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Abstract

Organizational innovation with information technologies encompasses a complex sequence of activities for the adoption, adaptation, and use of the technologies involved. While there has been research conducted on the adoption, adaptation, and use of information technologies over the past two decades, a review of over 60 empirical studies revealed several "gaps" in the literature. This paper discusses these gaps and proposes a conceptual framework for the future study of adoption, adaptation, and use of information technologies. Based upon this framework, several propositions for future study are suggested.

Introduction

Organizational innovation with information technologies involves a complex sequence of activities for: (i) adoption of the information technology, (ii) adaptation, or adjustments among the technology, organizational structures and work processes, skills, and work climate, and (iii) routinization of the use of the information technology. During the last two decades, the phenomena of adoption, adaptation, and use have been researched in the context of a variety of information technologies and applications and through the use of diverse theoretical perspectives.

This study examines prior literature to summarize extant knowledge in this area and to examine what still needs to be done. Two general research questions originally guided our research. First, do different types of technology result in different adoption, adaptation, and/or use patterns? Second, what theories have been used in the IS literature to explain adoption, adaptation, and use phenomena for specific types of technology?

Method And Analysis

In order to address these questions, a careful review of the IS literature was made to identify and examine empirical studies of information technology adoption, adaptation, and/or use reported during the period 1970-1998. Nine journals that have been noted as publishing high quality IS research were reviewed: *Academy of Management Journal*, *Administrative Science Quarterly*, *DATABASE*, *Decision Sciences*, *Information Systems Research*, *Journal of Management Information Systems*, *Management Science*, *MIS Quarterly*, and *Organization Science*. Empirical studies identified from these journals, as well as other studies that became known to the authors, were included in this research effort. We examined more than 70 published empirical research articles.

Our examination revealed several "gaps" in the literature. These gaps included a lack of a) research on adaptation processes, b) research of phenomena at the group level of analysis, c) research on complex technologies, d) similarity of predictors and measures between studies (with the exception of TAM/TRA/TPB studies), and e) theoretical richness. As a result, we were unable to adequately address our original research questions, and our analysis led us to continue the research effort focusing on the following conclusions and questions:

1. Adoption, adaptation, and use represent discrete events in organizational innovation. Yet, they are related and interdependent in very fundamental ways. Since most of the existing studies have focused their attention individually on specific events, there is a need now to look across the accumulated wealth of studies to discern what we have learned about the flow of information technology innovations through the stages of adoption, adaptation, and use in organizations. What types of factors influence the effective adoption, adaptation, and use of information technologies in organizations?

2. Individual research studies have examined a variety of information technologies and applications, ranging from packaged software for organizational functions to specific information technologies (e.g., databases and e-mail.), to specific business and IT organization designs and work practices (e.g., matrix organizations and object-oriented development). Further analysis is required to understand if the processes of adoption, adaptation, and use differ according to the nature of the innovation. For example, how are the dynamics of adoption, adaptation, and use different across information technology applications, information technology artifacts, and business and IT organization designs and work practices?

3. A variety of theories have been developed and used for studying the individual phenomena of adoption, adaptation, and use. For example, Rogers' (1995) model of innovation adoption has often been used to examine the characteristics of early adopters, whereas theories of organizational learning (e.g., Fichman and Kemerer 1997), organizational knowledge (e.g., Leonard-Barton 1995), and critical mass (e.g., Iacovou, Benbasat, and Dexter 1995) have been used to examine the organizational use of information technologies. Further, the theories of reasoned action (e.g., Hartwick and Barki 1994), technology acceptance model (Davis 1993), and social influence (Burkhardt 1994) have been used to examine individual use of information technologies in organizations. Used less in the empirical studies examined, however, were theories that helped to predict or explain the impact of contextual factors on information technology adoption, adaptation, or use. How are we to make sense of these different theories in terms of their relevance, contribution, and overlap in understanding?

