Socio-Technical Networks of Large, Post-Implementation Web Information Systems: Tracing Effects and Influences

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Abstract
This paper presents the results of a study to increase knowledge of the nature of post-implementation web IS, and issues inherent in ongoing web IS management. It employs a new socio-technical framework, Kling's STIN, to organize and analyze field data from four large U.S. manufacturing companies. The paper finds that post-implementation web IS are highly dynamic systems composed of multiple technical and non-technical components. The paper illustrates how web IS are socially embedded by showing how social components compromise an integral part of the technological system, and by providing examples of how social forces shape the technical components of the system. Using the STIN framework and the case study data, the paper outlines major groups of actors of dependencies which comprise the STIN. The paper argues that web IS are transitory, socially negotiated artifacts. It suggests a new view of web IS configurations as reflections of current organizational power arrangements.

1. Introduction
Organizations increasingly see their web information systems (web IS), including Internet web sites and extranet sites, as imperative business tools. They have rushed to develop web IS to publicize their organization and products, to electronically offer goods and services, and to facilitate ongoing interactions with customers, suppliers and vendors. At present, many organizations have installed bases of web IS and now confront the challenges of managing these systems on an ongoing basis [1]. However, the research community is just beginning to focus its attention on the nature of post-implementation web IS and issues inherent in ongoing web IS management. While researchers have produced a stream of articles investigating the development, implementation and diffusion of web IS [2, 3, 1, 4, 5], few researchers have empirically explored post-implementation web IS management [6, 7]. For this study, we defined organizational web IS as the union of all externally oriented Internet or extranet sites maintained by a single organization and linked together via hypertext tags [8]. This broad definition encompasses both highly centralized, database driven sites and loosely federated groupings of quasi-independent websites [3]. We define a web site as a grouping of related pages within a larger web IS [8].

In this paper, we present the results of an investigation to help fill the post-implementation web IS research gap. Drawing on contemporary theorizing about information and communications technologies (ICT), we provide insights about post-implementation web IS from the experiences of research participants across four case sites. We argue that post-implementation web IS are highly malleable, fragmented, socially embedded systems. Drawing on a socio-technical analysis, we highlight key actors groups and dependencies between these groups in order to illuminate the complex relationship between web IS technology and the people and organizations that use it.

We have organized this paper in the following manner. First, we provide an overview of current web IS and web management research. We then briefly introduce three theoretical frames from the IS literature which we draw upon in our data analysis. Third, we describe our data collection and analysis methodology. Fourth, we present the data from our research sites in the form of four illustrative vignettes. Fifth, we return to the three theoretical frames to present a new, socially based, view of web IS. We conclude by summarizing the results and implications of the study.

2. Contemporary views of web IS
The IS research community has produced a steady stream of data, models and frameworks related to web IS. For example, authors have proposed new systems development frameworks and new implementation models [4, 1]. Despite the knowledge generated by this
new literature, our current understanding of the social aspects of web IS is weak. Most web IS research focuses on planning and implementation, not ongoing management [1,3]. Further, many web IS studies depict web IS and web management work in socially sanitary terms. That is, either they do not mention the social context surrounding the system, or they explore context in a very limited manner. For example, some studies portray post-implementation web IS management in terms of an orderly logical process unaffected by social phenomena [4]. Others present web IS as socially neutral black-boxed components of larger-systems [9]. Discussions of the actors involved with web IS work often prescribe necessary roles and responsibilities for system functioning without any discussion of social factors influencing actors' interactions with the system [10]. Further, these studies rarely discuss system consequences other than those purposefully intended. While these studies help us conceptualize complex web IS systems development and management processes and suggest how organizations may use web IS, they are not useful for understanding the social aspects of web IS. Socio-technical theorists would argue that they overlook the wide array of social influences continually shaping web IS and ignore the consequences of web management, both to organizations and society at large [11, 12, 13].

Drawing on the more socially oriented theorizing outlined below, this study adds to a small, but growing, stream of research that examines web IS and web management as a social phenomenon [3, 1, 5].

3. Theoretical Background

Our social analysis of web IS draws on three areas of theorizing, or streams of thinking, from the information systems literature. The first stream of thinking suggests that certain ICTs will experience high rates of change after initial development and implementation. The second points to the multiplicity of components contained in an ICT that must function in coordination. The third instructs us to view the configuration of ICTs as the output of a process of social negotiation.

