

PROCESS OF REQUIREMENTS EVOLUTION IN WEB-ENABLED EMPLOYEE SERVICE SYSTEMS

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1. INTRODUCTION

In recent times, according to the Association for Payroll Specialists, the adoption rate of web-enabled employee service systems (ESS) in Australia has accelerated to a point where one in 10 Australian firms now have such systems in place for employees to view and update their details online (Nixon 2003). The main objective of web-based support for HR solutions was to replace paper-based documents and the multiple steps of the HR process with online data entry and interaction by employees and managers themselves. Furthermore, the adoption of such services was greatly influenced by the organizational strategic plans that basically translate into operational goals of improved productivity, data accuracy, and the reduction of paperwork and administrative overheads. Despite the optimism and success stories, these systems have their share of obstacles. One of these obstacles is the plain fact that only a fraction of employees have access to the web and computers (Lapointe 1997). Such systems necessitate infrastructure support in the forms of increased security features, workflow and transaction management, and web administration. Moreover, these systems have been designed keeping in mind that the users will be casual and untrained. Also, the stakeholder base will be far wider than that of conventional non-web HR systems, which are traditionally used by HR staff alone (Lapointe 1998). The broad, diverse, and expanding stakeholder base, characteristic of web-enabled information systems (WBIS) in general (Nazareth 1998; Carter 2002; Standing 2002; Stevens and Timbrell 2002), raises the issue of multiple and possibly conflicting viewpoints regarding the various facets of the web system (Easterbrook 1994; Sommerville, Sawyer et al. 1997).

So, in light of these complexities, how are the requirements for WBIS established? Gordijn and associates (Gordijn, Akkermans et al. 2000) criticize the currently practiced process of requirements gathering as largely inadequate for web development. In particular, they claim that requirements for web-based information systems are

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commonly “created from scratch” by developers themselves rather than being discovered through the normal process of identifying system stakeholders and gathering their requirements. This is indeed true in light of the fact that most WBIS are built for a specific business purpose by developers and then offered and sold as a product to clients with an avid plan to disseminate services via the web. This is why the requirements analysts associated with web development often fail to identify and characterize the potential users of their future web systems (Russo 2000). Review of relevant literature on the development of web-based information systems reveal that such systems are commonly “configured” using an evolutionary approach, whereby the version of the application, acquired from the vendor, is first deployed as a *pilot*, in order to gather user feedback before the evolutionary cycles commence (Fraternali 1999). Subsequently, the web system typically undergoes continuous evolution until it eventually becomes a system capable of providing fully-fledged web services (Ginige 1998; Siau 1998; Standing 2001).

However, the purpose of this paper is to understand and elucidate the experience of project initiators in pursuing the evolution of web services, a process that undoubtedly involves dealing with stakeholder issues. In this regard, existing literature fails to adequately capture and discuss the experience of stakeholders associated with the diffusion, usage, and evolution of web services. The Internet Commerce Development Methodology (ICDM), proposed by Standing (2000), deals with great many problems of web development. Web IS Development Methodology (WISDM) (Vidgen 2002b) is yet another web-specific methodology. Having emerged from Multiview2 (Avison, Wood-Harper et al. 1998), WISDM is inherently associated with the overall development of web-based information systems. These approaches are essentially methodological prescriptions for web development, but do not shed any light on the experiences of project initiators in fine-tuning the various features of the solutions and their subsequent rollover throughout the realm of end-users. Initiators are organizations or organizational units that propose the web services to their clients (Riggins and Mukhopadhyay 1999).

The concept of the *stakeholder* originates from literature in strategic management (Freeman 1984). Accordingly, a stakeholder could be defined as any individual, groups, or organizations whose actions can influence or be influenced by the development and use of the system whether directly or indirectly (Pouloudi 1999). Sharp and colleagues (1999) have used the term “baseline” stakeholders to imply individuals or groups who are *directly* involved or interact with the information system, and have included users, developers, and decision-makers or initiators as belonging to this category. In this paper, the concept of stakeholders has been adopted to refer to “baseline” stakeholders.

