Using Intranets:
Preliminary Results from a Socio-technical Field Study

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Abstract

This paper describes research-in-progress that examines the relative influences of internal and external factors on the development and use of intranets, as a particular case of information and communication technologies (ICTs). This three-phase qualitative study integrates cross-sectional, comparative and traversal methodologies to identify where it could be effective to combine socio-technical theory (emphasizing individuals and social groups) with institutional approaches (emphasizing interaction through influence and regulation.) Preliminary results suggest that a balance of pressures are at work, with external factors motivating the use of intranets and other forms of web information systems within the constraints of local organizational contexts.

1. Internal and external influences

We commonly assume that, within organizations, internal knowledge demands drive information technology use. These demands may be tactical, generating a need for information gathering, data analysis and knowledge management about core products and processes. Strategic demands may also generate a need for industry analysis and market data. They could even spur investment in new technologies to achieve greater production and communication efficiencies. When researchers examine organizational incentives to adopt and use information and communication technologies (ICTs), their studies concentrate attention on these internal knowledge demands [1, 2]. However, new research results indicate that external demands strongly drive ICT use. In a recent study, I examined the use of online information by 26 California firms in three different industries. Data show that external environmental factors and interorganizational relationships strongly drive information investments and the use of online technologies [3]. Institutional demands, such as disclosure mandates and regulatory agency approval requirements, generate extensive data gathering activities. Interorganizational interactions further shape online use. Firm members frequently described their online use as a response to information demands arising from firm interactions with clients, competitors, partners and regulatory agencies. Some firms made much greater use of online information than others, and that had as much to do with external institutional and interorganizational factors as with any internal decisions of the firms' managers or staff. Do these external factors shape the organizational use of other information technologies as well? Do they shape the use of intranets?

2. Why study intranets?

This paper describes a study designed to examine whether the findings of my prior research can be extended to other industries and other ICTs, such as web information systems (WIS). I have chosen to study intranets for two reasons. First, intranets are an "inside-the-firm" technology configuration-- unlike extranets or web-based electronic commerce networks that are intended for multi-organizational use. A study that examines the use of intranets, rather than these other new WIS, could characterize interorganizational influence less ambiguously. Thus, an intranet study might determine whether or not findings about the influence of external factors

could be extended to WIS in particular and to ICTs more broadly defined.

A second reason for choosing to study intranets when examining questions of technology shaping is that they are a new, highly configurable WIS that organizations are adopting at a rapid rate. According to a 1996 Forrester industry report, 40% of the firms surveyed had already implemented intranets, 25% were in the intranet planning stage, and 24% had begun to consider implementing one [4]. In the US, Forrester estimates intranet growth to be 60% annually, largely spurred by promises of ROIs exceeding 1000%. My own preliminary screening of midwest firms shows that in 1998, about 40% of the firms I contacted had intranets "up and running" or were just implementing them.

The use of intranets and internet technologies, is growing rapidly. Ironically, some information systems analysts express concern that they will be misused or underutilized [5]. Their concerns extend from firms that don't use intranets at all, to firms that use intranets simply as file servers, or as corporate web servers--not taking advantage of their potential capabilities. Some have suggested that intranets can be used as groupware, as LAN replacements, as local digital libraries, as document management systems, as Internet firewalls, and as web information systems [6, 7, 8]. But, at least for the moment, there is a gap between these anticipated uses of intranets and actual use. It would appear, then, that within many firms the potential usefulness of an intranet is not completely apparent, nor is actual use limited to a single style of implementation. Intranet implementation plans may very well be open to redirection and influence through local interorganizational interactions. A study of intranets at this point in time may provide a unique opportunity to examine what shapes the initial use(s) of a new ICT.

3. Organizations using technology

For a long time now, researchers have tried to explain what shapes the organizational use of ICTs. A large body of research has focused on examining ICTs from an efficiency perspective. Often, this work looks at the fit between the task to be performed and the technology intervention [9, 10, 11]. These researchers try to measure how efficiently and effectively the technology aids an individual in executing a task. They concentrate their investigations at the individual level and base their examinations on theories that describe how rational economic individuals make choices about tools and information resources [12, 13]. For these researchers, lower-than-expected use of a new technology often indicates problems with media accessibility and technology usability factors, and their prescriptions follow the ergonomic concepts of efficient and effective tool design [14, 15]. Their findings, however do not aggregate well, and they have not had much success in explaining organizational use of ICTs. Baldwin and Rice [16] confirm that individual preferences for ICTs have little impact within organizations.