The first stream of thinking suggests that some types of ICTs experience high rates of change after their implementation [14, 16, 6]. Orlikowski calls these “reconfigurable technologies” and Truex, Baskerville and Klein refer to them as “emergent” [14,16]. Traditional characterizations of post implementation systems and systems maintenance work assume that actors make only relatively minor, maintenance oriented changes to systems after their original implementation [16]. The new thinking suggests that actors constantly reconfigure systems to adjust to changing conditions and to take advantage of opportunities. And therefore, actors continue to make design and configuration decisions about a system well initial design and implementation. In this view, systems are constantly under development, or "reconfiguration." Based on this conception of post-implementation systems, we define web IS management as all post implementation maintenance and enhancement activities required to ensure the continued operation of the web IS, and the satisfaction of perceived customers’ needs. Maintenance activities keep a web site’s components functioning correctly and keep content accurate. Enhancement activities improve the functionality or content of a web site, and include systems redesign or additional development [17].

The second stream of thinking instructs researchers to consider the multiplicity of technical and non-technical components comprising an ICT [18, 15]. Orlikowski and Iacono charged that typical IS research ignores the fractious nature of technology and simply presents ICTs as "relatively stable, discrete, independent, and fixed" entities [18 p. 121]. Research should instead investigate the distinct components of an ICT that must be made to work together, and the relationship of these components to their social context. Research critiques from this stream of thinking have also charged that research tends to overlook the non-technical components of ICTs, emphasizing instead how technology is independent of all things social [19].

Web IS, like other ICTs, include many technical and non-technical components such as networked hardware, operating systems, applications software, database management systems, data structures, information structures, navigational schemes, visual designs, different types of content, work practices, protocols, procedures etc. Further, we recognize that the configuration of components may also interact with social context. As client-server based systems, web IS are often physically distributed, within an organization, with different systems components existing in different social contexts and controlled by different actor groups.

The third stream of thinking suggests we view ICTs as socially constructed and emergent [12, 13, 14, 18]. It posits that ICTs exist in a relationship of reciprocal shaping with their context, and asserts that we cannot understand ICTs or ICT use without reference to context [11, 19]. One approach used in this area of theorizing is the socio-technical approach. The socio-technical approach conceptualizes context in terms of multilevel “socio-technical” networks composed of actors and links [12, 20].

Within the socio-technical approach, researchers have created a number of frameworks to assist in analyzing and explaining the socio-technical networks encompassing technology [13, 21, 27].
Table 1: Study Site Overview

<table>
<thead>
<tr>
<th>Primary Products</th>
<th>Use of web IS</th>
<th># Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Co.</td>
<td>2 on-line catalog sites; Listed daily price changes; Descriptions of services</td>
<td>4</td>
</tr>
<tr>
<td>Blue Co.</td>
<td>On-line customer service functions; Descriptions of products and services</td>
<td>4</td>
</tr>
<tr>
<td>Grey Co.</td>
<td>On-line customer service functions; On-line order tracking; On-line direct sales</td>
<td>6</td>
</tr>
<tr>
<td>Red Co.</td>
<td>On-line catalogs for selected customers</td>
<td>4</td>
</tr>
</tbody>
</table>

One such framework is Kling’s Socio-Technical Interaction Network (STIN) [22, 23]. A STIN is a heuristic tool for understanding the socio-technical networks through which people and technologies interact. STIN are particularly useful for understanding the mutual shaping between technology and social context and the consequences of ICT use. A STIN analysis highlights how social relationships are inscribed into ICTs and how social practices and social forms interact with ICTs [22]. Kling defines a STIN as the links and the nature of the social interactions between various participants and technologies [22].

The STIN framework examines a number of elements including actors and dependencies. Actors are those individuals, groups or organizations that interact with the ICT. Their actions may shape the planning, development, implementation, use and reconfiguration of ICTs. Also, their social relationships, interactions and practices may depend on, or be impacted by, ICTs. A STIN framework also examines the links between actors in terms of two types of dependencies, resource dependencies and account taking dependencies. Within a web IS STIN, resource dependencies refer to links or interactions based on access to needed capital such as funding, prestige, trust or legitimated knowledge [29]. Account taking dependencies refer to links or interactions based upon some type of imitation, or social benchmarking.

