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Abstract

This paper describes the preliminary results of a multi-site field study to document the problems common to post implementation management of web information systems (web IS). This study of web IS managers uses coordination theory as an analytical frame in the identification and analysis of web IS management problems common across traditional manufacturing organizations. The preliminary analysis reported here is a typology of 13 problem types. Results will aid in the planning and evaluation of organizational web management efforts.

Introduction

Looking through popular trade magazines, one can hardly turn a page without seeing some reference to new web-based information systems (Web IS) such as company catalog sites, supplier or dealer extranets, and product support sites. Marketing and industry studies point to the growth of web-based sales and services (Kalin, 1998; CommerceNet/Neilsen, 1999; Prodigy, 2000).

The academic community is responding to the interest in web IS with a growing body of research, especially focusing on the implementation of web IS (e.g. Lamb, 1999; Jarvenpaa & Ives, 1996; Eder & Arinze, 1998). This paper introduces the initial results of a study that extends the current implementation work by exploring the problems related to the post implementation management of web IS. The study seeks to answer two questions:

1) What problems are common to the post implementation management of web IS in traditional manufacturing organizations?

2) What is the social context surrounding these problems?

The paper continues in five sections. First we explain the relationship of this research to previous research on web IS and IS management. Second, we briefly justify the study's social informatics approach and our use of coordination theory as theoretical framework. Third, we outline the study's methodology. Fourth we present our initial results. Finally, we briefly discuss implications, further planned analysis, and future research.

Background

Generally, the information systems research community acknowledges that the web "will likely bring turmoil to the information management function in organizations." (Jarvenpaa & Ives, 1996 pg. 96). But, while there is growing attention to web IS, currently there is only a small (but growing) empirical understanding of the types of problems companies experience managing web IS (Bieber et al., 1998). Current web research focuses on implementation/ diffusion issues (e.g., Lamb, 1999, 2000; Jarvenppa & Ives, 1996); evaluation (e.g. Benbunan-Fich, 1999; Hert et al., 1999;); and/or design (e.g von Dran et al.,1999).

From a broader perspective, the IS and social/organizational informatics literature has greatly increased our understanding of organizational problems related to information and communications technology (ICT) management (e.g. Orlikowski, 1996; Barley, 1996; Leonard-Barton, 1988; Kling, et al., 1998; 2000; Sawyer and Rosenbaum, 2000)

Building on these traditions, the study represents an early effort to explore post-implementation issues relative to web IS management. We broadly define management as all post implementation maintenance and improvement activities required to keep a web IS operational and meeting customer needs. This includes the upgrading of current web IS

through site redesigns or new additions, but excludes creation of completely new sites in divisions or business units that have not previously had a web IS.

Conceptual Approach

Building on the social informatics perspective, which highlights the importance of the socio-technical nature of any ICT, this research was designed to explore the social context surrounding web IS (Kling, et al. 1998; Sawyer and Rosenbaum, 2000; Kling, Crawford, Rosenbaum, Sawyer, 2000). Previous research on web IS (Hert et al., 1999; Lamb 1999) suggests that an approach which captured social context is important for several reasons. First, web IS can be highly physically and logically dispersed within an organization and thus may influence and/or be influenced by many different groups. This dispersal is similar to the 'federations' of intranet site found in Lamb (1999).

Second, popular press attention, the promise of improved efficiencies or opportunities, and general 'hype' has made web IS extremely visible within (and without) organizations. Previous research (Hert et al. 1999) and pre-testing for this study indicated that many organizational stakeholders are interested in influencing or contributing to how the web IS represents their products and the organization. In other words, not only do many people within the organization have the opportunity to influence the web IS, but that they are also very interested in doing so.

Our goal of focusing on problems while accounting for social context led us to choose coordination theory as a general theoretical framework (Crowston, 1996; Malone and Crowston, 1994). Coordination theory advocates examination of complex processes in terms of interdependent tasks, actors and resources that require coordination. We employed coordination theory in three ways. First, we used it to focus the study on the problems with coordination of web management processes. We interpret each problem as a mini-process for analysis. Second, we used it to

guide data collection by explicitly eliciting problems resulting from dependencies among actors in the web management process. Third, we plan to use coordination theory's typology of dependency relationships (Crowston, 1996) as a framework through which to analyze each problem in terms of the dependencies in its social context.

