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Abstract

We are in the second year of a three year, longitudinal, field-based study of work group life and technology change. Our view is that present organizational life has two dominant characteristics. The first characteristic is an increasing interdependence between members of the organization to do work. The second characteristic is the increasing dependence on information technology to support work. The interaction of these two forces becomes a key issue confronting the modern organization. In that context, this research seeks to describe:

- **How is client/server computing effecting technology-supported, group-based, work?**
- **How are these effects shaped by organizational, temporal and social structures?**

This study focuses on chronicling the change in I/T infrastructure at one large academic organization. This change is viewed from a multi-theoretic perspective. We have the opportunity to observe and document the move of a large academic organization as it embraces the client-server computing infrastructure. Present, interim, findings include: (1) technical changes are difficult, social and organizational changes are more difficult; (2) change requires they maintain two systems; (3) there are two types of users and they are both important; (4) the technologists are now in the middle of the value chain.

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This research-in-progress reports on the second year of a three year, longitudinal, field-based study of work group life and technology change. We began this research interested in how distributed computing,

embodied by client/server, effects the structures of organizations, the structures of work, and their interrelationships over time. Using a four-phased field-study approach, we are gathering data at the individual, group, and organizational level at one site. Presently the first phase is completed. This paper presents findings from the ongoing, second phase, of the research.

Our view is that present organizational life has two dominant characteristics. The first characteristic is an increasing interdependence between members of the organization to accomplish work (Kelley, 1990; McGrath and Hollingshead, 1994). Second, there is an increasing dependence on information technology (IT) to support work (Goodman and Sproull, 1989). Increased IT use is manifested in the rapid growth of computer-based work, visible on most desktops. Increased interdependence between workers is seen in the increasing reliance on teams as the primary locus of work (Adler, 1986; Keen and Alavi, 1991). The interaction of these two forces becomes a key issue confronting modern organizations (Sproull and Kiesler, 1991). In this context, the present research focuses on these characteristics and seeks to describe:

- **How is client/server computing effecting technology-supported, group-based, work?**
- **How are these shaped by organizational, temporal and social structures?**

Conceptual Basis

We believe that as organizations increase their use of IT, the nature of the worker's interdependence, and the characteristics of their jobs, change. While the effects of many of these attributes on individual, work group, and organizational performance have been studied by researchers from many disciplines, new information technologies (e.g., client/server computing) raise new questions about these effects (Trice and Beyer, 1993; Collins and King, 1990; Orlikowski, 1989; Barley, 1986; Schein, 1980; Kanter and Stein, 1979).

Our approach has been to observe, interpret, and report on the change of computing infrastructure at one site. The site, a medium-sized university (MSU), is moving its administrative computing infrastructure to client/server. A computing infrastructure includes the hardware, software, and cabling, the data and information, and the rules, procedures, and norms of behaviors surrounding its use (Holsapple and Luo, 1995). Client/server computing allows multiple computers to share data and applications in an interactive processing environment (Hall, 1994).

The client/server change reduces many of the technical barriers to accessing and manipulating data (once housed on mainframes and centrally controlled). Reducing the technical barriers, however, exposes social and organ-izational barriers. As more powerful computing tools (and the authority to use them) are made available to workers, the way administrative work gets done at MSU will also be altered.

We choose to view this change from three theoretic perspectives. While three is an arbitrary number, they serve as both independent, and overlapping, perspectives. The first is structuration theory (Giddens, 1984; and Turner, 1992; Orlikowski, 1992; DeSanctis and Scott Poole, 1994). This links action to the organizational and technological structures that exist. This theoretical lens can be used across all three levels of analysis, though our interest is to look at organizational and workgroup issues in this way. Work-redesign theory provides a view of how work is understood at the individual and work group level (Hackman and Oldham, 1980). This lens provides a way to view changes in work as the new infrastructure evolves. Punctuated equilibria as an organizational theory posits change in terms of discontinuities in time (Gersick, 1989; 1991; Tushman and Romanelli, 1985; Romanelli and Tushman, 1995). Since organizational change is temporal, a conceptual structure to explicitly incorporate time is a critical, and unifying, aspect of any longitudinal research (Gersick, 1991; Morgan, 1988, Pettigrew, 1990). This multi-theoretic view moves away from exploratory work. We use the competing theoretic views to provide a dynamic tension to assist our interpretation.

