for complex problem solving and systems analysis and design.

The importance of Systems Analysis and Design (SA&D) for any program of study in information systems and to the field of Information Technology (IT) development is well summarized by Harris et al. (2006). The re-emerging interest in SA&D a few years ago (see Iivari et al., (2005)) was evolving in parallel with a renewed interest in the applicability of systems thinking to Information Systems as a discipline (see Mora et al., 2007, Petkov et al., 2008). A number of relevant papers on the application of systemic approaches to Information Systems development were published over the last eight years in *IJITSA*.

Examining the recent evolution of systems thinking we may note that the body of knowledge in Soft Systems Methodology (SSM) has reached a stage of maturity that allows reflections on how it is applied in practice (see Checkland & Winter (2006) for general insights on SSM and Rose & Saifullah (2012) for a recent case study of its application to IS development). The Work System Theory (WST) by Steven Alter, a systemic methodology specifically developed to bridge the gap in the language of IT practitioners and the clients, has also been the subject of increasing research (see Alter (2013)). Alter and Browne's (2005) typology of IT project contexts demonstrates well the need for systems thinking methodologies like SSM or WST to be applied in more complex project situations.

Systems Analysis and Design techniques in Information Systems development have evolved over the last decade. Iivari et al (2005) point that object oriented methodologies were better associated a decade ago with programming courses while SA&D was focusing more on structured systems analysis techniques. Both industry and academia are focusing these days more on object oriented methodologies.

Hence there is a need to identify the current state of research on the application and teaching of systemic approaches in systems analysis and design in recent years with respect to object oriented software development and complex systems development integrating technical and management systems. We believe that the papers in this special issue are demonstrating some of the contemporary developments in the above directions on applying systemic thinking in SA&D practice and teaching. This special issue is an extension also of past research published by this journal since 2008. It was preceded by preliminary exchanges related to a panel discussion on Systems Thinking and Information Systems at the 2014 ISECON conference organized by the AITP EDSIG (see Petkov et al., 2014). A call for papers was disseminated also through the ISWorld list server of the Association for Information Systems. All submitted papers were subjected to a double blind review process. Next we present an overview of the four selected papers for this issue.

The special issue starts with the invited paper A Work System Front End for Object-Oriented Analysis and Design by Steven Alter (University of San Francisco) and Narasimha Bolloju (LNM Institute of Information Technology, Jaipur, India). It deals with the unresolved issue of interfacing systems thinking with object oriented methods. The paper justifies how work system theory (WST) and the work system method (WSM) might serve as a front end to object-oriented analysis and design (OOAD). The Work System Method was proposed by Alter almost 15 years ago for the purpose of bridging the gap between user representations of system requirements and those of software developers. Extending those ideas towards integration with the Unified Modeling Language (UML) including the prevalent techniques for software specifications today is an important contribution towards accomplishing this goal. It demonstrates how tools from WSM can be used as a front end for OOAD. It is a step before creating use case diagrams and other UML artifacts that capture as a result in a better way business requirements.

The second paper by Donna Champion (Loughborough University) is titled Navigating Complex Systems Design with the PEARL Framework. It illustrates the role of soft systems thinking in the third, fourth and sixth types of project situations in the typology provided by Alter and Browne (2005). The paper provides reflections on the practice of complex problem solving and on previous applications of the PEARL framework, an intellectual device based on soft systemic principles, proposed a few years ago by Champion. The paper shows also how PEARL was applied to support complex systems development in the automotive industry involving sophisticated embedded software systems and demonstrates the power of soft systems thinking in such highly complex environments.

The third paper titled Addressing Team Dynamics in Virtual Teams: The Role of Soft Systems is by Frank Stowell (University of Portsmouth, UK) and S. Cooray (Curry College, USA). It is a case study on the application of the PEARL framework to the systems analysis of development of a study abroad program demonstrating how soft systems thinking can be applied to address issues of team dynamics in virtual teams. It is an extension of past research by the same authors. As virtual teams are used extensively in software development the findings of this paper have practical contributions for the IT industry. The paper is very valuable also to the systems community for its methodological guidance on how to conduct and document systemic interventions as action research projects.

The last paper deals with an issue related to the potential difference between the espoused theory in the Information Systems discipline and its theory in practice. It is titled Analyzing the IS 2010 Model Curriculum for Evidence of the Systems Approach and is authored by George Schell (University of North Carolina, Wilmington, NC, USA) and Richard Mathieu (Queens University, Charlotte, NC, USA). It applies as a methodology content analysis to the most recent curriculum guidelines for undergraduate Information Systems programs. Thus the paper contributes in a significant way to the goal of this special issue by analyzing to what degree systems notions are present in the documents about the recommended IS curriculum. Its findings aim to stimulate a more active dialogue on how to integrate the systems approach in IS programs and in business schools.

The second and third papers are showing the relevance of soft systems thinking to complex problem solving. It promotes learning about the problem situation and thus contributes to problem solving according to Jackson (2003). The first paper deals with the integration of a socio-technical systems approach (WSM and WST) with OOAD while the last paper is concerned predominantly with how hard systems thinking is reflected in the IS curriculum recommendations. Thus the four papers in this special issue illustrate how the rich diversity of systems approaches might be applicable to systems analysis.

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