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Establishing the Research Foundations for Successful Client-Server Computing: What Naturalistic Studies Could Contribute

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Establishing the Research Foundations for Successful Client-Server Computing: What Naturalistic Studies Could Contribute

by
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Abstract

What is the nature of the process of implementing a new technology? How should the dynamics of implementing a new technology be studied? What research methods are best-suited to the study of complex issues of social and organizational impacts arising from the implementation of a new technology? Client-server computing represents a significant new technology that has not been a focus of research investigations. As companies pursue client-server technology as a replacement for legacy computing systems, there is a need to provide practitioners with grounded research that discover patterns of organizational and social dynamics that influence the successful outcome of a transition to this new technology. This article suggests that naturalistic research studies can formulate realistic business foundations for the successful implementation of client-server computing.

Introduction

The recent innovation of client-server computing (CSC) has proliferated rapidly replacing mainframe computing in a majority of organizations (Alper, [1995](#)). Surveys of senior MIS executives reveal up to 80% are anticipating or currently implementing CSC (Bridges, [1994](#)). Despite the compelling nature of the issues surrounding an emerging technology within the legacy workplace, CSC has not been a subject area favored by MIS researchers. Because there is a paucity of critical literature on the subject of CSC, researchers and practitioners do not have available an information resource that can be used to analyze patterns of CSC implementation. Research investigations are required to reveal patterns that may be common or peculiar to a pervasive set of environmental circumstances unique to CSC implementations.

There are four issues addressed by this article: (a) the conspicuous absence of systematic research addressing the social dynamics and organizational consequences of developing, using, and maintaining CSC; (b) the incomplete knowledge of how and why the specific technologies of CSC are adopted within the legacy MIS organization; (c) the incomplete knowledge of the social and organizational dynamics that enhance success and the factors that contribute to failure by MIS organizations and CSC implementers; and (d) the inadequate research foundation that arises from the failure of MIS researchers to apply research methods appropriate to questions of social and organizational impact within the area of CSC. This paper will discuss how naturalistic research studies can formulate realistic business foundations for the successful implementation of CSC. The following discussion presents the specifics of these issues.

The Problem

There is a conspicuous absence of systematic research addressing the social dynamics and organizational consequences of developing, using, and maintaining CSC. Descriptive studies of client-server implementation and computing are not common. Systematic research concerning the organizational consequences of CSC in a refereed journal is nonexistent. The available literature consists mostly of anecdotal, unsystematic accounts (e.g., see almost any issue of *Computerworld* or *Informationweek*) or proselytizing accounts by detractors or promoters for a variety of CSC software and hardware solutions (Schatz, [1995](#)). Researchers should be intrigued that despite many successful client-server implementations, there have been a greater number of failures of client-server development that have received widespread attention within and outside the computing community (Capper, Colgate, Hunter, & James, [1994](#); Schrage, [1995](#)). These failures are seldom examined in articles from popular computing literature. Instead, the popular computing literature relentlessly presents CSC successes. The inadequacy of past research with respect to CSC encompasses two issues: a lack of systematic research and conflicting accounts of the experience of implementing CSC.

The existing popular literature comprises three types: vendor product promotions, interviews, and white papers. First, there are promotional studies of effective transitions provided by software vendors of client-server products (see IBM, PowerSoft, Microsoft). These studies purport to describe successful cases of CSC and *always* involve successful implementations linked solely to the use of a vendor tool set. Second, there are interviews with senior MIS executives recently successful in implementing client-server technology. These articles focus on the individual executive's management prowess in successfully implementing a client-server project. This type of article seldom interviews an entire project team (i.e., analyst, end-user representatives, developers, project manager, engineers) and focuses instead on the higher-level management view of project success. Third, there are articles/white papers purporting to provide hints and tips for successful CSC. These are often based on surveys that rely heavily on linking successful projects to hardware and software preferences. Often the accounts of the transition to CSC found in popular computing literature provide a differing view of the landscape of change. Interviews with chief information officers (CIOs) yield accounts of contented, challenged workers in modern forward-thinking companies with technically competent project managers who embrace the retraining of their legacy programmers (Brandel, [1995](#); Garner, [1995](#); Jenkins, [1995](#); Schatz, [1995](#); Wilde, [1995](#)). Interviews with legacy programmers yield a different reality with accounts of discontented, pressured programmers struggling to create programs in languages they do not know and of alienated/terminated workers replaced on new projects by contractors and out-sourcing (Berg, [1994](#); Bozman, [1995](#); Cremer, [1993](#); Due, [1993](#); Edgemon, [1995](#); Kelly, [1995](#); King, [1995](#)). Are these images reality? Why do the accounts differ? What really happens in legacy MIS organizations when CSC is introduced? Answers to these questions could be provided through systemic research that addresses the sequence of activities that transpire in developing, using, and maintaining CSC through the experiences of those most directly involved in the activities of CSC-- the project team.