4. Methods

The first author collected data at four large (over 5,000 employee), U.S. based, traditional manufacturing companies, referred to in this paper as Green Co., Blue Co., Grey Co., and Red Co. She used criteria sampling to select companies that had maintained Internet and/or extranet sites for at least 2 years in order to ensure participants could discuss post implementation experiences. She also restricted sites to traditional manufacturing companies. This criterion ensured that each of the four organizations would support similar processes and structures, (e.g. independent business units, product development processes) and that analysis could compare the interaction of web IS with those processes and structure across the four sites [24]. Table 1 provides an overview of the organizations and their web IS at the time of the study.

The first author collected data through interviews, observations, and document analysis. The primary data collection technique consisted of 50 to 90 minute semi-structured interviews with a total of 18 web IS managers across four study sites. She interviewed many participants more than one time. Participants were selected through a criteria based snowball-sampling technique [17]. Data collection began in the spring of 1999 and ended in the summer of 2000.

Data analysis drew on transcriptions of each interview, a demographics questionnaire, researcher notes from observations, and background documents drawn from company websites. The first author employed the analytic induction analysis technique. Preliminary analysis consisted of identifying and testing patterns in the data cyclically, resulting in the development of initial themes [25]. Later stages of analysis used the STIN framework as a heuristic to organize the theme data in terms of actors and dependencies important to post implementation web IS management.

5. Data

In the following section, we present four vignettes from the study sites. Each vignette focuses on a different aspect of web management in order to provide the reader with a fuller understanding of the variety of actors and dependencies involved. We refer to the identified actors and dependencies in our discussion. For a broader, summary view, we present tables of all the actors and dependencies identified in the data analysis.

Green Co. and the order fulfillment staff

Green Co. was a regional producer of agro-business supplies and services. It was composed of six quasi-independent business groups. One business group, GoodSeed, maintained two on-line catalogs geared for small farmers and suburban gardeners. The CIO and the GoodSeed web IS managers had set a goal that the catalog
systems would fill and ship all on-line orders within 24 hours of order placement. At the time of the study, the on-line order system could not meet its 24-hour goal. Established work practices within the GoodSeed order fulfillment facility slowed the fulfillment of the on-line orders.

The GoodSeed order fulfillment facility traditionally received customer orders through the mail or 1-800 phone calls. The on-line order system collected orders into a web-interfaced database and forwarded copies of the orders to the fulfillment facility through company electronic mail. Filling on-line orders therefore required periodically checking an e-mail account – a change in work procedures traditionally focused on phone and mail. Further, at the time of the study, GoodSeed’s large customers continued to send in their orders via phone and mail. A GoodSeed web IS manager estimated on-line orders to account for less than 1% of total sales. Given large customers’ continued use of traditional ordering mechanisms, the small number of on-line orders, and the change in work procedures required to fill on-line orders, GoodSeed web IS managers believed that order fulfillment staff privileged traditional orders at the expense of the on-line orders.

*I think that part of the problem is the people in the management positions [in the order facility] are saying 'take care of this big customer that just called in and worry about the on-line orders tomorrow.'*

The systems’ failure to meet the 24-hour goal has social repercussions for the GoodSeed web IS managers. Frustrated by the work practices at the order fulfillment plant, the web IS managers’ frustrations grew when the Green Co. CIO, who occasionally monitored the on-line order database, would call to express concern that orders sat unfilled. GoodSeed web IS managers feared the system failure would taint the CIO’s perceptions of their competency to handle web projects.

*You want to be seen doing your job, and you don’t want the seed business to get a bad reputation... and you also want corporate to have a lot of confidence in you personally... [so that] you get to be involved in other interesting projects.*

SB web IS managers also worried that the delayed orders would both discourage on-line order growth and discourage further GoodSeed and Green Co. investment in web IS. They feared that if the on-line seed catalogs did not provide a return on investment, business managers would refuse to fund future web IS projects.

*When [business managers see that] we spent x to put this together and we haven’t been taking so many orders, that this hasn’t paid for itself -- they don’t forget that when we ask for another project on-line. So that plays into future budgeting issues and attitudes.*

**Blue Co. and content contributors**

Blue Co. manufactured environmental control equipment through five different business groups. The Eastern business group had aggressively developed its own web site, and had developed a bit of a “maverick” reputation within the company for taking action without complete corporate oversight. The web pages at Eastern combined company, product and employee contact information, and also offered access to a number of interactive customer service applications linked to back-end legacy systems.