3.1 CSCW studies

Some researchers have tried to shift the level of focus of their efficiency and effectiveness studies toward individuals working within small groups and organizations. A wide-ranging set of research, loosely categorized as computer-supported cooperative work (CSCW) studies, have examined the situated use of ICTs within complex organizations. Their electronic mail studies, for example, have provided insights that explain the differential benefits of organization-level use of ICTs. Their work has shown the need for a "critical mass" of users, and has identified the wider social benefits of email use that may accrue to globally distributed organizations [17, 18]. Some CSCW researchers have also examined the incentives for using ICTs like groupware and internet-based help systems to augment organizational memory [19, 20, 21]. Their work shows that among different organizations, the same technologies will be used differently depending on the practices and incentives present in each organization. This line of research has not, however, had much luck in explaining what shapes new ICTs.

3.2 Information systems research

Information systems (IS) researchers have had more success. Guided by theories about organizational change and workplace dynamics, they have tried to examine more specifically how organizational contexts can affect the use of a set of ICTs--an information system--and how these IS technologies may, in turn, present an occasion for

organizational restructuring. Some have compared the use of a single technology, by two or more organizations in the same industry [22, 23, 24]. They have characterized the organization-level incentives that lead to greater or lesser use of the technology, and how uses within some contexts can enhance the quality of worklife, while others can foster a "sweatshop" atmosphere. Their complex characterizations also show how an IS can trigger organizational change, and how reciprocally, the organizational context can spawn new ways of configuring ICTs and shaping their use.

3.3 Examining institutional factors

IS researchers, guided by institutional perspectives, have been particularly successful in making some connections between the use and the shaping of information technologies. These scholars have extended the scope of their studies to include the larger organizational environment--the social, economic, political and industry institutions that constrain and enable organizational action. Their work has identified the complex sets of interdependent resources needed to use information systems effectively within and among organizations [25]. Much of their work carefully examines the multi-faceted and often paradoxical incentives that shape information systems and information resource use in the public sector [26, 27, 28, 29, 30]. These studies highlight the interdependence of the public and private sectors, the strength of interorganizational ties, and the ways in which infrastructure supports particular types of interactions [31]. As King et al. [32] have noted, however, institutional and interorganizational contexts are rarely studied in conduction with technology use. One criticism of institutional approaches has been that the individual is often portrayed as a passive recipient of new technology, rather than an active adopter or a creative interpreter.

Researchers guided by social constructionist and structurationist perspectives [33, 34], have also made some progress toward understanding what makes technologies more useful for some than others [35, 36]. Bijker [37] has begun developing a theory of the social construction of technology (SCOT) that explains how relevant social groups reshape the technologies they use based on what they know about the task domain and other technologies. IS researchers have begun to explore the use of ICTs, such as groupware and management information systems, guided by socio-technical theories based on SCOT and structuration theory [38].

These institutional and constructionist perspectives also provide helpful explanations of complex adoption and use phenomena for WIS researchers. I believe that some interleaving of SCOT theory with institutional perspectives could help to situate individual and group activities within a dynamic, powerful, overarching industry and institutional setting. In this study of organizational intranet use, I intend to bring these two sets of concepts together to provide a more comprehensive explanation of how "information technology is situated in a web of interrelations that is intimately connected to other dimensions of the workplace" [25].

4. Methodology

To examine what shapes intranet use and development, I have designed a field study that involves three overlapping phases of data collection and analysis. (See Table 1.)

In the first phase, I will conduct a cross-sectional intranet status study within each of four industries: law, hospital care, real estate and general manufacturing. To ensure that the study encompasses firms with a wide-ranging set of external influences and conditions, I selected one industry from each quadrant of Scott's [39] technical and institutional industry environments framework. This industry selection will establish a basis for cross-case comparison [40]. My first task is to contact approximately 200 midwest organizations (50 in each industry) to determine their intranet status. I have chosen to conduct my research in Chicago and Cleveland, because I believe these cities are in a region which is representative of US organizational environments. The region is also convenient to my research facilities. I am using revenue-ranked Dun & Bradstreet listings of law firms, hospitals, chemical and metal products manufacturing companies, and real estate brokerages from which I pseudo-randomly select the sample firms of this study. I then telephone each organization to identify which firms currently have intranets and how long they have had them.