There is incomplete knowledge of how and why the specific technologies of CSC are adopted within the legacy MIS organization. Technological innovations in hardware and software often seem to help ease the burdens of computer use while providing opportunities for the quantitative

growth and qualitative development of an organization. Computing can represent an organizational implementation of technology consisting of patterns of activity, equipment, and materials; knowledge to develop and perform programming; and a managerial regime and infrastructure to coordinate its effective use (Gasser, [1984](#)). Therefore, the implementation of computing technology is a means to enhance the survival, development, and growth of an organization.

Case study data suggest that technological change may affect a broad array of organizational processes and outcomes (e.g., job characteristics, satisfaction, career paths, supervision, and management). The implementation of advanced technology is often complex and unpredictable, fraught with uncertainty and rife with organizational politics (Dean, [1987](#); Gerwin, [1988](#); Kling, [1980](#)); it may upgrade jobs, downgrade jobs, or eliminate them (Argote & Goodman, [1986](#); Attewell, [1988](#)); it may increase managers' power or decrease it (Attewell, [1988](#); Barley, [1986](#); Nadler, [1981](#); Tornatzky, [1986](#)); it may create new excitement and productivity in an organization or cause resentment, boredom, and anger (Argote & Goodman, [1986](#); Tornatzky, [1986](#)). The activities integrating CSC into legacy organizations that must be considered are the following: the management of computing innovation, the adoption of new technology, the dissemination of the technology within the MIS organization, and the management of the work for the installation of the projects. A partial list of technologies instrumental in CSC include object-oriented programming, object-oriented design, tiered architectures, and middleware. These new technologies and methods reside within a legacy environment and give rise to the following questions: Do these technological innovations that support CSC impact legacy development activities? How do object-oriented methods change the development environment? What is the character of the development process using new technologies? How do differing methods of design, iterative versus systems development life cycle (SDLC), coexist? One way for researchers to identify and understand how these activities affect the CSC development effort is to examine the recurring social interactions that integrate CSC within the MIS organization. It is important not to take social arrangements for granted, or to overlook the contingencies that people may face in implementing and using CSC. This knowledge can provide researchers with important information about how and why CSC technologies are adopted within the legacy MIS organization.

There is incomplete knowledge of the social and organizational dynamics that enhance success and the factors that contribute to failure by MIS organizations and implementers of CSC. The micro-social processes of fitting a client-server implementation into a legacy environment is integral to the success of a CSC project. These processes have not been investigated and are discounted or ignored in industry checklists designed for CSC success. Many analysts, developers, promoters, and critics of CSC offer an opinion on the ideology of the process of implementation without a deeper understanding of the elements that create the social dynamics of the CSC effort. It has always been easier to propose new methods/technologies as silver bullets (Brooks, [1987](#); Mays, [1994](#)) than to have an understanding of the human processes that impact the project outcome. The MIS research community's understanding of the social dynamics of the transition to CSC in legacy MIS organizations is primitive. Before practitioners can actively and confidently address many of the technical and organizational problems of CSC, they need more basic research into the social mechanisms through which CSC is implemented and is used in organizations. Without this knowledge, MIS organizations cannot make an

accurate assessment of the true costs and benefits of a transition to new technology. For example, the consequences of organizational adaptation are often a hidden cost in the transition to CSC. Research should be undertaken to illuminate the social dynamics and to expose some of the hidden costs as well as hidden difficulties of sustaining the smooth operation of CSC.

There are many anecdotal accounts and numerous images of the ideal CSC environment, but there are few organizational studies that systematically address what it is like to implement CSC. An exploration of the process of implementation from multiple perspectives by the actual players in CSC is needed. The ease or difficulty of fitting, augmenting, and working around legacy systems in an organization should be examined. Understanding the dynamics of the transition can provide a theoretical basis for how to best implement CSC for success. Research that will examine the micro-level social processes, which integrate client-server technology into the legacy MIS organization, has not yet been done.

