

Rise of the Intranet: Organizational Adaptation to Disruptive Emerging Technology in Public Accounting Firms

Jane Fedorowicz, (jfedorowicz@bentley.edu), Bentley College
Janis L. Gogan, (jgogan@bentley.edu), Bentley College

Abstract

Thousands of organizations are investing in Web-based "Intranets" for global, enterprise-wide information sharing. This paper examines the organizational impacts of Intranets on public accounting firms. Specifically, based on a review of three relevant literatures -- those of Emerging Information Technologies, Organization Support Systems, and Disruptive Technologies -- seven propositions are offered that address the adoption and assimilation of Intranet technologies by public accounting firms. The paper concludes by outlining a series of issues comprising a research agenda for the study of the impacts of this emerging technology in public accounting firms.

Introduction: The Challenge of Effective Intranet Use in Global Organizations

Thousands of businesses are investing in Intranets to support global, enterprise-wide information sharing, coordination, and collaboration (Thyfault, 1996). I/S and business unit managers at a wide variety of global firms are seeking guidance on how best to capitalize on the Web's low cost and unique capabilities for Intranet applications (Cortese, 1996; Stahl, 1996; Thyfault, 1996).

Many of the Big Six investigated and implemented groupware-based information sharing and dissemination systems very early, garnering competitive advantage while undergoing pro-

found cultural transformations (Cheney, 1995; Elliott, 1992; Stahl, 1995). These systems, based on technologies such as Lotus Notes and First Class, were expensive and time-consuming to implement, and laid a solid foundation for a subsequent move to the added flexibility and accessibility of an Intranet-based successor.

As innovators in the widespread application of groupware and Intranet technologies, public accounting firms are considered to be leaders in the development and assimilation of today's emerging technologies. Thus, research proposing effective management of global In-

tranets and associated changes in related organizational processes and structures would be of immediate interest and use for public accounting firms, who are now facing high demand for these internal information networks.

The organizational culture changes implied by the accessibility of vast amounts of information must be acknowledged and orchestrated in parallel with the introduction of this highly visible technology. Public accounting firms recognize the importance of "organizational communication systems" (Tucker et al., 1996) in moving toward new organizational forms, including team-based and horizontal organizations (Ostroff and Smith, 1993). Sharing of knowledge is key to achieving improvements in competitive standing and financial performance in the Information Age. Particularly in this industry, success depends on the effective and efficient sharing of knowledge and communications. Thus, Intranets become an important and exciting opportunity for process improvement and industry leadership.

This paper examines several MIS and management of technology literatures about the impact of new technologies in organizations. Following a brief review of the technologies underlying the World Wide Web and Intranet applications, three streams of research from MIS and operations management that converge on the areas of interest for this research are summarized. We present seven propositions to guide public accounting firms in the adoption and assimilation of Intranet technologies. We conclude with a discussion of issues specific to the global application of Intranets.

The literatures -- Emerging Information Technologies, Organization Support Systems, and Disruptive Technologies -- all examine the impacts of new technologies and identify management concerns in their introduction and control. Whether we view an Intranet as an "emerging technology," a "process transforming technology," or a "disruptive technology," we note that major changes in the organizational aspects of the adopting accounting firm will result, and

that careful planning and innovative implementation techniques will be warranted.

The World Wide Web: Technologies for Intranets

The Internet "opened for business" in 1992, thanks to a change in the National Science Foundation's Acceptable Use Policy, which governed the electronic exchanges passing over the US fiber optic backbone, which NSF controlled (Cronin, 1995). Several recently developed extensions of client-server technologies have combined to make the World Wide Web the Internet's most desirable "business district": a scheme that codes "pages" of multimedia information (using Hypertext Mark-Up Language, or HTML) and links them among Internet-connected server machines (by means of Universal Resource Locator addresses, resulting in a virtual World Wide Web); forms-compatible browsers (such as NCSA Mosaic, Netscape Navigator, and Microsoft Internet Explorer), which enable non-technical users to easily view material on Web Servers; "spiders," "agents", or software "search engines" for rapidly locating specific Internet information resources, based on key words, concepts, and other knowledge-based queries; "applet generators," such as Sun's Java programming language, designed to temporarily send interactive code (applets) to client machines for transient applications.