Method

Our research spans individual, group, and organizational levels of analysis. At the individual level we are looking at how jobs are being changed, and how this affects the way workers interact with their group. At the group and organizational levels we are looking at how structures are being adapted and appropriated through organizational and technological changes. These are related across time, making this a process study (Mohr, 1982). The field-study-based research effort is being conducted in four phases (see Figure 1).

Figure 1: Research Effort
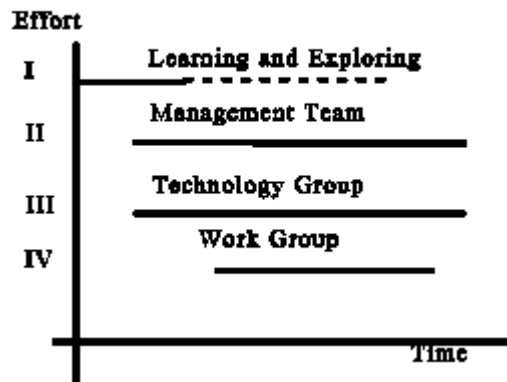
Phase one, now completed, served to integrate researchers into the daily activities of the I/S department and two key operational departments. This period also provided back-drop, history, and context to the effort. All key decision-makers from the organization were involved in establishing the research and agreed to participate in interviews and make data open and accessible. Field workers were introduced to the departments selected for the research study. Solid lines indicate constant contact while dotted lines indicate intermittent contact.

Phases Two and Three began in Summer, 1995. These phases, and **Phase Four**, are field studies (Barley, 1990a; Jackson, 1987). Phase Two is a study of the IS management team over the implementation period. Phase Three focuses on the computing systems department (the technologists as they implement the new infrastructure). The final phase will be observing several functional departments (work groups) as they implement the new systems. All phases employ participant observation, interviews, and archival data collection of records and products. Phase Four will also use structured surveys.

Findings

The MSU began the change to a CS infrastructure knowing it would be a multi-year program crossing every department and operating unit of the organization. This was envisioned as a five or six year project when begun in early 1993, though it is now seen as extending up to nine years. The move to client/server coincides with two major initiatives at the organization. First, an effort to upgrade key work processing and customer accounting systems. Second, a move toward a cost-accounting basis across departments and units. The client/server infrastructure is expected to enable both changes.

The technologists and their management knew complete solutions were not ready when they committed to the transition. Having decided to buy products from the market (and not build any systems), they worked with several vendors and actively partnered with vendors when systems that MSU needed were not commercially available. They sought to keep their IS staff (rooted in mainframe ways) and re-train them. After nearly 24 months of implement-ation work (plus 12 months of preparation), the technolo-gists find

themselves confronting several unexpected issues. These form the basis of this interim report and the focus of the research-in-progress.

(1) Technical changes are difficult, social and organ-zational changes are more difficult. The technologists have had to deal with many new products, new languages, new operational environments, and constant flux (updates, bugs, and inter-operability issues). This has been very taxing: morale is down and job stress is up. Much of the stress is due to unexpected organizational and social changes for which the technologists are not trained. This has contributed to the turnover of 50% of the IT operational management (most coming after 20+ months of effort). It is also making the CIO contemplate 'change teams' made up IS and non-IS folks, an effort he sees as "transient."

(2) Change requires they maintain two systems. This is a constant reminder of the differences in infrastructure. The IT staff continues to maintain the mainframe system (albeit with no new enhancements and little service) even as they assemble the new system(s). "It's hard to see all we've done just sit there . . . " says one senior analyst, "we can't deliver anything as stable to users. It'll be a few years." This move from a stable, to an unstable, infrastructure is very unsettling

(3) There are two types of users and they are both critical. End-users, those doing the work, are ambivalent about the new tools. Training, paid for by IT, is attended but does not seem to lead to increased use of the new tools. Data custodians (those who control access and provide meaning to much of the operational data) are reluctant to share access to data. So, they forestall use of shared databases (the data warehouse) and intervene between end-users and IT. This power struggle simmers, not boils, at a level below senior management. When it boils, the CIO steps in and creates change. However, this cannot happen for every system. "We need a champion, just one champion, for each system," he says "the trouble is finding that champion."

(4) The technologists are now in the middle of the value chain, not at one end. When IT ran the mainframe infra-structure, they built applications. Now, they integrate ven-dor products into their environment to meet user needs. This puts them between the vendor and the user. However, to the vendor, IT is the user. This leads to a position where MSU's technologists are responsible for schedules and functionality over which they have little control. Being between the two is an uncomfortable, and often unrewarding, experience.

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