Web IS managers within Eastern did not maintain their portion of the web IS on their own. They depended on the work of other employees, such as content contributors and technical specialists. Content contributors created or maintained the information on certain web sites, while technical specialists assisted web IS managers in gaining access to legacy system data for their applications.

A systems rationalist perspective of web IS management would assume that employees such as content contributors and technical specialists will help the web IS managers and aid in the success of the web IS. But within Eastern, pre-existing job responsibilities and lack of rewards for web IS related work discouraged content contributors and technical specialists from assisting. One Eastern web IS manager explained her frustration with content contributors’ lack of assistance,

*The content is somewhere, but [content contributors] don’t have the time to gather it and it’s just not a priority for them.*

External customers and vendors pressured web IS managers to quickly develop new enhancements to provide access to data on legacy systems. This work required the assistance of legacy system technical specialists. But like the content contributors, the technical specialists had primary responsibilities other than assisting the web IS managers, and the web IS managers were not always able to count on their help.

The lack of assistance from the content contributors and technical specialists had social consequences for the Eastern web IS managers. Web IS managers believed that people judged them on the overall quality of their web sites. But their reliance on others meant that while they had responsibility for sites, they did not always have control over all the content composing the web site. One web IS manager, thinking about problems with stale content explained,
We have contact names, phone numbers, addresses [on the web site] that change, that's a lot of maintenance. And, I just got a call yesterday, 'You have the wrong phone number [posted on the site].’ Well, it's not up to me to maintain it, call so-and-so. But it's reflected on me...

Grey Co. shapes industry standards

The Grey Co. Small Products (SP) business group manufactured electronic products that sold primarily through third party retail outlets such as office supply and electronics stores. SP web IS managers believed that consumers made purchasing decisions for their products based more on shelf or catalog positioning and price than brand name. Accordingly, the SP web IS managers used their web IS to try and create shelf space and catalog positioning advantages for their products. In one strategy, the SP web IS managers optimized the configuration of their web IS for retailers, so as to make it easier for them to do business with Grey Co than with competitors. For example, they developed order-tracking systems and customized billing systems for their key retail customers.

In another strategy to ensure the positioning of Grey Co. SP products, the SP web IS managers acted as beta testers for new internet technologies in order to try to shape the configuration of standards to favor their web IS and the set of skills held by their in-house technical experts. The web IS managers were also active participants in the development of multi-vendor catalog sites and industry portals. Early and active participation in these sites also gave the SP web IS managers the opportunity to shape configurations to optimize positioning Grey Co.’s brand name and products. One SP manager explained their aggressive adoption of extranet technologies and their active interaction with third party sites.

Getting ahead of evolving industry standards when it comes to the business-to-business type of extranets that are evolving, or people wanting to engage with third party catalog things...being proactive, being heavily involved with those things up front now... it's critical, otherwise we'll be following along doing what other solutions that have been defined for us. Participating in that up front certainly increases us having the possibility of having a Grey co.-friendly solution.

While the SP web IS managers worked to shape industry IT standards, the Grey Co. corporate web management group (CWM) worked to standardize the look and feel of the Grey Co. site, and the web tools and processes used within the organization. The CWM had recently developed a database driven portal that combined product information from each business group into one database driven web application. The CWM was trying to extend the look and feel developed for the portal into sites and applications still independently maintained by business groups like SP. The CWM saw the amalgam of tools and products used by the various Grey Co. businesses as an impediment to cross-organizational sharing and support cost reduction. But, the CWM’s work to promote standardization and sharing across the Grey Co. web IS depended on the willingness of the business groups to comply with new guidelines and policies.

Red Co. and the impacts of professional values and norms

Red Co.’s web IS had developed in a grassroots manner, with each business group managing its own development and enhancement projects [5]. Subsequently, many of its businesses, including the Sharp Systems (Sharp) business had in-house IT staff with significant web development skills. At the time of the study, the corporate IT (CIT) group had just proposed that Red Co. centralize web development and enhancement work within its corporate web group in order to better standardize use of hardware and software and development techniques, and simplify systems support. The Sharp web IS managers opposed the proposal. They feared it would reduce their opportunity to perform enhancement work.

