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Distributed Work Arrangements: Impacts of Advanced Information Technologies, Work Coordination Mechanisms, and Communication Requirements

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Introduction

In recent years organizations have applied various means to increase their efficiency and profitability. Constant developments in Information Technology have enabled downsizing, globalizing and also virtualizing of organizations. One such trend clearly enabled by advances in information and communication technologies is the creation of new distributed work structures and arrangements (Handy, 1995; Fryxell, 1994; Stanko, 1994). There are different levels of these work arrangements, ranging from supplemental work at home (Venkatesh and Vitalari, 1992) to completely virtual organizations (Galbraith, 1995). To date, these new work arrangements and organizational designs have met with varying success, and it is still unclear what outcomes organizations and individuals involved may expect.

One issue to be considered in information system research on the topic is reliance on studying bi-variate relationships between outcomes of distributed work arrangements and individual independent variables. There are no clear theoretical underpinnings to most of the published work. For this study, the concept of *fit* as a gestalt (Venkatraman, 1989) provides part of the theoretical foundation needed to understand the impacts of these new arrangements on organizations. In addition, this research draws on literature in organizational science, communication, and information system research fields.

This study investigates whether various types of information system and communication technologies have differing impacts on the success of distributed work arrangements, given the work coordination and communication required for a work group.

Literature Review and Research Framework

There is a long tradition in information systems research on evaluating the impacts of information technology on organizations and individuals. Within this broad context, some researchers have focused on the impacts resulting from implementation of information systems, and on resistance to change. This research reveals that effects can range from decentralization to centralization of authority; job enrichment or, in opposition, more routinization of jobs; and finally, sometimes there are simply no impacts (Robey, 1987). Robey (1987) discusses the three factors identified by Buchanan and Boddy (1983) to explain this wide variety of impacts: the capabilities and limitations of the technology chosen for the work, the objectives of management, and the existing physical and organizational structures.

The capabilities and limitations of the technology chosen for the task is a factor that will be discussed extensively in this research. I argue that other things being equal, the various levels of information system and communication technologies selected for distributed work arrangements will have differing impacts on the success of the arrangements, both for organizations and individuals. The second factor, objectives of management, also affects outcomes and, in addition, these objectives have a large influence on technological choices. Finally, the existing structures in the organization, specifically the work coordination mechanisms and communication requirements, will serve as both enablers and constraints in taking advantage of the advanced technologies.

In his Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making, Huber (1990) concentrates on decision making and communication tasks enabled by

newer technologies. While any impact on decision tasks is clearly important to organizations, this research focuses on communication tasks.

To perform the study, *advanced information technologies* is broken down into two components: advanced information system technologies and advanced communication technologies. Since this study will be performed within the context of distributed work arrangements, and since communication and coordination requirements will serve as enablers and constraints, it is important to separate which technology impacts the results. The first component therefore includes elements like type of personal computer, software and printing facilities available. And, the second component includes such things as modem speed and technology, fax and separate phone line availability, and communication line technology available.

Robey (1987) notes that changes in an organization cannot be predicted or produced by any one of the factors mentioned by Buchanan and Boddy (1983). Rather, "their interactions in a specific case must be traced carefully if we are to understand their effects" (p.75). Accordingly, this research borrows from the literature on the notion of *FIT* which has been used extensively in theory construction (Venkatraman, 1989). While there are many perspectives on FIT (moderation, mediation, matching, gestalt, profile deviation, or co-variation), the gestalt approach is used. It suggests that we have to look at all the variables of interest and their relationships together, as impacting the outcome criteria and impacting each other all at once.

Distributed work arrangements encompass many different alternatives to working at the traditional office. These remote work options, or non-traditional work settings, include satellite work centers, neighborhood work centers, flexible work arrangements, generic offices (recently referred to as *hoteling*), and telecommuting or telework. This research concentrates on distributed work arrangements of the telecommuting type, where employees use both computers and telecommunications to work at home all or some of the work days. Researchers report a large growth of the telecommuting phenomenon in recent years, and some say that in the US alone, telecommuters now make up more than 11% of the workforce (Business Communication Review, 1995). This is therefore a research context of high interest to practitioners and researchers alike.

