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8-16-1996

A Grounded Theory Study of Successful Organizational Integrated CASE Technology Implementation

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Introduction

This paper describes a research project that endeavors to answer the question are there certain characteristics of an organization that will predict whether ICASE will be successful in that organization? The objective of this research is to discern the organizational and technological factors that contribute to successful implementation of Computer-Aided Software Engineering (CASE) technology. Organizations using ICASE tools were studied to learn what organizational and technological factors contributed to their success, or lack of success. CASE technology refers to the software that assists in the development of application software. The promise of improved productivity has led information systems managers to invest heavily in CASE technology.

Despite the significant level of investment in CASE tools, no previous research has considered whether an organization that was successful in implementing integrated CASE (ICASE) technology had a particular profile. ICASE tools provide the greatest benefit to an organization that is developing application systems because of their completeness and integration. ICASE tools share the following characteristics: 1) they allow for the development and maintenance of a repository that is shared across all phases of the life cycle, 2) they provide tools to complete the tasks of all phases of the life cycle, and 3) they provide a way of expressing and storing the firm's business rules.

This research adds to the body of knowledge that explores the relationship between factors in an organization and ICASE adoption success. This study builds on the work of Orlikowski, Ryan and Bock, and Rowe (Orlikowski, 1989; Orlikowski, 1993; Orlikowski & Baroudi, 1991; Rowe, 1993; Ryan & Bock, 1992) This work also supports a direction of research that has been suggested by Wynekoop and Conger (Wynekoop & Conger, 1990). Finally, this research extends the stream of information systems research utilizing qualitative techniques(Calloway & Ariav, 1990; Calloway & Ariav, 1995; Fenton, 1992; Lee, 1989; Lee, 1991; Martin & Turner, 1986; Orlikowski, 1993).

Scope of This Research

The focus of this study is on the organizations that have adopted the technology, and not on the characteristics of particular products or vendors. Since ICASE tools are based on similar principles of software engineering, these tools are more like each other than they are different from each other.

ICASE tools require a large investment in software and are commonly used only for large projects in large organizations. The experiences of these organizations may differ from the experience of smaller organizations taking advantage of other forms of CASE technology. The results of this research might not be generalizable to all CASE users.

Description of This Research

This research is based on in-depth interviews with current and past users of ICASE tools. These users were identified by asking ICASE vendors for names of organizational CASE users. Participants were also solicited through electronic mail to an international CASE user's forum. Open-ended questions were

pursued. As with all research that relies on self-reported data, this study assumes that the respondents are able to assess characteristics about the organization and to report on them accurately.

The data collected were examined using qualitative analysis techniques. The objective was to discover those factors that contribute to an organization's successful use of CASE tools. A theory of successful ICASE implementation was developed based on these data by following the principles of "grounded theory." The result is an explanation of an organization's success or lack of success with ICASE technology. Grounded theory is a qualitative analysis approach that allows the data to "speak," through rigorous analysis and coding of concepts expressed in interviews (Calloway & Knapp, 1995; Strauss & Corbin, 1990). Grounded theory was first developed in sociology and has since been used in many other disciplines. This approach is invaluable when conducting theoretical research.

The concepts discovered in the interviews were classified based on the information systems literature. Categories were then developed to classify these concepts. These categories were integrated around a set of three core themes. In this way an explanation was developed based on the data collected to identify the factors that contribute to an organization's successful implementation of ICASE technology.

Findings of This Research

This study found that ICASE implementation success relies on the interaction between management's understanding of information technology, the information systems development environment, and the complexity of application systems that are developed in an organization. Some of the factors underlying these three core themes were suggested by the literature but most emerged from the analysis of the data.

The core theme of management's understanding of information systems technology is described by: the presence of a champion; the factors that were considered in the decision; the commitment of management; the expected benefits of ICASE technology; and the role of an information systems development methodology in the organization. The core theme of the information systems development environment is described by: the skill set of the information systems professionals that the organization employs; the way the CASE tool is used; the implementation strategy chosen; and the role of an information systems development methodology in the organization. Finally, the core theme of the complexity of application systems development is described by: the training approach followed; the expected benefits of ICASE technology; the implementation strategy used; and the role of an information systems development methodology in the organization.

This study discerns the organizational and technological factors that contribute to the successful implementation of ICASE technology, and examines the interaction among and between these factors. Table 1 summarizes these results. CASE is the tool-kit that allows the development of application systems. Since CASE supports information systems development, implementing CASE technology is different from implementing information systems in general. Much of the reported empirical work on CASE assumes that CASE tools provide value and that all organizations would benefit from using them, with little regard for organizational characteristics that might predispose success or lack of success. Organizations may realize some benefit from the use of CASE technology, but only if they are successful in implementing this technology.

Table 1
Relationship Between Core Themes and Chance of Success

	Management's of Information Technology	**Understanding Systems**
Application Systems Development Complexity	*Little*	*Complete*
Simple	Medium chance of success	High chance of success

Complex	Low chance of success	High chance of success

	Information Development	**Systems Environment**
Application Systems Development Complexity	*Undisciplined*	*Disciplined*
Simple	Medium chance of success	High chance of success
Complex	Low chance of success	High chance of success

	Management's of Information Technology	**Understanding Systems**
Application Systems Development Environment	*Little*	*Complete*
Undisciplined	Low chance of success	Low chance of success
Disciplined	Medium chance of success	High chance of success

The theoretical end points on a continuum are shown for each theme.

Conclusions

This research indicates that, at a minimum, practitioners need to pay careful attention to: 1) how an information systems development methodology is used in their organizations, 2) how the tool itself will be used, and 3) how training will be conducted, including who will be trained. Each organization should also assess its level of understanding of information systems technology. This research also indicates that an organization planning to use CASE technology must determine how the tool will be used. Finally, each organization needs to determine its level of understanding of information systems technology.

An organization that commits itself to a systems development methodology at all levels will better understand the role of information technology. The role of a methodology in the organization must be considered as a measure of management's understanding of information technology.

Suggestions for Future Research

This exploratory study identifies three categories of organizational and technological factors that contribute to the successful implementation of ICASE technology. The focus of the present study is on ICASE tools. Additional research could be conducted to determine if other kinds of CASE tools are affected by these categories of factors. Information systems researchers should also continue to examine how information systems applications are being developed, especially as the technology changes and desktop computing enables end users to develop more pieces of an information system.

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