Chapter 7.1
Towards A Wider Application of the Systems Approach in Information Systems and Software Engineering

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ABSTRACT

The chapter provides possible directions for the wider application of the systems approach to information systems development. Potential improvement of software development practices is linked by some leading experts to the application of more systemic ideas. However, the current state of the practice in software engineering and information systems development shows the urgent need for improvement through greater application of systems thinking.

INTRODUCTION

Information Technology (IT) articles often include statements along these lines: "systems development continues to be challenging. Problems regarding the cost, timeliness, and quality of software products still exist." (Iivari and Huisman, 2007, p.35). Such a statement justifies the continuous search for improvement of Information Systems Development (ISD). Boehm, one of the founding fathers of Software Engineering, stressed in a recent interview the importance of the systems approach to achieve improvements in software development (see Lane, Petkov and Mora, 2008).

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These are some of the origins for the motivation for this paper.

Glass, Ramesh and Vessey (2004) provide an analysis of the topics covered by the three computing disciplines - Information Systems (IS), Software Engineering (SE) and Computer Science (CS) - and show overlaps between them all in the area of systems/software concepts. They also demonstrate that CS has only minor regard of the issues and concerns of systems/software management. Sommerville (2007) states that CS is concerned with the theories and methods that underlie computers and software systems rather than the engineering and management activities associated with producing software. Whilst acknowledging that CS, SE and IS do have a considerable overlap, the practices of both IS and SE have to deal with common matters such as the management of huge development projects, human factors (both software developers and software end users), organizational issues and economic aspects of software systems development and deployment (Van Vilet, 2000).

For the reasons stated above we will concentrate here only on SE and IS and their links to systems thinking. We will consider as a starting point the reality that the whole computing field has evolved historically as several 'stovepipes of knowledge'; CS, SE and IS (Glass et al., 2004). Whether the separation or integration of computing disciplines will prevail is a complex issue. Integration has yet to be achieved as a consequence of the sets of values central to each area. We believe, along with others, that a systems approach may lead to improvement of the development and management of software systems and to a greater integration of computing. One might expect that the use of the word "system" in various contexts today leads to more "systems thinking", but is this true?

A reflective history of the IS field is presented in Hirschheim and Klein (2003, p.244-249). According to them, because of its roots in multiple disciplines, "such as computer science, management, and systems theory, it is hardly surprising that the field of IS cast a wide net when defining its boundaries, sweeping in many themes and boundaries" (Hirschheim and Klein, 2003, p.245). In that light, it is somehow striking to note the conclusion about a lack of a systems approach in IS research according to Lee (2004, p.16). Alter (2004, p.757) is even more specific claiming that "the information systems discipline is ostensibly about systems, but many of our fundamental ideas and viewpoints are about tools, not systems".

The systems approach has been acknowledged, in the SE literature, as providing an insight into the factors that influence the success or failure of computer technologies (Mathieu, 2002, p.138). It is symbolic that the 2006 special issue of the IEEE Computer magazine on the 60th anniversary of the IEEE Computer Society was dedicated to the past and future of SE. A brief examination of the papers in that issue shows that four of them are dealing with some systems features and the other three give examples of tool thinking. None of the seven papers issue had a reference to any source from the field of systems thinking and only one paper (Baresi, Di Nitto and Ghezzi, 2006) had references to several classic SE sources dealing with fundamental systems ideas. This does not advance the ideas suggested by Boehm (2006a) and Sommerville (2007) that there is need to integrate SE with Systems Engineering; a branch of systems thinking (see Jackson, 2003).

The contribution of this research is in the identification of areas where a systems approach would lead to improvements in ISD within a point of view that favors implicitly the integration of the IS and SE disciplines. The paper will proceed with an analysis of how links between software development and systems thinking were perceived in the fields of IS and SE. This is done predominantly with the intention of exploring the application of systems ideas to software development separately in the two fields, outlining the success stories and the open problems. At the end we will propose possible directions for future research in software