The Sharp web IS managers’ opposition to the centralization proposal stemmed, at least in part, from their self-identification as e-commerce technical professionals, and their exposure to the values and expectations of the larger e-commerce technical profession. As members of this profession, they judged the nature of their work against the examples of “good work” touted by the profession through trade press stories and conferences and by the exploits of peer web IS managers at other organizations. As one Sharp web IS manager described,

You're reading the magazines. You're going to the conferences. You see other people doing [development and enhancement work]...

The professional culture emphasized the need for the Sharp web IS managers to increase their technical prowess through continued development and enhancement work. These professional values and expectations conflicted with the corporate IT group’s proposal to take control over all web development and enhancement work. One Sharp web IS manager expressed his anxiety about the possibility of losing the opportunity to do development work.
And I don't know how much of a career is left [if the corporate IT takes over development work], and what's really left? I'm not sure if there's anything much, you know. Because a web developer isn't only a data gatherer, right? You want to do web development.

Actors and dependencies of the Web IS STIN

While the vignettes provide snapshots of some key actors and dependencies in each of the four case sites, they do not provide a full description of all of the actors and dependencies important in the web IS STIN. In order to provide the reader with a fuller understanding of all the elements in the web IS STIN, we compiled three tables summarizing this data. The tables appear in the appendix to this paper. Table 2 and Table 3 provide an overview of the internal and external actor groups we identified as part of the web IS STIN. The tables confirm findings from previous studies outlining important actors in web IS development [2,3,1,5]. Looking over Table 2 and Table 3, it is interesting to note the number of seemingly peripheral actors who turn out to have rather profound influence on the success or use of the web IS. While one would expect that web IS managers, business group managers and customers would act as important influences, less obvious actors also play important roles. For example, the vignettes highlighted the influence of the order fillers, content contributors, the trade press and professional peer groups.

Table 4 in the appendix outlines the major dependencies between web IS managers and the other actors in the web IS STIN. The dependencies are described in terms of the resource and account taking categories suggested by the STIN framework. Our analysis however, suggested decomposition of each category into subtypes. We defined three types of resource-based web management dependencies. The first, brainshare dependencies, requires the attention or commitment of others. The second, web-understanding dependencies, relates to business managers' level of knowledge of web technology, web design, or web management. The third, good name dependencies, concerns the public image of the organization as a whole or the public image of individuals or groups within the organization.

Data analysis also led to three subcategories of account taking dependencies. Account taking dependencies form when individuals or groups consciously or unconsciously benchmark their actions, performance, or outputs to the perceived desires, actions, or performance of other groups or individuals. The first subtype is lost opportunity/left behind dependencies. These form as web IS managers judge their own accomplishments and the accomplishments of their company’s web efforts in comparison to projects celebrated by others including peers, and the trade press. The second subtype, evaluation dependencies, relates to web IS managers benchmarking their activities to some corporate defined goal. The last subtype, policy/procedure dependencies, involves social referencing to official or unofficial rules, policies and procedures.

6. Discussion

In this discussion, we draw on the data from the STIN analysis and the ideas from our three theoretical frames to offer a new, socially rich, view of web IS. We discuss our findings in terms of each of the three frames.

Web IS as dynamic systems

As described in the introduction, several recent papers have proposed new conceptualizations of post-implementation systems. These papers explain how organizational actors continually reconfigure post implementation systems to adjust to changing conditions and needs. Our data suggest that actors made many changes to the web IS at each of our four case sites. This data, and the new theorizing, challenges our assumptions about the stability of post-implementation web IS. It suggests that actors undertake continual reconfiguration after systems implementation, and that these reconfigurations require steady levels of activity and resource investments [16]. New models of web development capture this by linking systems implementation directly to new development in order to show lack of a period of sustained maintenance stability [4].

Why do post-implementation web IS experience high rates of change? The socio-technical approach, the component view and our STIN analysis suggest concomitant social and technological explanations. For example, key characteristics of the technology allowed actors to make changes and create enhancements relatively easily. Web IS components were relatively cheap and easy to set up. One could run web IS from a simple server as opposed to a mini computer or mainframe. Further, web IS used relatively simple development languages like JAVA and PERL instead of C++. Also, many applications were available in a template form for easier implementation. Finally, one could maintain web IS on multiple possible platforms and perform enhancement work with a variety of development packages. This allowed actors to make platform and development package decisions that leveraged existing hardware, software or expertise.

