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The roots of executive information system development risks

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ABSTRACT

Context: Executive information systems (EIS) are valuable tools that enable executives to formulate and execute strategic decisions in their organizations. However, implementation of an EIS is complex and laden with numerous risks.

Objective: We apply the socio-technical model (STM) to propose a framework of risks for the development and implementation of an EIS. Such a framework may serve to guide risk management strategies and procedures beyond current practices.

Method: To assess, and better understand, the risks associated with implementing an EIS, interviews were conducted with the employees of three principle stakeholders of a taxation EIS. The interviews centered on the detailed experiences of the participants applying and working with EIS projects at their respective organizations.

Results: Content analysis of the interviews confirmed an ability to designate risks to both the project and the product of development through dimensions of task, actor, structure and technology as well as the fit between each combination. The result adds credence to the model for purposes of risk management in the development of an EIS.

Conclusion: Executive information systems play an integral role in business decision making. The successful construction and implementation of an EIS are reliant upon a clear understanding of the appropriate technology to be used, the end-user accessing the system, and the tasks executed. The STM is a useful tool for the identification of risks in the creation of an EIS. Further work should consider the extendability to other systems and its compatibility with development approaches.

1. Introduction

Executive information systems (EIS) are flexible tools that provide broad and deep information such as news, regulations, and competitive analysis for use in executive decision making [1–3]. These systems were created to address the needs of executives and support strategic decision making through scanning, analysis, and interpretation functions that continue to expand in their power and scope [3,4]. An EIS supports users, who perform highly unstructured work, and processes information from a myriad of sources about organizations and environments including transaction data, financial information, online analytical data, external news services, and market trends [5,6]. For decision makers, the EIS provides valuable information to help stimulate creative solutions, manage functions, control operations, and monitor environmental trends as they think about planning and strategizing [7]. Thus, the core processes of an EIS provide flexible and easy-to-use tools that add breadth, depth, and a variety of information for executive decisions.

Organizations often receive significant benefits from EIS implementations; however, the complexity of EIS implementations yield high-risk projects [8]. Multiple sources of internal and external data, the incorporation of decision models, the inclusion of on-demand modeling and data acquisition, varying decision styles, and management levels of the users are among the factors that make the development of an EIS a risky proposition. Yet, in a risk management framework, the identification of risks early in the development

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process is crucial to an effective risk management strategy [3,9,10]. Failure to recognize the risks in the development of a system or the exaggeration of risks often interfere in the effective management of risks [11,12]. Thus, it is natural that we ask the question: Can we do a better job of identifying risks in the development of an EIS? It is not enough to understand the presence and consequences of risk, which is the focus of most studies, we also must understand the root cause of risks in order to plan for risks and intervene in their occurrence to best achieve success.

Extensive literature exists concerning risk in systems development from the perspective of identification and control [10,12–14]. Some studies generate risk lists to help developers identify and control risks [9,12]. Others work to categorize risks in a fashion that allows for more of an analytical approach to designing risk management procedures [13,15]. Within these approaches, prior studies identify structural, actor, task, and technical risk factors such as user involvement, executive support, appropriate and flexible hardware and software, adequate resources, and well-defined requirements [2,13,14]. For better risk management, EIS project managers must equally consider the social, cultural, organizational, and technical factors [16]. Although prior studies provide useful insights into key risks found in EIS development, the origins of risk are not generally considered. In particular, risk studies tend to ignore the complex relationships in the development of even basic software, much less a complex EIS, resulting in a shallow description of risks rather than a deep examination of root causes [12,14,16].

One key may be in the level considered by prior studies. Often, the system or project level is the focus of study. A higher perspective must be considered that is pointed to by a number of research streams including socio-technical models (STM), consonance, and Task-Technology Fit (TTF) theory [15,17,18]. In brief, the socio-technical model indicates that systems will often ignore effects on the people and structure of an organization when dealing with tasks and technology. Consonance argues that perceptual differences between multiple stakeholders lead to conditions resulting in failure. More narrowly, TTF suggests that a root risk to success is the match of the capability of the technology to the demand of the tasks in the work environment. Each argues for an alignment – an alignment of the technical to the social, an alignment of stakeholder understanding, and an alignment of technology to best accomplish a given task. In a successful EIS development, the tasks are unique for a system requiring care in the alignment of the technology. User needs are narrowly focused, but must be fully understood by developers to deliver an effective system product. The technology dimension must not hide changes required to the decision-making structure of the executives.