Taken together, these technologies offer a set of capabilities for global, interactive multimedia information sharing and transaction processing. In the 1990's, the number of commercial sites on the Web increased dramatically. So far, companies are using the Web for three broad categories of applications: Intra-enterprise information sharing (so-called "Intranet" applications), Business-to-business commerce (procurement, RFP solicitation, etc. over the "Internet", EDI over "Extranets"), and Consumer commerce (advertising, direct-response selling, etc. on the Internet).

This paper focuses on the first area, examining "Intranet" applications. In their initial

experiments with Intranets, managers and professionals are feeling their way, with few guidelines yet available to organize and manage their efforts. In the following pages, we review three relevant literatures and offer preliminary propositions about the key characteristics of Intranets, their impacts, and effective approaches to their management. These propositions will guide accounting professionals in understanding and planning for the successful implementation of Intranets, and will also form the basis of a research program wherein Intranets illustrate the issues facing many emerging technologies.

A Starting Point for Research on Intranets: Relevant Literatures

Emerging Information Technologies:

In the first MIS literature, a long legacy of research has examined organizational assimilation of emerging information technologies (Nolan, 1975; Porter and Gogan, 1988; Cash et al., 1994). Nolan's Stages Theory, essentially a life-cycle model, specifies a sequential developmental path in the assimilation of emerging information technologies. According to this theory, technologies are identified and assimilated in stages, with organizations investing different resources and applying different controls at different stages. Assessing the sweeping impacts of information technologies in the past several decades, Haeckel and Nolan (1993) described three broad, overlapping eras: data processing (1960 - 1985), microcomputer (1980 - 1995), and network (1990 - ??).

Each era is characterized by four stages of organizational assimilation: initiation, contagion, control, integration. The last stage of one era coincides with the initiation stage of the subsequent era. For example, the integration stage of the Data Processing Era coincided with the initiation stage of the Microcomputer Era. By the nineties, microcomputers were well integrated in most organizations -- characterized by formalized policies, processes and structures for supporting the use of personal computers. Now companies are grappling with the opportunities and risks of

a variety of local and wide-area networking capabilities -- including Web-based Intranets. Thus, most companies are in the initiation or contagion stages of the Network Era.

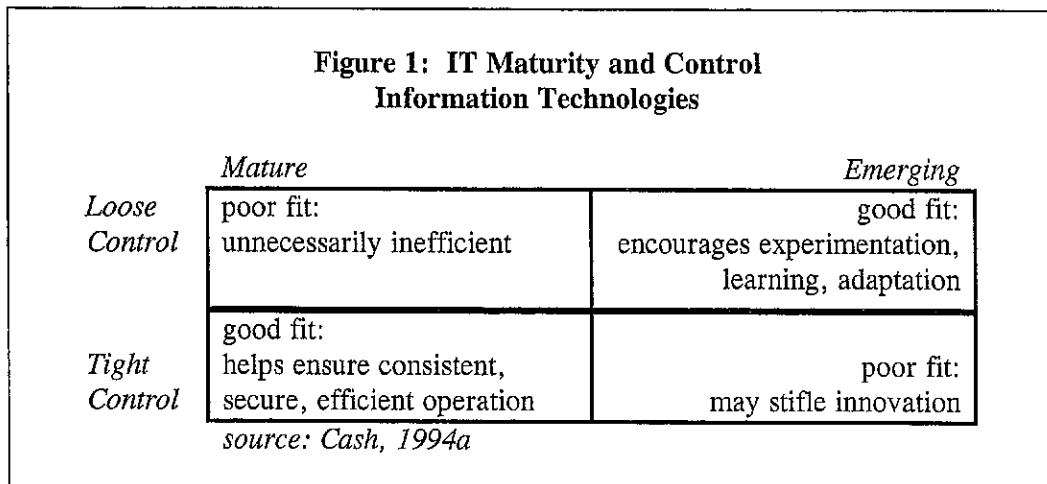
Cash (1994 a,b) observed that I/S shops often simultaneously manage *both* mature and emerging technologies, and suggested that Nolan's "stages" apply more directly to assimilation of particular technologies than to wholesale changes in the I/S organization. This line of research found, consistent with the fundamental supposition of the Stages Theory, that the controls and management processes that I/S organizations employ with *mature* data processing or MIS technologies are often ineffective choices for the management of *emerging* information technologies. Cash (1994a) explains that "well-oiled" I/S organizations are not automatically effective in utilizing new technologies:

"The same characteristics that serve (I/S) so well in producing consistent, incremental improvement can be a hindrance when new circumstances or new technologies call for inconsistent responses or dramatic change."

Cash (1994b) also noted:

"An emerging technology should not automatically be managed according to established policies and procedures, because the technology may pose a different set of opportunities and challenges. Lead users need some latitude to experiment with technologies and learn about them, free of the constraints inherent in strict cost-benefit analysis, charge-out and other policies that make sense for mature technologies."

Figure 1 (next page) illustrates the expected relationships between technology maturity and needed management controls. Recent work by Orlikowski and Hofman (1996) is consistent with Cash on "improvisational" approaches to managing the implementation of emerging groupware technologies. From this, implications can also be drawn for managing the assimilation and use of emerging Intranet technologies (such as browsers, applet generators, agent software, and



Intranet groupware). Presumably an initial management approach consistent with the upper right quadrant of the figure, with an eventual migration to the lower left quadrant is appropriate.

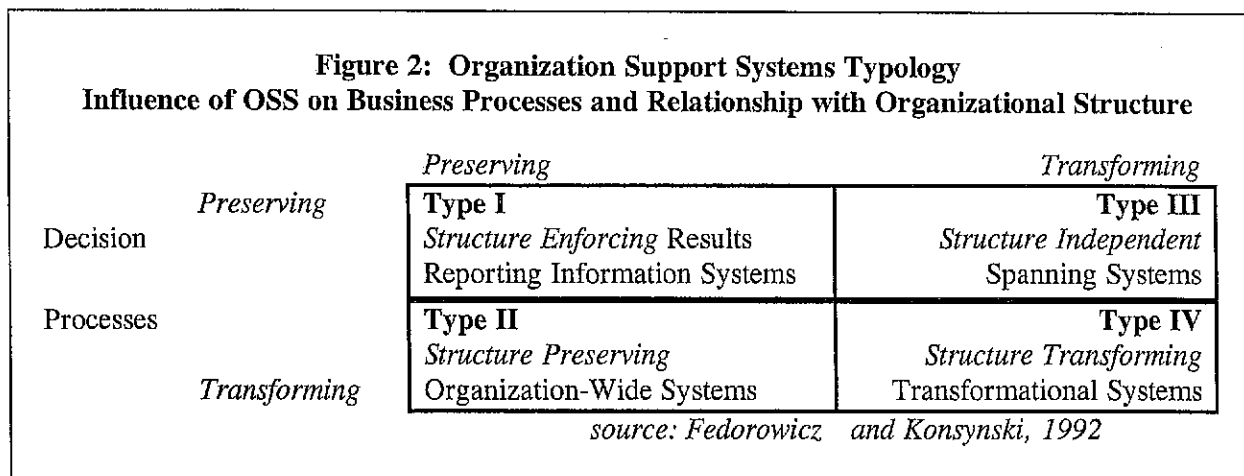
Many organizations are experiencing the initiation and contagion stages of some Network Era emerging technologies for intra-organizational coordination and collaboration, including Lotus Notes and Intranet applications. However, to date there has been little or no systematic examination of the management approaches which companies are actually taking in their Intranet initiatives. Consistent with Nolan and Cash, we anticipate the following:

Proposition 1: Loose control over the introduction of Intranet technology, characterized by informal policies, processes and structures, is warranted so that creative and appropriate uses can emerge from employee experimentation.

