AMCIS 1996 Proceedings

Americas Conference on Information Systems (AMCIS)

8-16-1996

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Abstract

Most analyses about risk in implementing large-scale information technology have tended to focus on discrete outcomes and to draw boundaries which often fail to capture important social relationships. It is argued here that the risk of failure needs to be interpreted operationally, not just as inherent in certain structural features of the environment or of a project, but also as arising from distinct human and organizational practices and patterns of belief and action. The emphasis is on the mutual influence between the large-scale information technology, the context in which it is being embedded, and the process of its implementation. Drawing on the rich data of the implementation of an automated baggage-handling system at the Denver International Airport, this presentation aims to foster discussion about risks associated with the implementation of large-scale information technology systems.

The purpose of this presentation is to foster discussion about risks associated with the implementation of large-scale information technology (IT) systems. Clearly the implementation of large-scale IT systems is risky, and the current risk literature is replete with description of things that can go wrong. The existing literature has identified risk factors and models which tend to share three characteristics. First, they consist of causal models based on the deterministic assumptions of either a technological or organizational imperative (Markus and Robey, 1988), therefore discount the importance of human intentions and action in shaping the implementation of technology. Second, they are variance models (Markus and Robey, 1988) that do not adequately capture the contextual and processual issues that are fundamental to examining implementation risks (Pettigrew, 1990; Sauer 1993). Third, they focus primarily on large scale IT system prior to implementation that do not examine the dynamic implementation process (Willcocks and Griffith 1994).

In this presentation, the history of the Denver International Airport (DIA) project and the evolution of the automated baggage-handling system implementation will be examined, looking beyond the system boundaries to understand how they influence, and were influenced by, the social setting in which they were embedded. The data for this presentation will be drawn from a historical and longitudinal study, involving contact with the managers and workers associated with the project to enable the documentation of the organizational change initiatives that extended over a twelve-year time frame (1983-1995). The preliminary findings of the study suggest that attention should be shifted away from identifying the increasing number of isolated antecedents of risk, and instead toward examining the changes in patterns of risk over time. This paper argues that the implementation of large IT systems should be conceptualized not as having static risk but a dynamic risk. Such a perspective allows us to anticipate, explain, and evaluate different risks and their consequences during the implementation of large-scale IT systems.

The overall context of the DIA project is characterized by the dynamic nature of the development of a new airport, the economic and political environment, the large number of parties involved, the severe time constraints for completion, and the one-time nature of the project. In addition, communication and debate at the various management levels and among subcontractors was not encouraged or facilitated, in keeping with the strong emphasis on product and deadlines that characterized the fast-track nature of the project. Within this context, the initial vision for a baggage-handling system at DIA was that each individual airline should build its own system. In June 1991, United Airlines signed on to use DIA as its second-largest hub airport. In order to turn aircraft around in under thirty minutes, United insisted on having an automated baggage handling system. In December 1991, they commissioned BAE Automatic Systems, Inc., a world leader in the design and implementation of material handling systems, to develop an automated system concept for their Concourse B. Airlines other than United, however, were not coming forward with plans to develop their own baggage systems.

Two years into the construction of the new airport, a vision began to emerge for the inclusion of an airport-wide integrated baggage-handling system that could provide a major improvement in the efficiency of luggage delivery. It was expected that such efficiency would be reflected on saving precious ground time, reducing close-out time for hub operations, and cutting back on time-consuming manual baggage sorting and handling. Since BAE was already working on United's automated system and recognizing its strong world-wide reputation as a baggage system builder, Denver approached BAE. The planning and negotiation for the implementation of this system was driven directly from the top by managers with no intimate knowledge of the baggage system technology and by consultants hired to develop the system specification but with no responsibility for monitoring the implementation. This emergent view, however, underestimated the high complexity of the expanded system, the newness of the technology, and the high level of coordination required among the entities housed at DIA that were to be served by the system. The management team never perceived the baggage-handling system as determining the economical survival of the project in any significant way, especially once the settlements with BAE took place. Furthermore, although the requirements for the system were expanded from one airline, United Airlines, to serve the whole airport, the managerial structures merely replicated past practices. The managerial team failed to redefine the system implementation in relation to its new context. They failed to link the interconnected knowledge base and expertise required for the implementation, and to assure consistency between the technology and the context.

Over time as changes in the context and in various internal components of the DIA project took place, and the technology began to experience problems related to its newness, management was caught without the tools, time, or structures to facilitate the required changes in operational processes. As the pressure grew, different views began to appear which resulted in open conflict. The process of interaction between the management team, the system development contractor, and the airlines involved a clash of perspectives. There is no evidence, however, that management sought clarification or that it fully understood the magnitude of the problem until the opening of the new airport had to be postponed. After delaying the opening of the new airport three times, the plans for the systems were scaled down from an airport-wide system to a single baggage-handling system for each concourse. During this stage, however, the system implementation management team (now consisting of United Airlines, an airport technology consultant firm, and BAE) facilitated desired changes in this area by sensitive management of the process of change, such as encouraging the extensive dialogue needed between interested parties. Appropriate efforts were made at the various managerial levels involved to avoid problems of coordination. The implementation of the IT system was consciously monitored allowing management to refresh and adapt the strategy for change over time. Six months after the de-scaling of the system, the airport was able to open and operate successfully.

Consistent with prior research on the implementation risk literature, ambiguity in the implementation of large-scale IT systems is inevitable due to such factors as the need to ensure agreement among diverse parties, the uncertainty in the organization's technology and environment, the multiple perspectives of different individuals and groups, and the lack of information about the various components that could be affected by large-scale system. No one manager is likely to have the competence to evaluate critically and in depth all the components that could potentially affect or be affected by the implementation of a new large-scale IT system. On the other hand, the responsibility for the implementation, with respect to the process of organizational change in combination with large scale, can easily fall into the gap between system developers and managers since both groups can assume a role for themselves that assigns responsibility to the other party.

The process of organization change surrounding the implementation of the baggage-handling system at DIA involved new ways of working, managing, and thinking (Nadler and Tushman, 1989; Hoffman, 1989; Henderson, 1992). In every stage of systems implementation, distinctive transformations of either the technology or the organization, or both, took place. In all cases, however, the changes that took place provided a new context for later systems implementations (Applegate, 1993; Argyris, 1990; Beer, et al., 1990; Hoffman, 1989; Kanter, 1992; Kelly and Amburgey, 1991; Mohrman, 1989). The DIA management group struggled over time to achieve alignment between the changes that were taking place in the overall project and the operation of systems that were being implemented. Management failed in its role of creating

an environment of understanding between the various stakeholders involved. These stakeholders who were the potential users of the system and the system developers were neither homogeneous nor static in time, but were broadly incompatible with the overall strategy of implementing a large-scale IT system with unknown technology (a very dynamic part of the project) within the rigid time constraints.

This research is useful in describing (in one specific setting) the patterns of technological and organizational change which reflect the properties of the social setting in which a large-scale system is being implemented. An understanding of these issues is central to an explanation of the risks associated with the failure of large-scale IT system implementation, and central to the detection of potential sources of conflict in a specific social context.

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