An extensive review of the literature on distributed work arrangements, and readings in other fields, has led to the development of an initial research framework (Belanger and Collins, 1996). It integrates work from information system, organization science, and communication research fields. It adds extensively to the three factors discussed above (capabilities and limitations of technology chosen for the task, objectives of management, and existing physical and organizational structures), specifically with the notion of FIT, individual and work characteristics, and individual and societal outcomes.

The framework suggests that organizational, individual, work and technology characteristics all have an effect on outcomes of a distributed work arrangement. It more specifically suggests that the fit between the various variables is a determinant of success of the arrangement. Organizational characteristics include such variables as the objectives of the organization in establishing a distributed work arrangement program (e.g. cost savings, increasing productivity, etc.), the culture of the organization, and especially the preferred control mechanisms (for example hierarchical control vs. management by objectives). Individual characteristics of interest include individuals' objectives for participating (e.g. reducing commute time, saving on baby sitting costs, etc.), skills of individuals (both technical and personality related), and individuals' social needs. Work characteristics could include a variety of variables, but two were selected for this research: coordination mechanisms required, and communication requirements to perform the job. Finally, technology characteristics include the work environment, security requirements, and the available information system and communication technologies.

The concept of fit suggests that there is a level of internal coherence among the various characteristics outlined above needed to ensure success of distributed work arrangements. But how do we measure success? Besides sub-unit levels, there are three main levels of impacts with the introduction of information technology (or new uses of it): individuals, organizations, and society. In the context of distributed work arrangements, impacts for society could include reduced pollution; impacts for organizations could include

increased productivity, changes in culture, changes in work structures, reduced turnover, etc.; and for individuals, these impacts could be changes in stress level, changes in job satisfaction, creation of work-family conflicts, changes in quality of work life, etc.

Within the literature on telecommuting, there are currently no empirical studies clearly reporting increases or decreases in productivity. The very few empirical studies published have either used perceived increases in productivity (Alvi and McIntyre, 1993; Hartman, 1992), changes in satisfaction (Hartman et al, 1992) or have subjectively observed changes in productivity (Katz, 1987).

Research Question and Model

An extensive research agenda can be derived from the distributed work arrangement research framework (Belanger and Collins, 1996). The present study will focus on only some variables of the framework, and will therefore be guided by the following research question, depicted in Figure 1:

Within the context of a distributed work arrangement like telecommuting, and with other variables being held constant, there are some fits between the work coordination mechanisms used by a work group, the communication requirements of the work group, the type of information system technologies selected, and the type of communication technologies selected which will be related to the success of the distributed work arrangement.

Methodology

Organizations are dynamic and complex. For this reason, it is often very difficult to test precise propositions. Even if a change can be measured or identified, there always remains the question as to whether that change is permanent or not. In order to obtain rich data to measure beyond bi-variate relationships, while still being able to quantitatively measure and statistically analyze impacts of advanced technologies, a two stage approach is used, consisting of both intensive (in depth case study) and extensive (survey) data collection methods.

The study focuses on two levels of outcomes: for individuals and for organizations. At the organizational level, three measures will be taken, one for perceived changes in productivity, one for perceived changes in job performance, and for changes in communication patterns. At the individual level, two measures will be taken, one for changes in job satisfaction, and one for changes in perceived personal control.

Expected Contributions

Many contributions are expected from this research project. The research framework will identify not only key variables to be investigated in the context of advanced information systems and communication technologies, but also how various patterns of fit will potentially lead to different outcomes, both at the individual and at the organizational levels. This should add to the existing research on impacts of information systems on organizations, specifically impacts of advanced information system and communication technologies. In addition, this research will empirically test the effects of coordination mechanisms and communication requirements on the success of distributed work arrangements.

It is also expected that when the research is complete, it will provide valuable information for organization theory researchers and for organization designers regarding which variables should be acted upon, and how, in order to get "managed impacts" (Robey, 1987) of advanced information system and communication technologies on organizations. Finally, this research will use and investigate a context of enormous interest to both researchers and practitioners, namely distributed work arrangements.

References

References available from author upon request.

Figure 1. Research Model (Adapted from Belanger and Collins, 1996)