Proposition 2: Following this period of experimentation and organizational learning with Intranet technologies, a transition to tighter controls, characterized by formalized policies, processes and structures, is necessitated to help ensure consistent, secure, efficient operation.

Organization Support Systems:

A second reference area investigates the organization support system (OSS). A global Intranet is an ideal example of an OSS, defined by Fedorowicz and Konsynski (1992) as “an information technology infrastructure that establishes an environment for organizational and individual decision-making.” OSS can have varying impacts on both *decision processes* and *business processes*, and varying relationships to organizational structure, as summarized in the figure below:



Of particular interest to the proposed study are Type IV systems, which enable new organizational structures to evolve. If introduced and managed appropriately, these systems can promote a high degree of flexibility, innovation support and coordination complexity, in contrast to Type I systems, which reinforce traditional roles and responsibilities through the use of embedded policies, procedures, and a design which supports a static view of organizational structure.

Intranets offer information sharing and team collaboration capabilities that many managers hope will support Type IV outcomes, such as effective virtual teams. However, as Fedorowicz and Konsynski point out, "Success ... depends on the effective marriage of organizational and behavioral issues with the capabilities of information technologies." To date, little or no research has examined the alignment of organizational and behavioral processes and structures with Intranet initiatives. However, a substantial body of research (such as Dennis and Gallupe, 1993 and Karon, et al., 1996) found that group decision support systems can improve teams' cohesiveness and decision-making, ability to handle conflict, organizational commitment, and a host of other desirable outcomes -- provided appropriate adjustments are made to structures, management controls and reward systems. It seems likely that, like GDSS, successful implementation of global Intranets will also require attendant changes in management processes and structures.

Proposition 3: Intranets exhibit the characteristics of a Type IV OSS. Thus, they can promote a high degree of organizational flexibility, innovation support and coordination complexity.

Proposition 4: Successful ongoing implementation of Intranets will require the firm to plan for and address organizational issues along with technological ones. This will include significant adjustments to organizational structures, management controls and reward systems.

Disruptive Technologies:

In the management of technology litera-

ture, the third area of interest, studies of technologies ranging from the V-8 automobile engine to steel mills to microcomputer disk drives (Bower and Christensen, 1995) have documented examples of companies which failed to recognize the implications of "disruptive" technologies (defined below) and suffered severe consequences.

A long line of economic research originating with Schumpeter (1934) established that new technologies can lead to "creative destruction" of traditional industries and firms, and give rise to new ones. Furthermore, technologies vary in their impacts: "Some innovations disrupt, destroy and make obsolete established competence; others refine and improve." (Abernathy and Clark, 1985, p. 4). Different types of innovations have been found to have varied effects on both *market/customer linkages* (conserve/entrench new linkages versus disrupt existing/create new linkages) and *organizational competence* (conserve/entrench versus disrupt/ obsolete), giving rise to requirements for different managerial skills and organizational environments (Abernathy et al., 1983).

Bower and Christensen (1995) distinguish between "sustaining" and "disruptive" technologies:

"Sustaining technologies tend to maintain a rate of improvement; that is, they give customers something more or better in the attributes they already value... Disruptive technologies introduce a very different package of attributes from the one mainstream customers historically value, and they often perform far worse along one or two dimensions that are particularly important to those customers... At first, then, disruptive technologies tend to be used and valued only in new markets or new applications; in fact, they generally make possible the emergence of new markets."

These researchers explain that market leaders sometimes fail to capitalize on new technologies because their planning and budgeting processes are aimed at allocating resources to

those investments most likely to serve the currently-understood needs of the customers most important to market leaders. Over time, new technologies sometimes catch up with the sustaining technology on traditionally-valued features, and (as noted above) sometimes spawn entirely new products or services. By the time the market leader recognizes the true value of the disruptive technology, the early adopters have attained sufficient experience with it to have captured significant market share from the leader, including in the mainstream customer segments. As discussed by Nevis et al. (1995), such early organizational learning can be a source of long-term sustainable advantage.