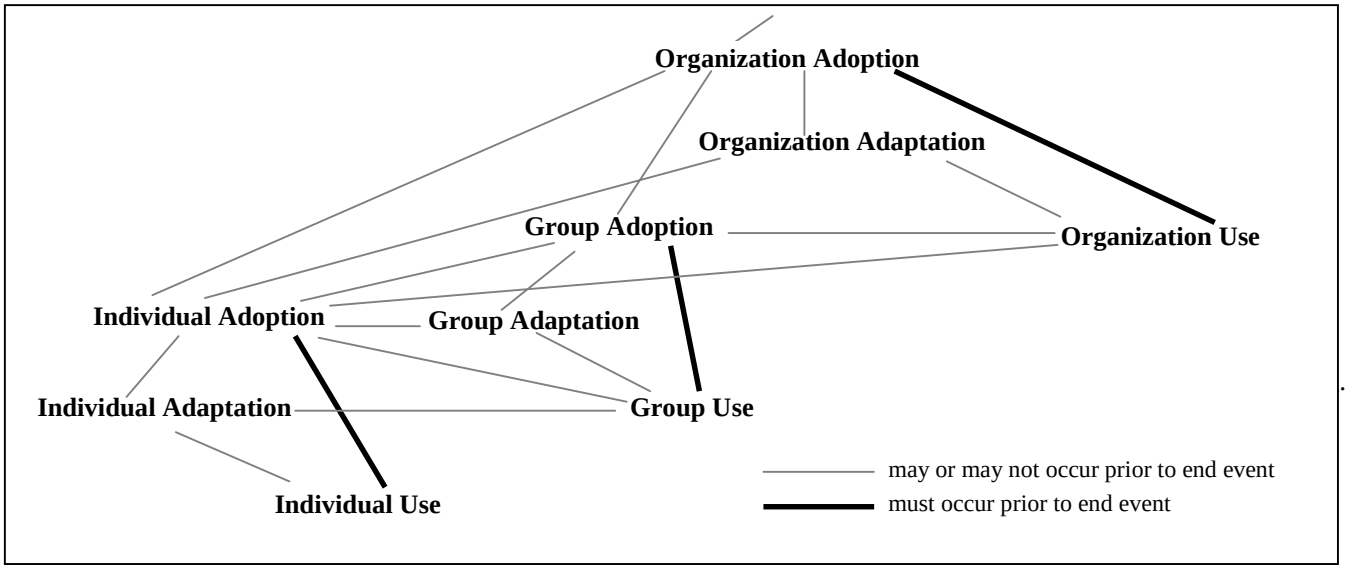
This research generates answers to the above questions by developing a conceptual lens through which to understand the phenomena of adoption, adaptation, and use of information technologies in organizations. We argue that these events could occur at any one of three focal levels: individual, group (work unit, project team, or a department), and organizational. While acknowledging that any single study will typically focus on one event, we suggest that there are important interdependencies between the three stages that are typically ignored in most prior research. For example, often information technology adoption occurs at the organizational level, whereas subsequent adaptation and use actions could occur either at the individual or group level.

Conceptual Framework

The conceptual framework above (Figure 1) is presented as a representation of the cycle of organizational assimilation of information technologies. Several principles underlie the model. First, an information technology must be adopted at a focal level before it can be used at that level. In other words, the decision to use a technology must be made before it is actually used, even if the adoption is merely symbolic as may be the case in mandatory use. Second, the information technology in question may or may not be adapted to the particular needs of the adopting unit prior to use. Additionally, adaptation can occur after use of the information technology has begun. Third, adoption or adaptation of an information technology may or may not lead to subsequent use. Fourth, an information technology may have been adopted, adapted, and/or used at a "higher" focal level -- or by a different unit at the same focal level within the organization -- prior to consideration of adoption by a specific group or individual. It is also recognized that an information technology may be adopted, adapted, and/or used at lower focal levels, which then may influence the adoption, adaptation, and/or use at higher levels.

Use of this conceptual model allows for the incorporation of historical, temporal, and situational contexts within which information technology adoption, adaptation, and/or use occurs. We suggest that it is important to recognize and acknowledge the potential influence the prior dimensions of innovation event (adoption, adaptation, use) and focal levels (individual,

Figure 1



group, organization) will have on the phenomena under study, in terms of both the research setting and the point We also suggest that the particular context, the dimension(s) of event, and the focal level(s) involved in the phenomena under study should influence the type of theory used for prediction or explanation. For example, research of phenomena having a scope that includes multiple dimensions of event or focal levels may be better served with theories that incorporate process (e.g., structuration, social influence). Whereas research of phenomena with a scope limited to a single dimension of event may be served well with variance theories that focus on factors for prediction and explanation.

Discussion And Future Research

Our review revealed that the emphasis of most prior research has been on either adoption or use at the individual and organizational levels. However, the middle ground of adaptation has not received much attention. A focus on adoption and use might have been appropriate for prior generations of technology where technology applications were more tightly circumscribed. In other words, there were a limited number of ways in which organizations, groups, and individuals could have used the technologies. Arguably, for the newer knowledge-intensive technologies, such as data warehousing and the Internet that exhibit increasing interpretive flexibility, adaptation is perhaps the most critical phase in the innovation cycle. Therefore, we develop proposals for future research by identifying promising research questions, prospective theoretical underpinnings for these questions, and strategies for examining adaptation as a middle ground between adoption and use of information technologies in organizations. Two examples are provided below.

Complex technologies are malleable and typically require the participation, expertise, cooperation, and coordination of various organizational units. Given the nature of complex technologies, a fruitful area of research is the study the mutual adaptation (Leonard-Barton 1995) processes that occur during implementation. Interesting research questions to be studied include 1) What adaptation processes occur during the implementation of a complex technology? 2) Does the source(s) of motivation to implement a complex technology significantly influence the adaptation processes employed during its implementation? 3) What knowledge and understanding exist, and how does this knowledge and understanding influence adaptation processes during implementation?, and 4) How do the adaptation processes employed during implementation influence complex technology success outcomes? (Carter 1999).

Another fruitful area of research addresses the need for new conceptualizations of information technology "use." Recent literature points to the potential importance of the construct intentions to explore new uses of a technology (Nambisan, Agarwal, and Tanniru 1999). A focus on the exploration of information technologies as a form of use would facilitate a richer understanding of the impacts of information technology use on organizational and individual learning, as well as the impacts of learning on information technology use.

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