2. RESEARCH METHODS

As the experience of project initiators in promoting the further evolution of web-based services is inadequately substantiated in the professional literature, an exploratory study was designed with the aim of gaining some understanding of the phenomena of interest. This understanding can be induced using an *interpretivist* approach which we adopted in our study (Strauss and Corbin 1990; Walsham 1993; Klein and Myers 1999).

The conducted study aimed at uncovering and examining the experience of project managers who had initiated and overseen the introduction and evolution of web services

in their organizations. Hence our study had to probe deep into the complex stakeholder interactions and institutional settings for the projects, which pointed us to adopting qualitative methods of analyzing the collected data (Kaplan and Maxwell 1994). Furthermore, to understand the emerging practice in ESS diffusion, we undertook investigation of several projects in their natural settings, which in turn justified the use of multiple case studies (Yin 1994; Darke, Shanks et al. 1998). Phenomenology is the underlying philosophy behind the analysis of the empirical findings of the study, as it examines the “lived experience” of project leaders in dealing with stakeholder concerns (Moustakas 1994; Moreno Jr. 1999; Hancock 2002). Therefore, the analysis considers the meaning of “dealing” with stakeholder concerns in the context of the evolution of ESS within organizations, the various types of stakeholder concerns experienced, and the consequences of the actions – positive or negative - of projects teams in dealing with those concerns. Boland (1979; 1985) employed phenomenology and hermeneutics in his research on information systems. According to him, the interactions between system developers and users are investigated in order to interpret the significance and potential meaning they hold. Thus, phenomenological studies and hermeneutics can be employed to gain an understanding of the phenomena examined in the study (Galliers 1985). We proceeded to conduct our case studies in the context of five organizations responsible for initiating and operating web-enabled employee support and payroll services.

At the time the empirical studies begun, the adoption of web technology by outsourced payroll providers and HR departments was relatively new, though it had gained some popularity in the US a few years earlier (Lapointe 1997). The investigated organizations focused on providing ESS services in quite diverse business settings. Three of the WBIS used in our study were operating in tertiary educational institutions, while the remaining two were deployed as a medium through which outsourced payroll companies provided services to their clients. In all our case studies, we focused on the collection of data reflecting the experience of project leaders in dealing with concerns of the most significant stakeholders in the ESS environment (Marshall and Rossman 1989; Creswell 1994). This was supplemented by the investigation of audiovisual materials, such as demonstration software, user manuals, project notes and presentations of “awareness” programs.

3. DISCUSSION OF FINDINGS

The empirical data was analyzed in accordance with the steps of the modified *Van Kaam Method of Analysis of Phenomenological Data* discussed by Moustakas (1994) and based on the principle of the *hermeneutic cycle*, which is essentially an iterative analysis of textual data (until it was determined that no more new issues could be uncovered) undertaken to produce meanings and interpretations (Gadamer 1976; Lee 1994). Owing to the aim of the paper and space limitation, the textural-structural description of each case will not be discussed. Instead, we focus of the *synthesis* of the composite descriptions that represent all the five cases.