Table 1: Phased Intranet Study Design

	Phase I	Phase II	Phase III
Analytic Focus	Cross-Sectional	Comparative	Traversal
Primary Industry	Firms from Selected Industries	Manufacturing Company International Law Firm Hospital Real Estate Brokerage	Multiple Industries Firms & Agencies
Participant Roles	Information Ctr and MIS Mgrs	IC/MIS Dev/Mgrs Intranet Users/Non-Users ICT Strategists	Firm Contacts and Industry Coordinators
Technology Focus	Intranet Status	Intranets & Related ICT	Intranets & Related ICT

When this cross-sectional analysis is complete, I will have a snapshot of the status of intranet use within a set of firms that represent Scott's four categories of institutional and technical environments. The systematic screening process that I am using to select sites for this first phase will also provide the sampling criteria for my comparative study site selection. I will visit the sites that have used intranets for more than six months to determine whether they would be suitable for and willing to allow an in-depth, onsite study.

In the second phase, I will conduct the comparative case studies that form the basis of my theory building research [41]. I will select four sites from those I have visited--one in each industry--to participate in a qualitative study of intranet use. I intend to spend 4 to 6 weeks at each of the four sites, discussing and observing intranet use, in conjunction with other information systems and information resources that may be used for similar purposes. I will collect data from multiple sources within each organization, including direct examination of intranet content and usage statistics, observation of intranet use, semi-structured interviewing, and document collection [42, 43]. I will talk to intranet users, non-users, developers, managers and ICT strategists. An important part of the interview process will be a discussion of how these people coordinate interdepartmental and interorganizational activities. As I proceed from one industry case study to the next, I will use constant comparative methods to formulate data categories, identify cross-case patterns and develop theoretical leads for further investigation [44]. This data will allow for an analysis of the interplay between informational influences from both micro and macro environments, and an analysis of how these occasion the use of intranets in each firm. During this phase

of the study, I will record detailed descriptions of how each firm has developed and used its intranet(s), as well as the influences and incentives that firm members identify as motivators. I will chart the network of interorganizational relationships that anchor those influences, forming a list of organizational subsidiaries, other organizations and outside agencies that may influence each firm's intranet.

In the final phase of this research project, I will use Latour's methodology [45] to follow the links in these interorganizational networks. I will contact people at each organization that has a key relationship with one or more of the comparative study firms, and interview them about how information and information systems--including intranets and internet technologies--are used at their firm, and about the nature of their relationships with the comparative study firms. I expect these relationships to be of very different types. They may be formal or informal, and they may fulfill a variety of purposes. For example, some may be supplier-customer relationships, some may be competitor relationships, others relationships may involve regulatory oversight. I also want to identify which relationships influence intranet use and how they affect it. Some of these influences may be intentional and acknowledged, others may be implicit and unrecognized. Traversing the interorganizational network, as I follow up on each reference, will allow me to characterize the nature of these sets of technical and institutional influences on intranet use and development, and to identify the types of interorganizational interaction that shape intranets.

Sociotechnical studies are often comparative, sometimes cross-sectional, but only rarely traversal. I could have chosen other methods for examining the

interorganizational networks that influence intranet use and development at each of our comparative study firms. Graph theory, sociometry, clique detection, and centrality analysis have all been helpful in analyzing interfirm connections. These methods generally concentrate on measuring network density (the number of firms in the network that an organization is connected to) or network centrality (the path length that connects firms in a network, or subsets of firms in a network). They often assume that all interfirm connections are of the same type, for example in value chain alliances all links are between buyers and suppliers. I have chosen Latour's method for analyzing interfirm connections, because it allows me to richly characterize the informational dimension of each link type I encounter. Network traversal also promises to dovetail the constructionist and institutional underpinnings of this study--to provide a view of WIS shaping that incorporates both micro and macro environmental elements.

This coordinated, three-phase approach provides a powerful set of theory building tools, that each single phase cannot provide alone. To my knowledge, this process has not been used before, although the methodologies adopted are all well accepted by qualitative researchers. It is a tightly integrated process for collecting and examining data from individuals in organizations that focuses attention on the external environment and interorganizational relationships of the firm. It could establish a new way for WIS researchers to examine how networks of organizations use networking technologies.