Methodology

To examine the coordination problems inherent in web IS management, we developed a multi-site field study of internet and extranet site management in large manufacturing companies. Site selection was based on five criteria:

1. We selected traditional manufacturing organizations that used the web as a secondary sales or marketing channel in order to observe the impact of the web IS on traditional organizational processes.
2. We selected sites with at least two years web management experience in order to eliminate web implementation problems from the study.
3. We selected sites with distributed or decentralized governance structure in order to observe the impact of web IS within line organizations. Previous research suggests that the decentralization of technology (such as web IS) creates unique problems (Eschenfelder, Sawyer and Heckman, 1998).
4. We selected sites with over 5000 employees. to control for organizational size.
5. We selected sites that offered at least one on-line service (e.g. catalog, order tracking, product registration). Results of pre-testing for this study suggested that the technological sophistication of a web IS affects the types of problems that its managers experienced.

We collected data from companies in four different manufacturing sectors: Green Co - animal health and farming products, Blue Co. - environmental control equipment, Grey Co. - computer peripherals, and Red Co. – postal

distribution equipment. In each company, we interviewed four to six web IS managers.

At each site, we recruited web IS managers that met at least three of the following criteria using the snowball sampling technique: (a) Made decisions regarding web resources, services and projects; (b) Provided team or project leadership for web IS; (c) Developed policies or oversee policy implementation for web IS; (d) Determined needs and goals of web IS; (e) Managed budget issues regarding web IS and related projects.

Eighteen web IS managers across the four sites participated in 50-70 minute semi-structured interviews[1]. Ten of the managers worked for a corporate IS unit and eight worked for either a divisional or business line unit IS group. In the interviews, we asked each participant to describe three current web management problems related to the dependencies between different individuals and groups within the organization. Data collection resulted in rich descriptions of 56 problems.

Analysis drew on an analytic induction approach (Glaser and Strauss, 1967) and framed, in part, by coordination theory. All interviews were fully transcribed and coded with the aid of ATLAS-TI software. Using the analytic induction approach, we expect to amend and expand the analysis frames we employ with themes and issues we identify in the interviews (Bogdan and Biklen, 1992).

Results

This section presents initial analysis of the study. These results provide insight into web IS management and also serve as input to the next stage of analysis which will employ the coordination theory framework[2]. We describe two parts of the presently completed analysis: A typology of web management problem types,

and a more detailed examination of three of the problem types.

First, the typology presented in Table 1 describes generalized categories of web management problems that apply across the four participating companies. We constructed this typology by applying an initial problem typologies drawn from the literature to the data and modifying it in light of new patterns (Lyles and Mitroff, 1980; Eschenfelder, 1999). This resulted in a new typology of thirteen non-orthogonal web management problem categories. We view any specific problem situation as a multi-dimensional, and thus spanning multiple categories in the table.

Second, to achieve a richer understanding of each of these generalized problem categories, we documented less generalizable patterns, or 'aspects' of each of the problem types (Miles and Huberman, 1994). The aspects represent concrete incarnations of the problem type found in two or more of the participating organizations. Table 2 summarizes these aspects for each problem type. In this section, we discuss the aspects for the Content Management, Objective Struggles and Product Processes categories.

Content Management

The content management category encompasses issues related to creating, obtaining, evaluating, posting and refreshing web IS content. We broadly define web IS content to include look and feel, text and pictures, and applications.

The content management category included four aspects: standardization vs. customization, obtaining content, responsibility, and choosing projects.

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[1] The instrument/guide is available from the first author upon request.

[2] For references to the more complete analysis, please contact the first author.

Table 1: Web Management Problem Categories

Problem Category	Definition
Appropriate Content	Issues related to perceptions of content as good or bad. Content includes characteristics of the site information architecture, look and feel, information or message, and applications or services.
Content Management	Issues related to creating, obtaining, evaluating, posting and refreshing web IS content.(including look and feel and applications).
Customer Expectations	Issues related to participants perceptions of what customers' anticipate with regard to the web IS.
Image	Issues related to one party's impression of another party with relation to web IS management.
Procuring Support & Resources	Issues related to obtaining inputs needed for web IS management.
Resource Requirements & Expenditures	Issues related to the fact that web IS management requires the use/expenditure of limited inputs.
Interpersonal Relationships and Communications	Issues related to the flow of information between individuals or groups, and/or the cooperation between individuals or groups, and/or affective relations between individuals or groups.
Product Processes	Issues related to the perceived interactions of web IS and traditional product processes in the company
Authority Struggles	Issues related to who should have a leadership role, who should make decisions or set rules for web IS projects or systems, who has the charter to do web development work.
Technology	Issues related to hardware, software, systems integration or technological management processes
Rules	Issues related to policies, procedures, standards and rules.
Objective Struggles	Issues related to different entities within the organization struggling/disagreeing over what the objectives of web IS should be and or the degree to which being involved with the web is important.
Web Know How	Issues related to others' level of interest in and understanding of the web, including its potential, limitations, and requirements. The impact of that understanding on web IS management.

