Chapter 2.4
Dynamics in IS Development:
A Multi-Method Experiment to Measure the Effects of Disruptions during the Development Process

Peter Otto
Union Graduate College, USA

Salvatore Belardo
University at Albany, USA

ABSTRACT

The failure of many IS development efforts suggests that the development process, in particular the role that key antecedents play in ensuring success, is poorly understood. Information systems are based on a series of highly complex interrelated tasks that can be significantly affected by organizational (e.g., management attention), project (e.g., resources), and technical (e.g., tools) drivers. Changes or disruptions in these can have severe and, in many cases, unanticipated consequences for IS development efforts. To help understand how disruptions during the IS development initiative affect the quality of the system, we employ the system dynamics methodology to capture feedback from non-linear activities, viz., those that define a systems development effort. The results from the simulation lead to some tangible and timely recommendations to manage an IS development initiative. [Article copies are available for purchase from InfoSci-on-Demand.com]

INTRODUCTION AND MOTIVATION

Developing an information system is a difficult task often plagued by cost overruns, delays and cancellations. Disruptions arise from a number of factors including technical difficulties, lack of managerial attention, lack of strategic or process alignment, or lack of user involvement. Models intended to explain factors critical to successful IS development (cf., Arnold, 1995; DeLone and McLean, 1992; Seddon, 1997) address important deployment (e.g., system quality) and usage (e.g., user satisfaction) drivers but fail to adequately explain the impact of relationships between these factors.

Research suggests that because managers have difficulty understanding the interactions among factors in complex systems, they fail to adequately account for the time delay between a control action and its effect (Simon, 1979; Sterman, 1989). They may also fail to understand the feedback between their own decisions and changes in the environment, which, as Sterman (1989) notes, can cause instability. In many cases, we assume conditions to be stable during IS development. Unfortunately, both external and internal disturbances that accompany systems development efforts can cause conditions to become unstable, and systems to become unpredictable or uncontrollable (Cambel, 1993).

The literature suggests that the most common sources of instability are changes in schedule, user requirements, staffing/leadership, and design (Rebentisch, 1996); a number of researchers have attempted to explain the impact of these factors on system development efforts (cf., Schmitt and Kozar, 1978; Necco et al., 1988; Davis et al., 1992; Pollalis et al., 1993).

IS projects fail not only because of instability but also because of management's inability to anticipate the delay that inevitably occurs before problem resolution takes full effect (Keil and Robey, 1999). Traditional IS development models (cf., DeLone and McLean, 1992; Seddon, 1997) sequentially arrange deployment and usage drivers or apply linear methods (e.g., regression) in which independent variables are used to make predictions about system behavior (Svyantek and Brown, 2000). A better understanding of the dynamic interactions that affect IS use and, subsequently, IS success can be achieved using non-linear methods.

Abdel-Hamid et al. (1989, 1990, 1992 and 1999) have applied non-linear modeling to investigate how staff turnover, resource allocation, and managerial turnover affect software development and cost. While this research stream addresses a number of important questions in regard to schedule changes and cost overruns in software development, it has focused primarily on the human resource dimension of software project management. Our study aims to extend the work of Abdel-Hamid et al. by (a) including the qualitative dimensions of the skill and knowledge of IS development teams and (b) measuring the expected outcome of IS development projects from the user's perspective. We contend, that by quantifying the different effects of instability during IS development and viewing the results from a user's perspective we are better able to measure the anticipated use of the information system and, subsequently, IS success.

The next section describes IS development characteristics with reference to DeLone and McLean's original IS success model. In the methodology section, we conceptualize the simulation model, explain our research methodology and discuss key variables and interactions between them. In the section entitled "Model Characteristics" we show how, under certain conditions, imbalances between desired and available resources and changes in project scope can have a profound impact on the development of an information system. The article concludes with a discussion of limitations and possible extensions of the model.

IS DEVELOPMENT CHARACTERISTICS

Over the last twenty-five years or so, numerous studies have been conducted to determine strategies to help improve the chances of developing successful information systems (Lucas, 1981; Bailey and Pearson, 1983; Ives et. al., 1983; Davis, 1989; Melone, 1990). The authors of one of the more widely cited models (DeLone and McLean, 1993) contend that use of the system, and user satisfaction, are highly correlated with the system's impact on the user and the organization. Rai, Land and Welker (2002) contend that there is empirical evidence to support the explanatory power of the DeLone and McLean model. In a ten

Related Content

Exploring a UML Profile Approach to Modeling Web Services in Healthcare
Wullianallur Raghupathiand Wei Gao (2010). *Strategic Information Systems: Concepts, Methodologies, Tools, and Applications (pp. 714-730).*
www.irma-international.org/chapter/exploring-uml-profile-approach-modeling/36721

Group Decision Support Systems
John Wangand James Yao (2010). *Strategic Information Systems: Concepts, Methodologies, Tools, and Applications (pp. 1543-1550).*
www.irma-international.org/chapter/group-decision-support-systems/36773

Contributions to a Future Inertial Motor and More
Dan Ciulin (2013). *International Journal of Strategic Information Technology and Applications (pp. 63-97).*
www.irma-international.org/article/contributions-future-inertial-motor-more/77358

It Takes Two to Tango: The Fit Between Network Context and Inter-Organizational Strategic Information Systems Planning
Ton A.M. Spil, Tijs van den Broekand Hannu T.T. Salmela (2010). *International Journal of Strategic Information Technology and Applications (pp. 23-41).*
www.irma-international.org/article/takes-two-tango/39111

Towards a New Data Replication Management in Cloud Systems
Abdenour Lazeb, Riad Mokademand Ghalem Belalem (2019). *International Journal of Strategic Information Technology and Applications (pp. 1-20).*
www.irma-international.org/article/towards-a-new-data-replication-management-in-cloud-systems/241865