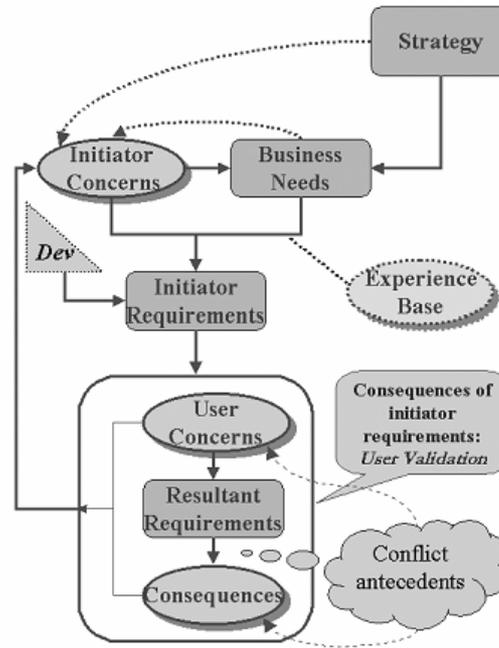


Figure 1. ESS Evolution: An Iterative Model

3.1. The model of the evolution process

The model, illustrated in Figure 1, was derived from a composite structural description of the processes of evolution in the five cases. Most often organizational projects are given the impetus by the strategic plans of the organization (Irani 2002), indicated by the arrow from Strategy to Business Needs. In the case of ESS, the significance of the translation of strategic objectives into business needs is quite apparent (Lapointe 1997; Lapointe 1998). The strategies brought about some of the initiator concerns (indicated by the dotted arrow from Strategy to Initiator Concerns in Figure 1), thus necessitating the elaboration of the business needs. Business needs are also driven by the concerns of the project initiators, indicated by the arrow in the figure. Some of these include concerns surrounding issues of productivity, cost reduction, and improvement of the quality of its services. This direct link between initiator concerns and business needs was found to be more explicit and direct. On the other hand, the impact of business needs on concerns was much less apparent and indirect, which is shown by the dotted arrow.

The process of ESS evolution in the iterative progression of web-enabled applications began at the stage of formulating the initiator's requirements, thereby confirming the notion proposed by Boehm (1986). All the organizations, except one, purchased the WBIS from a vendor, which included features that were more or less a direct reflection of the HR and payroll requirements. In one case, the system was

developed in-house by the IT division, shown by the dotted triangle labeled as *Dev* in the figure, and it played a part in setting the initial requirements for the WBIS.

Initiator requirements had their consequences (as shown by the callout in Figure 1). The initiator consequences encompass a sub-process, which includes user concerns, resultant requirements, and consequences. What this indicates is a causal relationship between the initiator requirements, and the concerns of the users. In other words, each initiator requirement may trigger some concerns among users, which need to be looked into in order to motivate them to use the web system or to minimize their resistance toward it. This is shown by the thin arrow from User Concerns and leads into the thick arrow to Initiator Concerns as shown in the figure. This relationship also represents the validation of the system features, initiator-driven, by the users. Resultant requirements represented the actions taken by the initiators to address the user concerns, which in turn, had their share of consequences that raised concerns, thereby leading to another cycle of refinements and validation. Thus, the model was perceived to iterative and evolutionary.

3.2. Experiencing Stakeholder Concerns and the Manifestation of Conflict

Despite the differences in the organizational setting of the two groups of enterprises, we discovered remarkable similarities in the manner in the perceptions of project managers with issues they considered to be stakeholder concerns. As illustrated in Figure 1, the ESS was launched for beta testing equipped with the standard requirements, which were either put forth by the initiators or reflected their viewpoints (Initiator Requirements in the rectangle). During the various cycles of validation of the initiator requirements, users provided feedback, which varied from suggestions for minor modifications, such as a more soothing colour for the GUIs, to more serious issues related to the fact that some of the target users had no ready access to the Internet or even a PC. It was essentially the feedback of the latter type that the initiators perceived as “concerns”. In this regards, the definition of a concern that we induced from our interviews with the project leaders is:

“A concern is an issue voiced by a particular stakeholder with regards to some aspect of the proposed information system, which impacts the stakeholder’s involvement in this system and which when addressed will determine the need for further evolution of the system.”

Thus, there was no doubt that this evolution was greatly dependent on the various cycles of concern consideration and subsequent setting of requirements solutions. At any point, if a concern was ignored or could not be dealt with, tension between the stakeholders surfaced! This is illustrated by the “clouds” of conflict antecedents looming over the process of evolution and linked (by broken arrows) to the user concerns and consequences. Furthermore, owing to the fact that the clouds loom over concerns and consequences, they have both been represented as ellipses. On the other hand, strategies, business needs, and requirements are actions undertaken by the project teams, and are thus shown as rounded rectangles. It should be noted that concerns also varied in their degree of criticality. In other words, though antecedents were apparent in all concerns, only in some situations did the failure to address the concerns appropriately result in full-blown conflict. The less critical concerns, on the other hand, exposed points of disagreement that could be sorted out without “drawing swords”.