5. Preliminary results

At the time of this writing, I have contacted over 50 MIS managers and Information Center directors in midwest firms. I have spoken to them about the use and development of intranets within their organizations, future intranet plans, and also the reasons for not developing intranets, at those firms that don't use and aren't planning to implement them. I have visited nine of the fourteen sites that reported using intranet technologies for longer than six months, and I have conducted one 6-week onsite study at a Fortune 500 manufacturing firm. (See Table 2.)

5.1 Intranets federations

One of the most interesting early results is that many firms implement several intranets within the same organization, *each one developed by a different group*. Such "federations of intranets" seem to result from multiple influences to use organizational networking technologies. This type of loosely connected intranet configuration has also been reported by other researchers [46].

The finding that intranets often develop in a federated configuration--with some intranet servers hosting a unique, heavily used application, clearly motivated by external factors--suggests that external context does indeed shape the use of 'inside-the-firm' technologies like intranets.

Table 2: Current Status of Intranet Study

| Screening	Onsite Visits	Case Study
Locations: Cleveland, OH and Chicago, IL	**Intranets Overviews**	**Comparative Intranet Study**
Systematic Sampling from D&B Listings:	Firms with Intranets (6 mo. plus.):	Fortune 500 Manufacturing Firm:
Manufacturing Firms: 26	Have intranets: 14	Interview Participants: 41
Legal Firms: 25	Sites Visited: 9	Intranets/External Sites: 12

Fortune Mfg Internet Sites
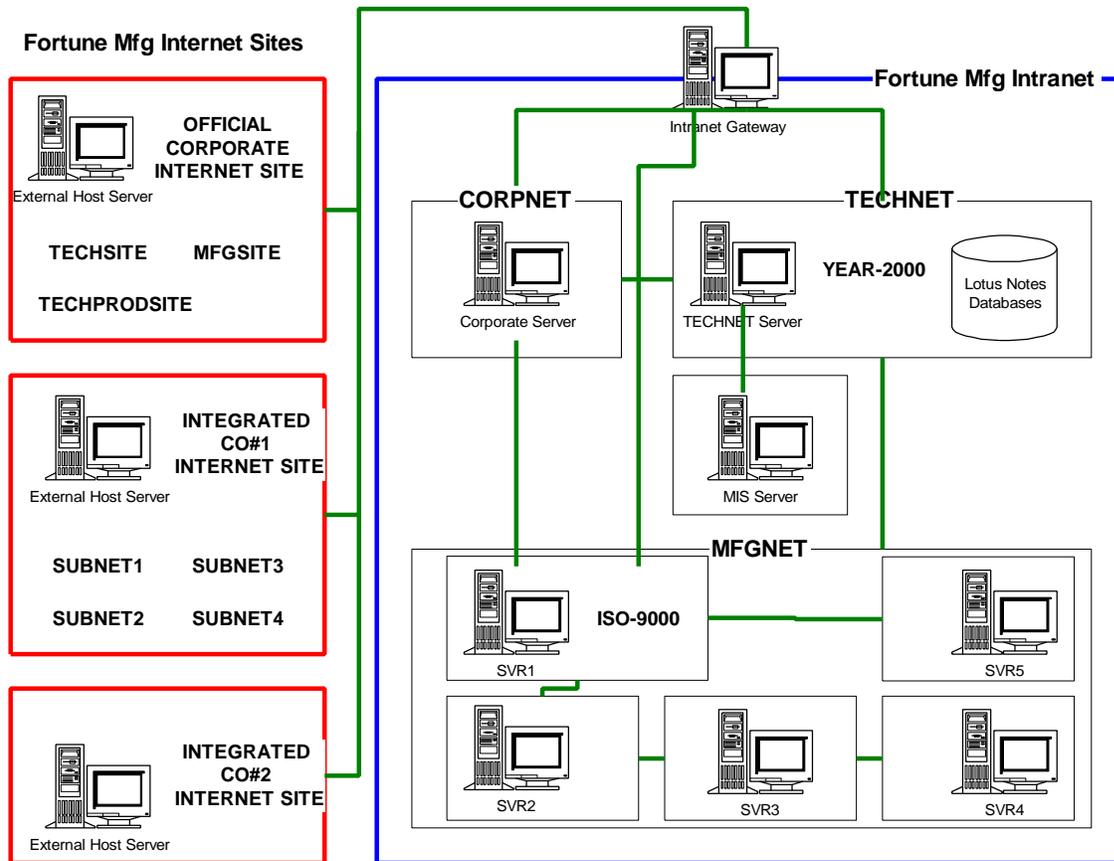
Figure 1: The Intranet/Internet Configuration of Fortune Manufacturing