Consistent with Bower and Christensen's definition, a Web-based Intranet appears to be a disruptive technology (Gogan, 1996). For example, the Web's performance on attributes which are viewed as key by lead-customers that currently purchase alternative wide-area networking products (on-line information services, value-added network services, etc.) -- reliability, security, and support for group collaboration applications -- is currently inferior; yet, consistent with Bower and Christensen's criteria, these performance attributes are projected to improve markedly in the next five to ten years. Furthermore, consistent with Bower and Christensen's final criterion, the Web offers new capabilities -- for ease in searching, accessing and sharing multimedia information -- that lend themselves to new applications, and hence new products and markets.

Recent discussions of the relative position of Lotus Notes as a tool for groupware applications, compared with Web-based Intranet applications, have parallels with Bower and Christensen's examples of emerging technologies for steel mills, computers, and disk drives (Black, 1995; Ziegler, 1995). Lotus Notes currently offers more robust features for group collaboration than do currently-available Intranet applications (thus, one would guess that for key IBM/Lotus customers, Notes is viewed as superior to an Intranet). Cost-sensitive smaller customers that IBM/Lotus might view as "marginal"

today are investing in Intranet applications, which (if IBM were not moving effectively into the Intranet niche) could give competitors a sustainable advantage due to their earlier organizational learning about Intranet technologies and processes. Thus, it comes as no surprise that numerous entrepreneurial start-ups (such as Netscape Communications and Open Market) are attempting to convert existing customers of groupware products (such as Lotus Notes) and value-added networks (such as GEISCO) to their applications, delivered via the Web. IBM has responded to this competition with its own Web market entry. Notes' new Web-based interface, Domino, and its competitor, Netscape Communicator, give immediate Web access to corporate data, expanding the accessibility of these groupware products.

Bower and Christensen also reported that disruptive technologies challenge organizational competencies. In particular, some new technologies have been found to have disruptive impacts on labor markets, giving rise to a skills training life cycle posited by Flynn (1991 and 1993), in which employers' recruiting, staffing and career-path practices are altered. Organizations are more likely to benefit from investments in new information technologies to the extent that their disruptive characteristics are identified and to the extent that management accordingly makes appropriate changes in organizational processes, structures, and human resources practices (Cash, et al., 1994; Bower and Christensen, 1995). Thus:

Proposition 5: Early in their assessments of the value of Intranets, Big 6 accounting firms initially view other tools for global coordination -- including VAN's and proprietary groupware products such as Lotus Notes -- as more directly meeting their needs. This distinction will dissipate as the Intranet and these other tools take on more of each other's characteristics and form.

Proposition 6: The use of Intranets by accounting firms may cause disruption in market/customer linkages, leading to new ways of reaching and serving customers, as well as new

customer niches.

Proposition 7: The use of Intranets by accounting firms will cause some disruption of existing organizational competence, giving rise to a need for new skills and organizational environments. Accounting firms will need to revise recruiting, staffing and career paths to attract and retain employees who recognize and contribute to the added value of this communication-intensive technology. In addition, there may be a substitution effect in place that would necessitate fewer staff members due to the increased level and sophistication of Intranet-enhanced communication.

Expected Impacts of Intranets

It is likely that disruptive impacts of Intranets will vary across different types of companies. For example, (consistent with findings by Bower and Christensen) start-up companies, which are not burdened with outdated legacy systems, may more rapidly make use of innovative Intranet applications than established companies, which face the challenge of aligning their Intranet applications with their existing IT architecture. Professional services firms, including public accounting firms, with their extensive requirements for specialized knowledge sharing in support of client engagements, may face quite different opportunities and challenges than manufacturers, with their requirements for cross-functional coordination in their customer service, quality and cycle-time initiatives.

It is also likely that Intranets will play varying roles in supporting corporate strategy -- although not necessarily along the groupings identified above (start-up, manufacturer, professional service). Early research by Applegate and Gogan (1995) suggests that, at some firms, Intranet applications constitute important internal tests of technologies and processes that are subsequently put to work in Web-based business-to-business or consumer electronic commerce initiatives.

