

Democracy in Web Site Development and Maintenance

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Abstract

Industrial experience has shown that as much as seventy percent of the system development efforts are unsuccessful in terms of delivering the agreed functionality. Prior research pointed out that since there are fundamental differences between e-commerce systems and traditional information systems, a methodology should be developed specifically for the design and implementation of an e-commerce system. Prior research found that different organizations demonstrated a varied level of democracy in their policy regarding the development and maintenance of web systems. The current paper discusses the applicability of the Action Space framework as a diagnostic instrument for identifying the sources of restraints that may hinder the implementation of a selected web development and maintenance strategy. The framework builds on Engeström's Extended Activity Theory.

Keywords

web development strategies, action-space approach, organization design, activity theory

Introduction

A strong web presence has become strategically important to organizations. There have been strong debates on whether or not the development methodologies for the traditional information systems can be used in developing web-based systems. For example, Carter (2002) suggested an e-commerce system methodology that is directly adopted from the methodology for the traditional information systems. On the other hand, researchers such as Lowe et al [(2000), (2001), (2003)] Murugesan (2000) pointed out that since there are fundamental differences between e-commerce systems and traditional information systems, a methodology should be developed specifically for the design and implementation of an e-commerce system. It is believed that a well-formulated development strategy will enhance the chance for project success for e-commerce systems.

In the past, industrial experience has shown as much as seventy percent of the system development efforts to be unsuccessful in terms of delivering the agreed functionality (Johnson and Boucher 2001). Ceglarek and Kong (2005) suggested that such a high level of unsuccessful experience is due to the fact that many of the web system projects have not been guided by an appropriate development approach. On the other hand, Standing (2000), in his study surveying web site development methods used in major organizations, identified five web development and maintenance approaches of varied levels of distributed development efforts. Each of the five approaches seemed to imply the need for a unique prerequisite profile of organizational characteristics in order for the approach to result in system success. The

adoption and then the implementation of a selected approach do however not seem to be a straight forward task. There can be restraints that hinder the adoption and implementation process. These restraints come from multiple sources: Complexity of the problem domain, an overwhelming technical professionalism that restricts participation of the non-technical employees, and an overly authoritarian organizational culture that does not encourage too much democracy among employees. In order for the selected web development and management strategy to be implemented successfully, such restraints will need to be identified and diffused.

In the current paper, we discuss the applicability of the Action Space framework as a diagnostic instrument for identifying the sources of restraints that may hinder the implementation of a selected web development and maintenance strategy. The framework builds on Engeström's (1987) Extended Activity Theory. Action space is the set of actions that is available to a given community of actors who may apply these actions at will to a given situation. When adopting the term action space in the context of organizational web development, we in particular refer to the power and/or authority the actors of the organization have in influencing and shaping the development of a web management strategy, and deciding how such strategy should be implemented. The term actor here refers to all parties within the organization, including those who possess the expertise or knowledge to contribute to the contents of the web site, as well as those who have the expertise to contribute to the functionality of the web systems. According to Wong and Tiainen (2003), the action space is subordinated by three different sub-spaces: the domain space, the space of technical professionalism, and the social space. Each of the sub-spaces is modulated by a set of factors in the system of activities. The action space, which is the space where the web site and web-based systems developer can participate in adopting and implementing a given web development strategy, is variable subject to the relative size of the three sub-spaces.

This project consists of three major stages: The initial proposition stage, exploratory model building, and model validation and fine-tuning. The current paper will provide detailed discussions that establish the formal propositions. An in depth explanation of the identified web site development and management approaches, the Action Space framework, the development of the sub-scales in the Action Space framework, and the relationship and implications will be provided. The paper will also provide a discussion on the future stages of the research.