What was interesting was the fact that we discovered variations in the criticality of these concerns between the universities and the outsourced payroll companies. Project leaders in universities experienced a significantly greater number of highly critical concerns than did their payroll counterparts. Thus, the former had to be a lot more careful and tactful in how the concerns were dealt with. This was much more straightforward in payroll companies. The matter could be attributed to the different business settings and nature of stakeholders prevailing in the two types of cases. The power structures and relationships, and vested interests in universities were inherently complex and politically charged. Though they had gained support from the higher echelons of university administrations, the project teams had to convince the stakeholders that the ESS was to go to generate a broader range of benefits for everyone than just productivity gains for the Human Resource (HR) divisions. Added to this complexity was the even within a particular stakeholder group, there was a lack of uniformity in traits. Thus, no two academics or departmental administrators shared the same set of characteristics. Some of them were IT proficient and willing to become avid users of the web system, while others, already overburdened with their regular tasks and having no PC on their desks, viewed the project as an imposition on their work lives.

To cite an example to discuss this complexity prevailing in universities, in one of the case studies, the HR and IT divisions were two separate units within the organization, each with its own viewpoints and aspirations. Since both units were part of the same enterprise, they were driven by the same set of strategic objectives, but their association with different cliques resulted in conflicting viewpoints over the requirements for the WBIS. To generate an in-depth understanding of the aspects of contention, thorough interviews were conducted with both the project leader (who was basically an HR manager with computer skills and proven track record) and the head of the IT division. One of the main points of dispute was the security requirement involving the use of digital signatures, a facet proposed and enforced upon the system, with the approval of the top management, by the developers (IT) in line with their culture of technological innovativeness. The HR members of the project team were against this, as they perceived the requirement necessitating the dedication of vast resources, thereby rendering it somewhat infeasible proposition. The end-users of the system, the supervisors and departmental administrators, were likewise, not keen on digital signatures either. From the feedback obtained as part of the incremental approach to the evolution of the web system, it was revealed that they considered the implementation of this technology as a burden because it was time consuming to install and required additional training for effective usage of the technology. However, the concerns of both the HR unit and the users were not taken into account. In the words of the HR manager:

“This digital signature initiative was railroaded by the developers, it was not an HR requirement... since, the IT division (developers) knew how to use the technology (in line with their culture of going for cutting-edge stuff)...everyone else should use this...this was their justification. This impeded our progress in the roll-over and further evolution of the web system.”

Thus, the conflict between the two stakeholders manifested as a roadblock to the further diffusion of the ESS, owing to which the feature had to be ultimately dropped.

With outsourced payroll companies, the situation was definitely less volatile. They were basically offering the same set of services to their clients but through a web

medium, in line with their web or e-business strategy of enhancing the value of services to existing clients, attracting new clients from their websites, and streamlining certain internal operations, such as data entry. In accordance with this new strategy, they embarked upon promotional programs aimed at dispersing the web services to their existing and potential clients. One of the main motivators for clients to become recipients of web-based payroll services, as perceived by the project managers, was the delivery of premium services. Realizing that not all their clients were IT proficient, the payroll companies also kept the option of service delivery through conventional modes, such as fax and courier services. Some of the concerns raised by clients, who had adopted to become web-based service recipients, were significant enough for the initiators to consider, but the level of criticality did not pose the threat of conflict with the clients. This is apparent in light of the fact that the payroll companies were in no way involved with the power structures existing within the client firms. They were customers and thus, needed to be served optimally in order to ensure their satisfaction with the web services. This did not imply that conflict antecedents did not exist in these projects. If the adoption rate of the web services among clients failed to reach the established target, tensions among the power groups within the payroll companies themselves could soar to a point where the structure and composition of the project teams were under threat. Therefore, gaining and retaining customers for the web services were paramount to the success of the projects, thereby necessitating devotion of resources toward the effective management of the WBIS and appointment of competent Helpdesk personnel.

3.3. The Implicit Experience Base

As illustrated as a dotted ellipse in Figure 1, most of the projects studied had made use of some sort of a experience base, though this was not an apparently an institutional practice. In some of the enterprises, the knowledge base represented previous developmental experience, which promoted reuse, as stated by a web developer:

“We adapted the web interface for the Student Information System to the web-enabled employee services application and added the middleware. In terms of reusability, we have definitely tried to write our web application in such a way that the code is reusable not only in the student information system but also in this system...”

In another organization, the project team had conducted observations of a similar WBIS that was running “live” in other institutions. According to the project manager:

“... we started exploring a couple of sites (set up by our vendor) that were up and running. These systems we observed live as they were being used by some universities. Some of these sites were in the beta testing stages... plus it’s a fact that organizations are increasingly adopting these kinds of systems and we followed suit.”