A recent business-to-business initiative is

the "Ernie" system, an on-line Extranet service for small business clients offered by Ernst & Young (Mullich, 1997). Ernie provides subscription-based access to internal E&Y databases, a news clipping function, and emailed consulting by E&Y professionals. It leverages E&Y's existing Notes knowledge base, which had been used primarily for internal knowledge sharing.

Conclusions

Public accounting firms are leaders in the adoption and assimilation of network-based technologies, which first became prevalent around 1990. These technologies have played a major role in driving or enabling changes in the strategy (services offered, customers targeted), structure (reporting relationships and spans of control), business tasks and processes, internal controls, and human resources practices (recruiting and staffing, training, career paths) of each firm (Elliott, 1992).

Public accounting firms initially attempted to adapt to the emerging, disruptive technologies of the Microcomputer Era by applying the formalized structures and controls of the Data Processing Era. Because these structures and controls were inconsistent with the need for experimentation and organizational learning, in many firms the benefits of personal computing were slow in coming. Through most of the eighties, managing partners in public accounting firms questioned whether their firms were achieving the expected return on their investments in personal computing hardware and software. Now, after a decade and a half in use, the unique features of personal computers in supporting knowledge work are better understood, and all major public accounting firms have successfully incorporated the now-established technologies of the Microcomputer Era. Meanwhile, they have begun the process of adapting to the emerging disruptive technologies of the current Network Era -- including Intranets. We can expect that if public accounting firms attempt too early to apply formal structures and controls over Intranets, they will miss the necessary opportunities for experimentation and organizational

learning that will help them fully capitalize on the unique features of Intranets. Those firms that do foster a period of experimentation and organizational learning will identify promising strategic initiatives and opportunities for organizational transformation.

We anticipate that, for companies able to apply the lessons offered by the three literatures discussed herein, similar transformations will result from the introduction of future technology, in the so-called "Information Appliance" Age. Since this Information Appliance Era will generate opportunities and concerns similar to those of the Network Era, accounting firms are forewarned to learn from the lessons of these prior adaptations to make the next transition smoother and less costly to implement.

Suggestions for Future Research

Investigation of the steps that companies are taking to adjust their internal policies, practices, and controls in order to cope with the Web's disruptive features and capitalize on its new capabilities -- which ultimately may transform companies and industries -- is needed in order to begin to identify useful guidelines for managers struggling to make sense of this challenging mix of opportunity and threat. The propositions we suggest provide an initial set of guidelines to be refined by careful study of existing practice.

These propositions and the discussion of prior research areas join together to constitute several interesting questions about the introduction and impact of Intranets in public accounting firms. Specifically, we pose the following questions as goals for future research: (1) In public accounting firms, what are I/S managers' and partners' expectations for Intranets, in terms of cost reduction, improved individual and group decision making, project efficiency, organizational learning, and other criteria (Brown and Duguid, 1991)? (2) To what extent are Intranets being managed using controls, structures, and processes consistent with those used for other emerging information technologies, versus ma-

ture information technologies? (3) What are I/S managers' and partners' expectations concerning potential "sustaining" versus "disruptive" impacts of Intranets on their firms' global decision processes and business processes? (4) Are Intranets leading I/S managers and partners to reconsider their processes for strategic planning, management controls, organizational structure, and human resources practices? (5) How are I/S managers and partners' expectations about the value and impacts of Intranets changing as organizations gain experience in their use in supporting global strategy and operations?

Intranets provide a unique opportunity to study an emerging technology at a time of intense experimentation and adoption for a vast range of new and innovative applications. The uniqueness stems from the fact that the Intranet is a brand new technology, not an incremental improvement on an existing one. Thus, study of the Intranet will enable cleaner conclusions to be drawn about the impacts of the technology and its accompanying organizational changes. Given their importance in the public accounting arena, this is a topic of high interest to both researchers and accounting professionals. □□

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