The first aspect, standardization vs. customization represents an ongoing tension between perceived needs to standardize across the component web sites of a web IS in order to ease cross site navigation and support and perceived needs to customizing sites for key customer groups.

The second aspect, obtaining content, reflects the difficulty web managers experienced when trying to obtaining content from the content owners or obtain evaluations of content from content owners. The creators/owners often did not see it as a priority to provide the content in a timely manner. In other instances, they were just plain unwilling to provide the content.

The third aspect, responsibility, represents the finding that groups within the organization did not always have a strong commitment to developing or maintaining web IS content. Some actively avoided responsibility for web content, arguing that the content belonged to other groups. This variation in commitment to the web IS resulted in disparate levels of web-based services and content quality across the component sites of the web IS.

The fourth aspect, choosing projects, reflects the finding that the web managers often had more proposed web projects (new and maintenance) than web IS staff to complete these projects. Thus some projects had to be rejected or at least delayed. Participants spoke of the political consequences of choosing one project over another and the difficulty of deciding which projects will actually be most beneficial given a lack of agreed upon objectives for the web in the organizations.

Objective Struggles

This category represents issues related to different entities within the organization disagreeing about what the objectives of web IS

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should be. We describe two aspects of this category here: Lack of an accepted company wide goal for the web IS, and conflicting group goals for the web IS.

First, none of the four participating companies had established accepted company wide goals or strategy for their web IS. Participants in each organization spoke of the lack of goals and strategy and its negative impact on resource allocation decisions, planning and dispute resolution.

Second, we found that in the absence of an accepted company wide goal or strategy, different groups held (sometimes) conflicting goals for the web IS. For instance, product support groups advocated the publication of support information on the web, while groups that gained revenue from equipment repair opposed it.

Product Processes

This category included issues related to the perceived interactions of web IS and traditional product processes. Product processes include all standard activities associated with creating and selling a product. We will describe three aspects of this problem type: Channel conflicts, organizational disconnects, and lack of integration.

First, as noted earlier, different groups in the company held different goals for the web IS. In particular, some supported on-line sales and some opposed it. The term 'channel conflict' refers to the situation when a company that sells products via traditional channels (e.g. sales force, retailers, distributors) introduces web-based sales. Typically, the groups that receive revenue from the traditional sales channels oppose the introduction of web sales. All four companies in the study had introduced on-line sales; however, only in two of the companies did groups perceive the new channel to conflict with traditional channels.

The second aspect, organizational disconnect, refers to situations where the new web process structures did not in match or overlay onto the traditional process structures in the company. For instance, in several

companies, the traditional organizational structure for sales and marketing was divided regionally or nationally. Product availability, prices and marketing information were produced on regional or national basis and distributed to the appropriate customers. Web information however, is available internationally. Thus, even if a company created different pages with the appropriate information for each country, customers could still (and did) browse pricing and product availability information in other countries and make complaints about the differences they saw.

The third aspect, lack of integration, refers to situations where the web could be overlaid onto existing organizational processes, but where the parties that enacted those processes had not acted to incorporate the web into the processes. For instance, web managers complained that product development managers would not include the web in their processes. The result was that marketing information and new product information typically was not made available to the web team until *after* the release of a new product. In another example, order fillers neglected to check their email and electronic orders were not filled on time.

Table 2: Problem Type Categories and Aspects

Problem Types	Aspects
Content Management	Standardization vs. customization Obtaining content Responsibility Choosing projects
Objective Struggles	Lack of an accepted company wide goal for the web IS Conflicting group goals for the web IS.
Product Processes	Channel conflicts Organizational disconnect Lack of integration

Observations and Next Steps

With all the resources currently being invested in developing and implementing web IS, and with the growing importance of web IS as a conduit for products and services, it is important that organizations plan for post-implementation management of web IS. This study represents an initial attempt to document the common problems organizations experience managing their web IS. Initial analysis resulted in a 13 category problem typology with common aspects within each category. Through the development of the typology of problems and problem aspects, this study provides insight into the types of problems organizations should expect to experience in managing web IS. It also provides a framework and baseline data for further work.

Future work will involve continued analysis of the data using the coordination theory framework, further explorations at companies in different industries, creation of a survey instrument to test the conditions under which certain problems might occur and the development of web management assessment tools.

Acknowledgements

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