Therefore, this project team claimed to have “learnt” and reused their experience from observing the same kind of web applications being used in similar organizations. This undoubtedly uncovered the existence and use of an implicit experience base in the projects studied.

In one of the projects studied, the members constituted the experience base. Owing to this, the level of organizational knowledge dropped when a manager quit the team, which reflected the *exceptional designer* syndrome discovered by (Curtis, Krasner et al. 1988) According to the former team leader:

“...the next most experienced person to me left (after me), and we went down from a cumulative experience of 14 years to 6 years, and basically lost a lot of that organization knowledge”.

4. SUMMARY AND CONCLUSIONS

Our case studies of the projects enabled us to induce a number of facts about the social process inherent in the diffusion of ESS. We observed that the majority of web projects begin with dissemination of promotional information to create “awareness” about the proposed services among the user community. Such dissemination is commonly carried through seminars, newsletters, “Updates” on websites, to name just a few. However, no broad base requirements gathering process usually takes place. Instead the web applications are rapidly launched as “requirements prototypes” for pilot testing (Leffingwell and Widrig 2000). This is designed to assist the initiators in obtaining feedback from users in order to validate the requirements placed on the ESS. However, while analysts frequently have difficulties in gathering explicit user requirements, they manage to collect the abundance of feedback from the users regarding the proposed system features. Some of this feedback merely reinforced the notion that the web services will yield benefits for all the parties involved. However, the predominant feedback received by the project teams studied were a cause for “alertness” and possibly “alarm” and termed as *concerns*. Thus, concerns called for attention from the initiators, which typically lead to the further evolution of the WBIS as additional requirements were generated to alleviate these concerns. Some of these resultant requirements also had their own consequences, which caused concerns for the project initiators, and needed to be tackled on their own merit.

Of course, the concerns varied in their levels of criticality. Some were just “alert” concerns that needed consideration to ensure user adoption and satisfaction of services. On the other hand, concerns that caused “alarm” posed the imminent threat of organizational conflict if not seriously taken on-board and negotiated. The latter type of stakeholder concerns, perceived by the project leaders, exposed the power play between the prime interest groups prevailing in most enterprises. It also indicated the fact that if a project team directly involved groups with incompatible viewpoints, it created a fertile breeding ground for disputes over what should or should not be incorporated in the WBIS, thereby jeopardizing the projects (Sommerville and Sawyer 1997). Hence, stakeholder concerns were perceived to be highly significant in light of their predictive capacity to provide hints and clues to social issues that could “make or break” ESS projects.

Another profound discovery from the studies were the existence of implicit experience bases in the projects. According to Ginige (1998) and Standing (2001), the implementation of web projects can be improved by “learning through experience”. Indeed, the projects in which some form of experiential learning took place reported gains such as relatively faster pace of iterations and less drastic modifications. Yet, the

experience bases and their use (or reuse) were commonly not institutional, which is why the benefits of knowledge sharing and reuse were not always apparent in the end, i.e. saved development time in some areas but offset by hurdles in others

The findings of the studies challenge the functionalist perspective held by most web development methodologies. The complexity surrounding web projects is such that the application of objective measures to predict their outcomes and correlate the various facets inherent is largely difficult. The results of the studies on ESS projects bear similarities to the social implications of BPR projects discussed by (Moreno Jr. 1999). Thus, this paper presents a novel viewpoint to the field of web technology dispersion by revealing the underlying social process that inevitably needs to be considered in any organizational undertaking. Indeed, (Vidgen 2002a), the points to the importance of drawing from social theories to understand and explain web projects. Moreover, the studies can contribute an answer to the "web crisis" forewarned by Murugesan (1999).

It should be noted that absolute knowledge about a phenomenon is impossible to achieve, as there will always be room for further learning and re-learning (Boland 1985). Thus, future research can be directed at analyzing the experience of the users of ESS and the vendors who provide such solutions. In this way, the viewpoints of other stakeholders can be examined, thereby enabling a more comprehensive understanding of the phenomenon of the spread of web-based services.

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