Web sites development and maintenance

Standing (2000), in his studies, found that different organizations demonstrated a varied level of democracy in their policy regarding the development and maintenance of web systems. Some of the organizations he studied adopted a highly centralized policy that did not allow too much participation from employees other than those working in the information systems department. General employees were often viewed only as content contributors. Other organizations adopted a system development and maintenance policy that encouraged participation of all users within the organizations during the development stages. Some of those organizations even distributed the ownership of web sites to the sub-units or departments within the organizations, so that the sub-units or departments could have total control of the web sites. He suggested that the level of user participation in system

development and maintenance is associated with system success. Based on the survey he published, we developed a framework for classifying web development and maintenance methods using six criteria:

1. Level of planning (high or low)
2. Level of development guidance and control from top management (high or low)
3. Locus of development (central or distributed)
4. Locus of maintenance (central or distributed)
5. Ownership of sub-webs (central, business unit, co-ownership)
6. Growth (organistic or planned)

The first four criteria were used to first evaluate the core web site, and then the sub-webs. Based on the criteria in the framework, web sites can be classified into five types:

1. Collaborating approach
2. Centralized approach
3. Federated approach
4. Decentralized approach
5. Incremental approach

Table 1. Characteristics of the web development and maintenance approaches

		Collaborating Approach	Centralized Approach	Federated Approach	Decentralized Approach	Incremental Approach
Core	Planning	High	High	High	Low	High
	Development guidance and control	High	High	High	Low	High
	Development	Distributed	Central	Central	Distributed	Central
	Maintenance	Distributed	Central	Central	Distributed	Central
	Sub Webs Ownership	Co-ownership	No sub-web	BU	BU	Central
Sub Webs	Planning	High	N/A	Low	Low	High
	Development guidance and control	High	N/A	Low	Low	High
	Development	Distributed	N/A	Distributed	Distributed	Central
	Maintenance	Distributed	N/A	Distributed	Distributed	Central
	Growth	No	No	Organistic	Organistic	Planned

Table 1 provides a survey of the attributes distinguishing the various web development methods. These five types of web site development and maintenance methods are discussed in terms of the six classificatory criteria.

The collaborating approach

The collaborating approach to web development and maintenance can be characterized by the presence of strong centralized planning in the development of both the core and sub-webs. The style, structure and the functionality of the whole site, including the core and the subsidiary sites, are already covered in the plan. As such, it is usually not expected to have major growth or modification of the web site very soon after its construction. After the

planning stage, well defined organizational guidance is typically formulated and handed down to the business units, which in turn develop their designated web components following the central guidance. The ownership of the sub web is typically a co-ownership, belonging to both the business units and the central administration of the organization.

This approach is warranted where the control of web content and design is important and there are only limited resources for a total centralization approach. The advantages of this approach include a high level of alignment between the web developed under this approach and the organizational strategy, and a uniform image presented by the web sites for the organization. Good communication is particularly important for this web development method if the exchange of information regarding user requirements and development guidelines is to be effective. Another issue that the management of an adopting organization must consider is the provision of technical support and training to the users who will become involved in the web design and development tasks distributed to them. In order to ensure compliance with the agreed policy and guidelines, it is necessary for the management to develop an appropriate monitoring mechanism.

The centralized approach

The centralized approach to web development and maintenance can be characterized by the presence of strong centralized planning in the development of one main, centrally owned web site. The style, structure and the functionality of the whole site are already covered in the plan. As such, it is not expected to have major growth or modification of the web site very soon after its construction. After the planning stage, the development and the subsequent maintenance of the web site are either handled by the internal systems professional or outsourced to contractors. The ownership of the sub web typically belongs to the central administration of the organization.

This approach is warranted where the control of web content and design is important and there are resources available for a total centralization approach. The main advantage of the approach is the presentation through the tightly controlled web site a clear organizational image. Frequently, such approach counts on the services provided by contractors. As such it is necessary for the client organization to have an employee of its own act as the liaison who will maintain a good and functional working relationship with the contractor. The principle shortcoming of this development method is that the maintenance and modification of the web site can be problematic if the contractors are not responsive to the client's service requests.