There is an inadequate research foundation that arises from the failure of MIS researchers to apply research methods appropriate to issues of social and organizational change that follow the implementation of CSC. MIS researchers have at least two paradigms available to explore issues of CSC: scientific and naturalistic. Many studies of computer use prematurely jump to a scientific paradigm, relying on experimentation as a fundamental technique and deriving hypotheses from deductions that have not yet been observed. MIS researchers seldom have sufficient immersion in and experience with the phenomena under study to yield the inevitable conclusions about what is important, dynamic, and pervasive in the field (Guba & Lincoln, [1981](#)). The choice between paradigms in any research should be made on the basis of the best fit between the assumptions of the paradigm and the phenomenon being studied rather than selecting a method based on the scientific traditions of the hard sciences and business.

A relatively recent trend in business research is a growing interest in naturalistic methods of research (Slipey, [1990](#); Zemke, [1989](#)). Naturalistic methods are enthusiastically embraced by many business researchers as appropriate to a particular class of investigations, such as studies of corporate culture, which traditional approaches do not adequately address (Schein, [1985](#)). Examples of this technique are found in the work of Becker ([1982](#)); Cusumano and Selby ([1995](#)); Fagerhaugh and Strauss ([1977](#)); Kling and Scacchi ([1980](#)); Smith, Wiggins, and Bird ([1979](#)); and Strauss ([1978](#)). Ultimately, the appropriate methodology for a particular research project depends upon the questions driving the research, as well as the skills, resources, and ideologies of the researcher. The following discussion clarifies why the naturalistic method is the appropriate vehicle for MIS research into CSC.

An Alternative Method

The social aspects of computing work play a large role in shaping the computing milieu, as does the technology in use (Kling, Crabtree, & Scacchi, [1977](#)). A research paradigm that is restricted to discrete variables and their relationships is not sufficient to deal with the complex interactions and patterns of human behavior in adapting to technological change. Descriptive analysis (i.e., the qualitative analysis of empirical data) can be an effective way to present this information and is the preferred method in a majority of research concerning the social dynamics and organizational consequences of technological innovation. The questions researchers should

advance during an investigation of CSC can be characterized as social-behavioral: (a) What are the social and organizational consequences of developing, using, and maintaining CSC? (b) How and why are specific technologies of CSC adopted and used within the MIS organization? and (c) What are the specific social dynamics and organizational consequences that predispose a CSC project to succeed? The rationale behind the use of naturalistic inquiry to answer these questions is the research-based belief that behavior is significantly influenced by the environment in which it occurs. In other words, behavior occurs in a context, and accurate understanding of the behavior requires understanding the context in which it occurs. Organizations such as business, for example, definitely influence the behavior of persons in them. Relatedly, proponents believe that if researchers wish to generalize the findings to real-world settings, the findings should be derived from research conducted in real-world settings. The enthusiasm for this method of research is found in the "naturalistic mode aimed at understanding actualities, social realities, and human perceptions untainted by the obtrusiveness of formal measurement or preconceived questions. It is a process geared to uncovering important stories, told by real people, about real events, in real and natural ways" (Wolf & Tymitz, [1977](#), p. 6). An in vivo analysis of how people manage change and integrate new methods into their organization from the perspective of the people charged with the implementation of CSC can best be found by researchers, observing and classifying phenomena *before* trying to explain them.