For our study, we focus on these more global perspectives to explore risks in an EIS development and deployment project to determine if there is a better way to identify risks in the development of an EIS and perhaps other complex systems as well. Specifically, does the broad socio-technical model viewed in the light of consonance and Task-Technology Fit emerge in the development of a major EIS? Our concern is to be able to identify risks based on how they emerge. We identify a major EIS implementation to serve as our case, target key informants across several organizations, and conduct deep interviews. The interview data indicates that risks arise from failures to match across all dimensions of the socio-technical framework, providing directions for further research and a better view for practitioners looking to determine risks earlier in the development process.

2. Background and propositions

In a strategic context, increasing emphasis has been placed on understanding the link between what information executives possess that might bear on future performance to how they develop long-term strategies about future opportunities and threats. In this scenario, getting essential information to the executives is a core competency of winning organizations [19,20]. Therefore, the EIS becomes the core system (technology) to provide executive management (actors) strategically significant information (structure) to support strategic decision making (task), to update an executive's knowledge, and to challenge long-held viewpoints and assumptions. As organizations developed software for executives, their ill-defined tasks made it necessary to gather, explicate and understand internal and external information. Wide-ranging strategic information is a convergence of knowledge management, business intelligence (BI) and competitive intelligence [21,22]. Indeed, the EIS should permit awareness of environmental trends and the ability to monitor important indicators [23]. Embedding features to allow environmental scanning and delineation of external information is essential to aid executive efforts in planning strategies and anticipating changes [1,23]. Scorecard and dashboards in BI systems report key performance indicators, draw from diverse data warehouses, use advanced data mining and semantic search technologies to access valuable information on customers, competitors, and the environment at large. The increased data access and manipulation abilities help search for valuable information, build complex analytical models, and evaluate multiple strategies [23]. The complexity of multiple data sources, inter-organizational applications, sophisticated decision models, uncertain task structures, and output versatility make the development of an EIS a risky project.

Several innovative development approaches recognize the importance of considering further relevant aspects of the system, such as including more actors and a larger perspective on the environment [24,25]. Such methods typically begin with a sound analysis of organizational goals to drive an analysis that considers requirements defined through communications between developers and potential users, an emphasis on analytical and decision models under resource constraints, requirements shaped by software capabilities, and achieving an agreeable basis for continued development [25–27]. Examples of such methodologies include KAOS and i* which identify and document stakeholders' global goals in a form that can best be analyzed, communicated, and subsequently implemented or operate earlier in the software development process to best work with actor needs [24,25]. Methods that serve to identify a larger set of system aspects promote awareness of the greater breadth and greater understanding of all potential risks [26,27].

Risks can be any condition that will lead to the failure of a project during development, create errors in the output of a project, or produce a system with no value. Risk is often measured as a potential variance from expectations, such as a large cost overrun or delayed delivery of the system. Certain risks can be anticipated and mitigated early in the development process, others must be addressed as they occur, and still others are never identified because they were not anticipated or realized. Regardless, potential risks must be recognized and managed to achieve success in an IS project [9,28]. Project managers must assess risks to design controls that detect and respond to a risk event, mitigate the impact, or lessen the probability [10,29]. However, the identification of risks is not a straightforward task [11,12]. It is crucial to gain an understanding of how risks can be identified and how they can change over the course of development. Simple lists in the literature of textbooks and trade books do not provide sufficient malleability or specificity to be of value in a breadth of settings and times [30–32]. Analysis approaches allow for the design of controls for broad categories of risk [30]. While the focus of the literature allows for planning steps to analyze and control risks it is not sufficient to prepare for an early intervention.

EIS projects fail due to many risks common to most systems as well as those unique to the system type: inappropriate communication, lack of skilled actors, unclear task definitions, and complex technologies [3,11,21,22]. All of these are represented in the socio-technical model of system risks which could potentially help managers anticipate project risks and increase the likelihood of success