Social practices surrounding the systems also encouraged certain changes. For example, three of the four case sites had distributed governance of the web IS. We defined governance as the distribution of decision-
making authority for the web IS. Distributed governance occurred when distributed business groups could make decisions about their websites within the larger web IS. In a distributed governance structure, business group web IS managers did not have to acquire approval from other actor groups prior to making changes to their websites. With the exception of Red Co., most actor groups in the case sites maintained control over their html files, either on a group owned server or on rented space on an outsourced web server. Those that owned their own servers also controlled the physical configuration of the web server. Physical control over a server, or root directory access to html files on a distantly located server, allowed actors to easily reconfigure parts of the system or change the content contained in the html documents.

Our vignettes also suggest a number of social sources for continual reconfiguration of post-implementation web IS. The Blue Co. vignette illustrated how external customer demands for new applications led web IS managers to try and enhance the web IS by building links to back end systems. Data from across the four sites suggest that internal and external customer demands act to encourage constant reconfiguration. The Grey Co. vignette pointed out how external forces, such as the development of third party catalog sites, portal sites, or new technologies, encourage web IS managers to make changes to their web IS. This example highlights how web IS exist in a relationship of mutual shaping with socio-technical networks of interlinked, technology-based tools. The Red Co. vignette also pointed out how outside forces, in the form of peer expectations and trade press celebration of trends, also encourage constant reconfiguration of web IS. The account taking dependencies between Red Co. web IS managers and peers in other organizations encouraged the Red Co. web IS managers to incorporate the latest technologies and learn the latest skills.

In summary, the three streams of thinking we outlined in the introduction and our data from the STIN analysis suggest that post-implementation web IS are highly dynamic systems. This dynamicism stems both from the technical characteristics of the web IS components and from the social contexts surrounding the system.

**Component view of Web IS**

The reader will recall that the second stream of thinking advised researchers to consider the multiplicity of technical and non-technical components comprising an information system [18, 15]. In this study we found that as physically distributed IS, web IS depend greatly on non-technical systems components such as the work practices of non-technical employees. For example, our Green Co. vignette showed the failure of the GoodSeed web ordering system due to a non-technical systems component – order fulfillment work practices and the privileging of large phone orders over small email orders by order fulfillment personnel. Similarly, at Blue Co., the work of the content contributors shaped the overall quality of the Eastern business groups’ web sites. In a further example not included in the vignettes, web IS managers from across the study sites emphasized the important role of business managers’ strategic planning and goal setting activities as an important non-technical component of web IS. In the following example, a Grey Co. web IS manager explains how lack of planning contributed to wasted time.

*We’ve put up temporary sites with vendors’ help in four or five days, brought them back to the [business managers] and said, ‘Is this what you were thinking?’ [Then the business managers say] ‘Oh yeah. Well, how do I get my catalog items? What do I sell? What do I charge?’ Those things take months. And [this scenario] happens over and over again.*

The component view of IS also encouraged critical examination of the technical components of web IS. In the previous section, we described how certain characteristics of the technical components allowed actors to easily reconfigure the system. But the component characteristics had other implications as well. One characteristic of web IS is that they tend to be constructed using a client-server based architecture. A client-server based system tends to decentralize equipment, data, and IT governance within an organization. From a component/socio-technical point of view, the architecture of the networking component of the web IS determines, to a certain extent, other types of social arrangements that take place around the system. One might also assume that an organization which housed its web IS on a mainframe system would be less likely to have distributed governance. The distributed governance allowed business groups to maintain independent web sites and make independent decisions about the configuration of their web sites while still remaining linked to the larger company web IS because of standard protocols. In one sense, business group web sites acted as components of the larger organizational web IS.

The quasi-independence of business group web sites had important social ramifications. For example, the history of distributed governance and web development at each organization created pockets of web IS expertise within business units [3]. These pockets of expertise tended to privilege the interests of their business group and their own interests over the interests of a corporate IT group [5]. For example, in the Red Co. vignette, Sharp web IS managers resisted the efforts of the corporate IS unit to develop greater cross system uniformity and interoperability because the component configurations
required for greater uniformity and interoperability would reduce the Sharp web IS managers’ control over their portion of the web IS, and would exclude them from socially prestigious web development work.