Common and uncommon uses. In these firms, the intranets have developed independently, each reportedly influenced by the needs of the separate communities that implemented them, as Bijker's theory would predict. The intranet/internet configuration of Fortune Manufacturing (a pseudonym for the firm where I conducted the first comparative field study) serves as a good example of how a multi-server intranet federation might actually develop (see Figure 1.) In cases where business unit lines have been drawn along merger and acquisition boundaries (e.g. the separate SVRs associated within the MFGNET intranet in Figure 1), the intranets are more neatly separable as to who they serve and how they were influenced. Among these intranets, the redundancy of some applications, such as internal order forms, and services, like phone lists or online newsletters, can be explained by the fact that, while they may serve a need common to all members of the firm, the business units were originally unconnected to Fortune Manufacturing or to each other, and so did not always need to share this data or to pool

common concerns. But these common applications and services, while found on many intranet sites, have not been reported as motivating intranet development and active use. The unique applications motivate intranet development and use.

Institutional and interorganizational influences. Among the unique intranet applications and services at Fortune Manufacturing, two are well-developed and heavily used: the Year-2000 site on TECHNET, and the ISO-9000 site on MFGNET. ISO 9000 standardization clearly entails institutional factors. These standards define procedures and measures that help ensure the quality of manufacturing processes on an industry-wide basis. They are communicated within the firm, and made auditable by outside organizations, through a complex set of documentation. One business unit of Fortune Manufacturing has developed this documentation on their intranet server as a linked set of HTML pages and PDF forms. The ISO-9000 application serves the business unit quality management teams, as well as their customers--one

of which was noted as having been particularly influential in pushing for ISO 9000 compliance, and for setting even more stringent standards to guide industry-specific quality management processes.

The central piece of the Year-2000 site is a Lotus Notes database that tracks all the systems and software packages at Fortune Manufacturing, world-wide, and reports each system's status in terms of whether or not it can handle dates beyond December 31, 1999 correctly. It might be argued that bringing all systems to Year 2000 compliance status is in the best interests of the firm and would, therefore, be an internally motivated application. However, the recent demands that interacting organizations have placed on one another to certify their state of Year 2000 compliance in order to retain business has added a significant push to this effort. Although few firms can now certify that their systems are 100% Year 2000 compliant (or will be by January 1, 2000), managers at Fortune Manufacturing believe that it is important to be able to show that the firm knows its current status, and can demonstrate that it has a plan to become compliant. They speculate that, as the deadline approaches, the documentation that their Year-2000 site provides could help them retain customers who might otherwise give their business only to "certifiably 100% Year 2000 compliant" suppliers.

5.2 Intranet boundaries

Another interesting finding is that, because WIS technologies are highly configurable, it is difficult to define what is part of a firm's intranet, and what is not. At this point in the study, I define an intranet as "web-based technologies that are accessible inside the firewall." But that definition gets stretched a bit, because intranets routinely contain links to external internet sites, including a firm's own web presence sites.

Definition. "Mode of development" may help to additionally differentiate between what's an intranet and what's not. Among the firms of this study, external internet sites are almost exclusively developed and maintained by professional web developers. Intranets, on the other hand, are more often developed by people inside the firm, who are not primarily computer analysts or MIS developers, but who have a special interest in the technology and a specific need that it can serve. These folks may use consulting services to get started with the

technology, to solve specific implementation problems, or to create more professional looking web page artwork. But most intranet site development is done in-house and it's content-driven.

Alignment of interests. From a social constructionist point of view, it is fascinating that intranet sites are most often envisioned, developed and maintained by non-CIS/MIS authors--people who have no prior background and no formal training in systems development. Several people mentioned that, although initially they submitted their intranet content to someone who reformatted it into HTML pages, they had gradually assumed this responsibility themselves. They found that by using browser tools, simple editors, and the templates prepared by other firm members, they could just as easily manage their own content. Some of these self-taught novices are the "webmasters" of their intranet site. The affordances of the technology may explain some of these role-expansion instances. HTML pages can be developed in most of the word processors that people already have on their desktop computers. And an intranet server is not much more expensive than a typical desktop PC. These are technologies that many people are familiar with. However, they typically rely on their MIS group when it comes to some of the finer points of server monitoring or firewall protection.