In the research where the central questions are exploratory in nature there are no preexisting hypotheses to test. Indeed, the goal is to develop an accurate and well-grounded conceptual base and process description, in order to serve the development of explicit hypotheses for later research. Toward this end, the appropriate research method for preliminary investigations is the careful and systematic case study, leading to the development of grounded theory (Glaser & Strauss, [1967](#)). Case studies have been a foundation for the descriptive or evaluative analysis of common social units (Lucas, [1974](#)). A case study attempts to build an abstract representation of the organization under study. It is never possible to build a complete representation--if only because an organization usually exists through time, both before and after the study period. As proposed by Lucas ([1974](#)), the comparative case study method is a means of aggregating "diverse case studies together under a common conceptual framework so that findings will be cumulative . . . to identify what it is we already 'know,' what it is we do not know, and what it is we suspect" (p.1). Research investigations that encompasses the comparative case study method can strengthen the naturalistic method by defining specific analytical boundaries. First, the analysis can focus on identifying how CSC affects the legacy MIS organization. The analysis includes the dimensions of development, use, and maintenance of CSC. Second, the researcher examines CSC in differing MIS organizational settings. Third, the researcher compares the findings for each case. Each of these three levels of analysis serves as a boundary, grounding the breadth of coverage of the findings. In this way the analysis is both cumulative and broad in its analytical coverage. These boundaries delimit the generalizability of the claims the researcher can make and the theory developed. The analysis can be performed at three different levels, yet the analysis can be both cross-cutting (the levels overlap) and comparative (from one level to another). The methodology of comparative case studies developed via intensive interviewing and grounded theory data analysis can illuminate for CSC practitioners the skills required to transition successfully to CSC. The important issue is to illustrate the origins of the concepts in order to trace the development of a theory. Descriptive analysis is the most effective way to

present this information. This approach will provide subsequent researchers a grounded understanding of the process of implementing CSC technology innovations.

The naturalistic method seeks to converge upon the phenomenon from a number of directions and individual perspectives that interact and interrelate. In prior research into CSC, researchers have not explored the variety of viewpoints of the participants or the meanings of the ways in which new computing technology was introduced into the MIS organization. Traditional paradigms that distance the researcher from the phenomenon have missed the intricacies of the social milieu of the organization and reach premature conclusions about the reality of CSC (Finch, 1986). Gummesson (1991) used the term distance research to describe the pursuit of knowledge by methods that involve limited contact with the actual subjects of the research. The availability of a method that allows a sensitive and knowledgeable researcher to explore and verify perceptions in a complex organization is necessary. The phenomenon of client-server computing (CSC) exists in the minds of people--what they take to be problems, their perceptions of one another, the meaning of their environment, and what they value in the technology. These perspectives of the major players (i.e., the project team members) are critical to an understanding of the dynamics of the CSC project. Their perceptions and views cannot be limited to separate variables if the goal of the research is to develop an understanding of a complex human endeavor, such as the introduction of new computing technology into a legacy organization. The social reality of CSC is, experientially, neither singular, convergent, nor fragmentable; and not amenable to the scientific mode of inquiry. The selection of the naturalistic method of inquiry will allow the researcher to identify those aspects of the CSC environment that were recurrent and that support the complex relationship between the human resources and the application of innovative technology.

The goal of proposing the naturalistic investigation of the social-behavioral aspects of implementing CSC is to improve researchers' understanding of the social dynamics and organizational consequences of change in technology that occurs in real organizational settings. This research will attempt to clarify the perceptions that organizations hold about CSC through a careful and systematic investigation of client-server implementation and an exploration of what the technology represents for programmers and MIS organizations. The research will require the development of new concepts and theory via naturalistic inquiry in an area with little prior research or application of naturalistic methods. The success of this effort will have implications for researchers and practitioners of CSC.

The Compelling Need

An effort to develop a grounded theory for the transition to CSC will help inform computer scientists and MIS researchers as to how new developments in technology and methods applied to application development are assimilated by an organization and what impacts or consequences are realized. Such information can reveal the dynamics and consequences of the process of integrating computing innovations into legacy organizations. Similarly, such theory could inform practitioners as to the potential efficacy of a computing innovation in an organizational setting and, thereby, influence its specification, design, implementation, use, and maintenance. Who participates in making the decision to adopt and implement client-server technology? What organizational needs does this innovation meet? How does the adoption of CSC affect

organizational productivity? How will the skills necessary to support and maintain the new technology diffuse throughout the organization? Clearly, these are concerns of computing specialists committed to having their innovations widely and successfully used. A systematic investigation of different types of CSC can effectively outline the kind of answers possible to these questions.

Conclusion

The focus of this article has been an advocacy of the naturalistic research study using the methodology of comparative case studies developed via intensive interviewing and grounded theory data analysis. Additionally, through the study of individual and small-group interactions, which involve the transition to new methods/technologies, researchers can seek insight into the place of implementation in the work ecology within the organization and an understanding of the social dynamics that lead to successful CSC systems.

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