These findings suggest that the technical discrete entity view of web IS is overly simplistic. The component view suggests several important lessons. First, web IS are highly dependent on non-technical components. Therefore, we need a more holistic view of web IS that incorporates the work and influence of the disparate organizational and extra-organizational actors who influence the use and success of web IS. Second, web IS components can be configured in different ways, and those different configuration options affect social realities that benefit some groups more than others. Third, if we view web IS as comprised of multiple, potentially quasi independent technical and non-technical components, then web management requires negotiation to make all of the components to work together. Suchman describes this process as articulation work, or the “continuous efforts required to bring together discontinuous elements – of organizations, of professional practices, of technologies – into working configurations.” so they function [26, p. 407].

Web IS as socially constituted systems

Our final stream of thinking urged us to view ICTs as socially constructed and emergent [12,13,14,18]. What does social construction mean in terms of web IS? We found social construction of web IS to involve different actor groups working to ensure that the forthcoming configuration of a component will meet their goals and objectives. Kling has pointed out that configuration decisions are important points at which the social is embedded into the technical [22]. Social construction of a web IS therefore refers to the process by which different actors lobbied for the systems configuration that would best satisfy their needs or goals [18]. Further, given that multiple actor groups had different, (and sometimes opposing) interests, the configuration inevitably privileged some interests over others [30].

One can see this negotiation and privileging in an example from Grey Co. Grey Co. held meetings between all the different business groups in order to develop a pan-organizational, database-driven content management system. At these meetings, the different business groups debated the length and positioning of database output fields for company wide product page templates. Each business group felt that the information needs of their customers required a particular ordering of the database fields. For example, the Small Products business group lobbied for placing the price field first because they felt it would best satisfy their customers needs. Other business groups lobbied to place fields for product performance first. The configuration decision was based on social needs (each group lobbying for the configuration that would privilege its customers) and the decision had social impacts (the ultimate configuration inevitably privileged some needs over others). As a result, the outcome configuration reflected the interests and values of more powerful actor groups [30]. Based on this, we offer a new view of web IS. Current configurations likely reflect organizational power arrangements. If so, then we should be able to determine something about power arrangements within an organization by examining the configuration of the web IS. We suggest this as an area for further study.

Also based on this thinking, what do we mean when we say that web IS emerge? We mean that the needs, interests and values of actor groups changed over time, and thus their preferences for the configuration of web IS components also changed. We also mean that power relationships between actor groups changed over time and changes in the configuration of web IS components are likely to reflect these changes in power relationships. Further, it would seem that trends in the larger industrial sector, global market and web commerce tools arena will also impact the configurations of web IS over time.

7. Conclusion

The goal of this paper was to present a new conceptualization of post-implementation web IS. Drawing on three streams of theorizing from the IS literature, we described three characteristics of web IS. We first discussed how, contrary to traditional views of maintenance phase systems, post-implementation web IS are highly dynamic. Actors continually make changes to the systems, reconfiguring them to adjust to changing conditions and opportunities. Drawing on the socio-technical approach, we explored technical and social basis for the dynamicism. Second, we critically examined a number of the technical and social components that comprise web IS. In doing so, we countered the discrete-entity view of web IS commonly used in the literature. By critically examining a number of technical and non-technical web IS components, we show how these systems, seemingly completely technical in nature, are actually deeply socially embedded. We illustrate how even the technical components are shaped by and influence the social world surrounding them. Finally, we use our STIN data and socio-technical theorizing to describe how web IS are socially shaped during reconfiguration and enhancement activities. We end by considering the impact of organizational power on the shaping of web IS configurations.
8. Acknowledgements

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9. References


10. Appendix

Table 2: Internal Organizational Nodes of the Web Management Socio-Technical Network