The federated approach

The federated approach to web development and maintenance can be characterized by the divided ownership of the core and subsidiary web sites. The central administration is responsible for the planning, implementing, and maintaining of the core web site, while the business units are typically allow to plan, develop, and maintain their subsidiary web sites and/or the neighbourhood. Since the centralized planning function covers only the development of the core web site, the growth of the web site is expected to occur in an organic manner.

There is a major advantage for companies which adopt the federated approach of web development. The distributed ownership of the sub webs lends a better chance to the business

units for communicating and achieving their varied goals in an effective and responsive manner. However, adopting companies should be aware that this distributed ownership may result in a variety of styles and contents. This could result in a lack of the harmony presented at the more strictly controlled core web site.

The decentralized approach

The decentralized approach to web development and maintenance can be characterized as a 'bazaar', or laissez faire, style: A total absence of a centralized planning in the development of both the core and sub-webs. Each business unit and the central administration can at any time take on the development and maintenance of a part of the web site. Functions and contents can be added to the web site at any time by any unit within the organization. As such, a defined pattern of growth or a uniform underlying theme and image cannot be expected of the web site. An unclear web site ownership is also a characteristic.

Such a free style of development approach may be used for a short period of time with the hope that a useful web structure will emerge. However, the total absence of formalism in the planning and control leads the adopting company to risk both unmanageability of the web site and having web style and contents at odd with the company strategy. Such risks may be mitigated if this method is only used for the development of intranet web sites.

The incremental approach

As the name suggests, the incremental approach to web development and maintenance can be characterized by a planned and progressive development of the overall web site. The development work is first focused on the core web site, and then incrementally on the individual subsidiary web sites. As such, the proper prioritization of the various web components and functions of the web site is imperative if the development is to fulfil the strategic goals for the web sites. Like the collaborating approach or the centralized approach, the incremental method also features strong centralized planning, covering the structure and functionality, in the development of the core web site and frequently the future web components as well. The development work is usually done by the in-house systems professionals or by outside contractor instead of being distributed to the business units. Future growth or modification of the web site is typically covered in the plan. The ownership of the sub web in general belongs to the central administration of the organization.

The incremental approach of web development is usually favoured by organizations in which control over contents, functionality, and design of their web sites is important; however, there are not sufficient resources for the management to take a one-off approach to develop the whole web. Unlike the collaborating approach, the incremental approach does not have a master plan or similar document to cover all the components of the web. After the development of the core, planning effort will be focused on the web component that comes up next on the priority list. Thus, management needs to ensure that for each component to be considered, there are well planned group requirements sessions in place to obtain the necessary census about its design, content, and functionality issues.

The action space framework

By action space, we refer to the set of actions that is available to a given community of actors who may apply these actions at will to a given situation. When adopting the term action space in the context of web development in an organization, we refer to the power and/or authority the actors of the organization have in influencing and shaping, in terms of web content and functionality, the design and development of the organization's web site. The term actor here refers to all parties within the organization, including individuals participating in the development, systems professionals and the internal web users.

To identify the constraints of implementing a chosen web development and maintenance strategy, one can apply Engeström's (1987) extension of the Activity Theory to examine the interrelationships among the various mediating factors within an organization. The original activity theory (Vygotskij 1978) includes three elements: a subject, an object and an instrument. Each of the three elements interacts with each other in the process of accomplishing a given task. Engeström extended the activity theory by adding to it the social aspect. This addition makes the interaction much more complex. The extension of the original activity theory has been used in prior IS studies which focus on the social context of IS. For example, Korpela (1994) studied computer systems development in a developing country and Boer et al. (2002) studied the knowledge sharing process in an organization.