Intranet authors include librarians, marketing analysts, human resource managers, research scientists, chemical engineers, and the occasional MIS person--and various implementations combine the efforts of these individuals. The ISO-9000 application at Fortune Manufacturing came together because the interests of a few key people aligned rather fortuitously--the quality manager needed to completely remaster his quality systems documentation and was open to the idea of providing it online, the technical writer wanted to learn HTML and was interested in tackling an intranet-based documentation project, and one of the MIS staff had been "fiddling around" with an intranet server and was willing to help implement a real application on that intranet.

These people may bring together a nicely integrated set of skills and local interests, but they may not share any wider concepts about WIS use and development. They may each be aligned with very different relevant social groups, and their conceptualizations about the uses of a new technology like intranets--what Bijker would call their "technological frames"--may differ greatly.

This could explain why, within a single company, the intranets that develop independently tend to look and feel very different from one another, even when the applications and services are common.

5.3. Intranet development

Until now, the way that intranets have developed at Fortune Manufacturing, and at some of the other study sites, has been through what might be characterized as the "grass roots" mobilization of local individuals motivated by external influences. Fortune management has just begun to think seriously about using their intranets strategically. The company has made some recent acquisitions, and it now needs to integrate those firms into Fortune. The corporate communications team has talked about using their intranets to share the company culture with these new firm members. Over the past year, a new executive management team has also taken the lead at Fortune, and they want to infuse the entire organization with their initiatives and their vision for the future. In fact, the chairman has issued a mandate to develop the company's intranets. To use Bijker's terms, executive management represents a new and powerful relevant social group that has begun to influence intranet development.

5.4. WIS forms

At Fortune Manufacturing, I can see some of the same external factors influencing intranet use that I saw influencing online information use in my prior research. These factors involve both institutional and technical pressures, such as the need to manage the documentation requirements of regulatory agencies, the need to document the processes of quality control regimens, and the need to provide proof of industry standards compliance; as well as the need to profile the firm's technical and technological competence to its clients. In my previous study, these factors influenced only the intensity of online use--whether firms used a lot or a little. However, with highly configurable WIS technologies, these factors also influence the *form* the technology takes on in use. Different groups within the firm adopt WIS technologies and shape them for their specific uses. When the people I have interviewed begin to talk about process control, for

example, they talk about their intranets. When they talk about displaying competence, they describe their external internet sites. And when they discuss the need to improve service to clients, they talk about their plans for an extranet.

6. Interim observations and next steps

At this point in my study, I am encouraged to see that I am finding some evidence to support my theoretical bases, and that my three-phase methodology is allowing me to collect and integrate meaningful data about how firms use intranets. As institutionalists would predict, it seems that within organizations, both technical and institutional influences separate groups and focus their perceptions about technologies and the uses they make of them. I can also see that the interorganizational connections that convey these influences are of very different types. At Fortune, I have identified at least three types of links: industry coordination (e.g. ISO 9000 quality control documentation), professional practice (e.g. models for knowledge sharing among librarians), and client interactions (e.g. demands for fast problem-solving information.) Some links appear to be direct, but others are indirect and unacknowledged. Therefore, my decision to spend time traversing and characterizing these links seems justified, as different types of interconnections may allow for different types of influences and different processes to shape the use of intranets.

My next steps in this study will be to determine whether the intranet observations that I have noted while at Fortune are helpful in explaining intranet use at another firm in a very different industry. I am currently screening the remaining manufacturing sample firms to determine their intranet status, and I am preparing for a second comparative study at a midwest-based international law firm. I am also beginning to follow the interorganizational network connections that Fortune Manufacturing informants have given me.

As I continue, my examination of intranets will explicitly focus on external factors and interorganizational relationships, as they interact with internal influences to shape intranet implementation. Bijker's SCOT theory suggests that relevant social groups--whether internal or external to a firm--have the ability to shape ICTs early in the technology lifecycle. If this is the case, an intranet

study like this one that focuses on these influences at this point in time, could document how the shaping process occurs. By fusing institutional and socio-technical concepts in my field study analyses, I hope to provide insights that extend constructionist theories about ICT use and development.

7. References

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