<table>
<thead>
<tr>
<th>Nodes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Web IS Manager</td>
<td>Web managers that work for a corporate unit such as IS, marketing or communications.</td>
</tr>
<tr>
<td>Business Group Web IS Manager</td>
<td>Web managers that work for a business group or a division of a company.</td>
</tr>
<tr>
<td>Business Manager</td>
<td>Managers that lead a business group or division of a company.</td>
</tr>
<tr>
<td>Technical Specialist</td>
<td>Technical specialist that maintains other equipment needed by web IS managers or who has skills needed by web IS managers.</td>
</tr>
<tr>
<td>Corporate Strategist</td>
<td>Upper level corporate management that sets overall direction and goals for web IS.</td>
</tr>
<tr>
<td>Content Contributor</td>
<td>Organizational employees that contribute to the content management process either by creating, editing, or maintaining content.</td>
</tr>
<tr>
<td>Organizational Processes</td>
<td>Organizational employees that fulfill related organizational processes, such as order fulfillment, that affect web management.</td>
</tr>
<tr>
<td>Internal Customer</td>
<td>Groups within the organization that request web IS enhancement or maintenance work.</td>
</tr>
</tbody>
</table>

Table 3: External Organizational Actors of the Web Management Socio-Technical Network

<table>
<thead>
<tr>
<th>Nodes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Customers</td>
<td>Organizations or individuals that purchase products or services.</td>
</tr>
<tr>
<td>Peer Organizations</td>
<td>Organizations in the same line of business – competitors.</td>
</tr>
<tr>
<td>Suppliers/Vendors</td>
<td>Organizations or individuals that sell products or services.</td>
</tr>
<tr>
<td>Web Tools</td>
<td>Organizations that create hardware or software products for web IS.</td>
</tr>
<tr>
<td>Third Party Catalog Sites</td>
<td>Organizations that create web IS that feature products and services sold by multiple organizations.</td>
</tr>
<tr>
<td>Professional</td>
<td>Web IS managers in other organizations. Magazines and web sites that provide content of interest to professional web IS managers. They write stories about up and coming technologies and innovative projects.</td>
</tr>
<tr>
<td>Values/Expectations</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Socio-Technical Links and Dependency Types

<table>
<thead>
<tr>
<th>Socio-Technical Links Between Web IS Managers and...</th>
<th>Dependency Type (Resource Dependencies &amp; Account Taking Dependencies) and Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Managers</td>
<td>Resource – Business managers control access to important resources needed for ongoing maintenance and enhancement activities. Business managers generate ideas for enhancement projects.</td>
</tr>
<tr>
<td>Technical Specialists</td>
<td>Resource – Technical specialist controls access to equipment or skills needed by web IS managers for ongoing maintenance and enhancement projects.</td>
</tr>
<tr>
<td>Corporate Strategists</td>
<td>Account Taking – Strategists set the overall goals for the web IS which web IS managers try to achieve through their projects.</td>
</tr>
<tr>
<td>Content Contributors</td>
<td>Resource – The quality of the content is related to the degree to which content contributors take time to fulfill their content related obligations</td>
</tr>
<tr>
<td>Order Fulfillment</td>
<td>Resource – Web IS order turn around time is related to the goals and priorities of the order fulfillment staff.</td>
</tr>
<tr>
<td>Internal Customers</td>
<td>Account Taking – In order to maintain control over organizational web IS development, web IS managers must placate the maintenance and enhancement demands of internal customers, or they will hire outside developers.</td>
</tr>
<tr>
<td>External Customers</td>
<td>Account Taking – The perceived needs of external customers drive many web IS design decisions.</td>
</tr>
<tr>
<td>Peer Organizations</td>
<td>Account Taking – Desire to maintain stature within an industry or to attract customers encourages web IS managers to develop a better web IS than competing organizations.</td>
</tr>
<tr>
<td>Suppliers/Vendors</td>
<td>Account Taking - The perceived needs of suppliers and vendors drive many web IS design decisions.</td>
</tr>
<tr>
<td>Web Tools &amp; Third Party Catalog Sites</td>
<td>Resource - The types of functionalities and functionality restrictions built into new systems components by hardware and software vendors shape the design decisions made by web IS managers.</td>
</tr>
<tr>
<td>Professional Values/Expectations</td>
<td>Account Taking – the desire to influence the configuration of the third party site encourages early and active participation</td>
</tr>
<tr>
<td></td>
<td>Account Taking –The values and expectations set by professional groups and associations shape web IS managers’ expectations of what types of work they should perform and what types of functionalities web IS should include.</td>
</tr>
</tbody>
</table>