Activity theory

The development of an organizational web site is an organizational process that involves a complex structure of activities and actors. Engeström's (1987) extended activity theory can be used as a conceptual lens to analyze how the various contextual elements within an organization shape the total action space of all actors in that process. His model of activity is shown in Figure 1. According to Engeström (1987), the study of a collective mediated behaviour directed towards an outcome can be useful only when the activity is taken as a unit of analysis within its context. The activity together with its context forms a system

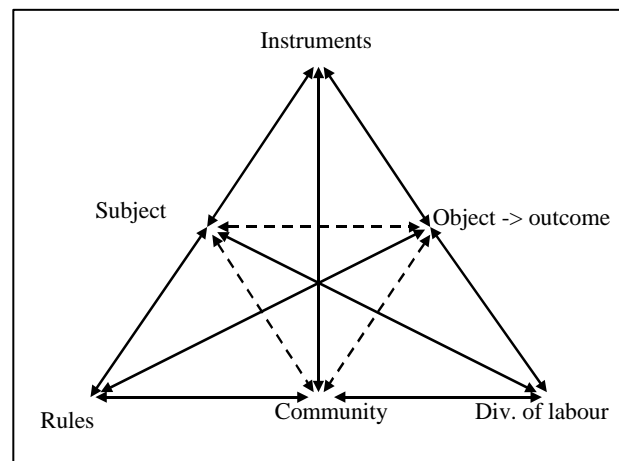


Figure 1. Structure of organization activities (Engeström 1987).

which includes a subject who handles an object with instruments, and a social infrastructure within which the subject and object interact. The object refers to the "raw material" or problem at which the activity is directed. This object is then moulded and transformed into an outcome with the help of instruments. Instruments refer to not only the physical artefacts and skills, but also language and other symbolic artefacts as well. The social infrastructure, according to Engeström, is constituted by social rules, the community, and division of labour. In the case of web development, the subject includes the IS and web design professionals, and object is the development of the web site the organization seeks to manage. Instruments within the current context refer to the variety of web development and maintenance methodology, while the community covers all other individuals and groups of people who

have accessibility to the web sites. For the current study, we focus mainly on the internal web users.

The factor of [social] rules refers to the explicit and implicit regulations, norm and conventions that constrain actions and interactions within the activity system (Boer, Van Baalen et al. 2002). People in an organization coordinate their actions towards a problem through the shared knowledge about rules and norms. These rules and norms are socially constructed: "species do not adapt to environments; they construct them" (Lewontin 1982). Social norms can be explicitly stated or implied (i.e. unstated but observed and understood). For the current study, we have identified four types of organizational cultures, each of them having a very distinctive character in terms of how authority and the central planning function are perceived. These four organization cultures are: pro-authoritative, individualistic, bureaucratic, and organistic (Standing 2000; Wong and Tainen 2004).

The third factor of social infrastructure is the organizational design in the given organization. In an organization where work is highly specialized, the boundaries of the work flow processes are likely to be clearly and singly drawn from very limited number of functional areas. The problems derived from such narrowly defined work flow processes frequently involve a relatively narrow domain. Whilst in a more integrated context, such as an organization having a cross-functional structure or in the situation of a virtual organizational design, a typical work flow process may cut across multiple functions involving a much wider domain. Problems arising in such an integrated context are more likely to involve more actors from different functional areas.

Subsidiary bounding spaces

The action space, which conceptually represents the possible actions available for different parties in the web development process, is indicated by the whole triangular space in Figure 1. The action space can be seen as being subordinated by three different sub-spaces: the domain space, the space of technical professionalism, and the social space. Each of the sub-spaces is modulated by a set of factors in the system of activities (i.e. the overall action space represented in Figure 1). The action space, which is the space where the problem-solver (subject) and the community can participate in solving a given system problem, is variable subject to the relative size of the three sub-spaces. The sub-spaces and their relationship with the action space are depicted in Figure 2. The model set forth in Figure 2 suggests the opportunity of analyzing a multitude of relationships within the overall action space circumscribed within the outer triangle. The objective of such an analysis is to identify an optimal combination of firm factors, web development methods, and the type of web sites to be developed for the generation of the desired outcome (i.e. the quality of the web site).

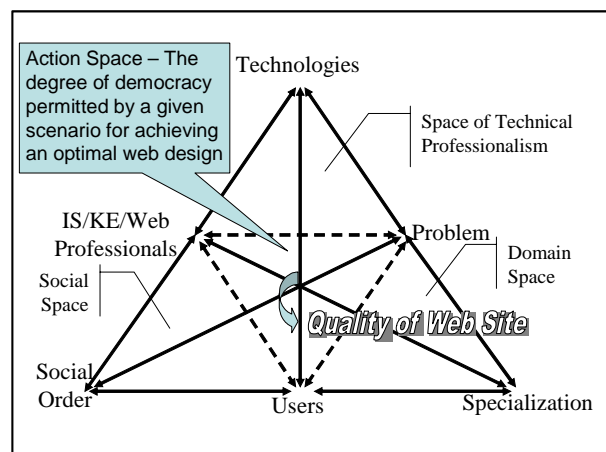


Figure 2. The action space is bounded by the subspaces of technical professionalism, social governance, and the domain subspace (Wong and Tainen 2003).

The domain sub-space

The domain sub-space is shaped by the type of web site to be developed, division of labor, and also by users' knowledge and professionalism. In Engeström's (1987) words, a division is a unit in which the users act as a community to respond to the problem (or the environment) that is posed to them. This community, with a dedicated set of skills possessed by its members, is always charged with similar types of problems. The congregation of problem types and skill sets overtime develops into a domain. A domain does not function alone in an organization to solve a complex problem; instead, it collaborates with other domains. Over time, the way that the domains in an organization collaborate and coordinate develops into a particular workflow pattern.

The degree of specialization in the organization has implications on how wide the problem domain is going to be (i.e. does the problem involve multiple domains, or does it involve one domain only) and the variety of roles played by users involved. If the problem in hand is one that involves deep-level reasoning using complicated models and/or problem-solving algorithms in a single domain, the room left for other ordinary users to participate in the design process is minimal. In contrast, if the problem is one that cuts across many areas involving not too deep a reasoning algorithm, the room for more ordinary user participation is increased. For example, in the traditional organization setup where business functions are departmentalized with their boundaries well defined, information systems are usually developed for the various tasks within the individual functional areas (e.g. accounting systems, human resources information systems). Developing these departmental systems does not necessarily need to involve users outside of the user's department. On the other hand, systems that support e-commerce (e.g. a shopping-cart application on the web) are expected to involve multiple functional areas from the order-taking department to the revenue collection department. In the current study, our analysis for each of the three factors defining the domain subspace thus focuses on the type of web sites for the analysis of problem, organizational structure for the analysis of specialization, and the user competency for the analysis of internal users (see Figure 3a).

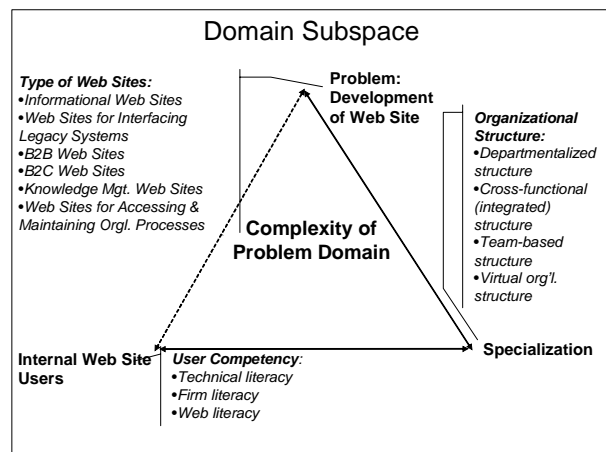


Figure 3a. A modified view of the Domain Subspace describing the contributing factors for the Complexity of the Problem Domain

The social sub-space

The social space is the space in which IS and web professionals interact with the internal web users to identify and solicit the requirements regarding the critical content and functions of the web site to be developed. This space is regulated by the prevailing social order, which entails matters such as the hierarchy of organizational structure, organization values, communications, and compensation systems. The execution of the social order is reflected by the organizational norms, stated policy, and other symbolic representations. Social order serves as a governance mechanism directing the roles played by the IS/KM/web professionals and the web users. The social subspace is graphically described in Figure 3b.

Social order is a product of the social construction process. The execution of the social order both confirms and modifies its contents and its value. Successful experiences confirm the value of the contents in the social order; failure experiences bring new mechanisms into the order. Such social construction process is never static; negotiations within the community are constantly taking place. As such, the social order is always renewed and changing, and so is the realm of the social space.

The making of the social order is not solely from endogenous factors; exogenous factors such as competition also have a lot of influences. In a traditional industry where competition and nature of the goods or services tend to facilitate the development of a bureaucratic management style, an organization may tend to develop a social order that is also bureaucratic in nature

hence resulting in a relatively inflexible and smaller action space for the users. While in an organization where innovativeness is what drives the company's strategy, employees are more likely to be empowered to participate, hence, a wider action space for the users. Likewise, if the social order is leaning more toward the democratic side that allows the users more liberty in IS determination and development, the action space for them becomes more bountiful. On the other hand, if the social order in an organization is authoritative, putting the expert's guidance on a very high status, the 'general public' in the company would not feel encouraged to raise ideas that may challenge the transcendent directives from the experts.

The sub-space of technical professionalism

The space of technical professionalism is shaped by the given problem (i.e. the development of web sites) and the IS/KM/web professionals, mediated by the technologies required by the web development process. The principle technological focus is the web development methodology: the collaborating approach, centralised approach, federated approach, decentralized approach and the incremental approach.

To an average web user, the web systems are the tools they use to accomplish their goals in their respective functional areas. In an organizational environment where the ratio of the IS/KM/web professions and ordinary users is small, the 'expertise' and professional knowledge are already parameterized in the IS tools. It is typical that many of the 'non-expert' users are not motivated to understand technically-related issues, such as the internal algorithms, since only problems derived directly from their primary function are ranked first order, while any others are secondary. As such, many of the users would be willing to subside from issues of second order and get around the 'black box' as long as the web development and IS issues do not get in the way of principle duties. Therefore, reliance on system and web professionals is developed.

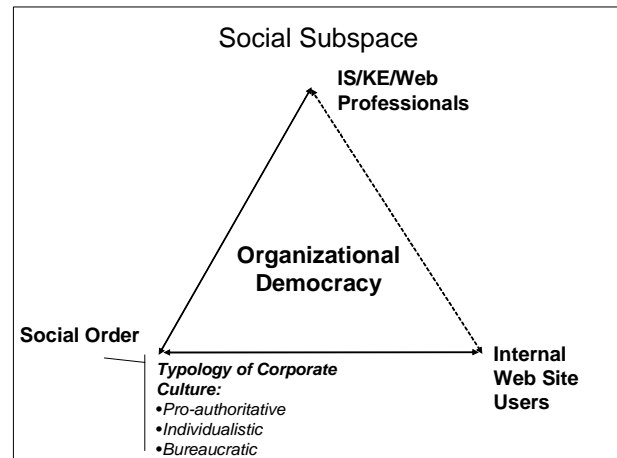


Figure 3b. A modified view of the Social Subspace depicting the contributing factors of the organizational democracy.

In addition, the degree of authority the IS/KM/web professionals would perceive to have vested on themselves is a function of how strong an objectivist attitude they have towards knowledge (about the web sites to be developed) and ISD projects. An objective view of knowledge leads one to view knowledge as an objectively existing matter that may take on a certain representational form. Wilson (1999) describes such a view in ISD, including web-development, as “suggesting that the external world consists of pre-existing hard, tangible structures which exist independently of an individual’s cognition.” Both of these views about knowledge and information systems suggest that there is no need, and no room, for alternative views from users. Haraway (1991) describes this kind of thinking as “the god-trick of seeing everything from nowhere”. When IS/KM/web professionals accept just their own way of seeing the association between knowledge and technology, it is their way to

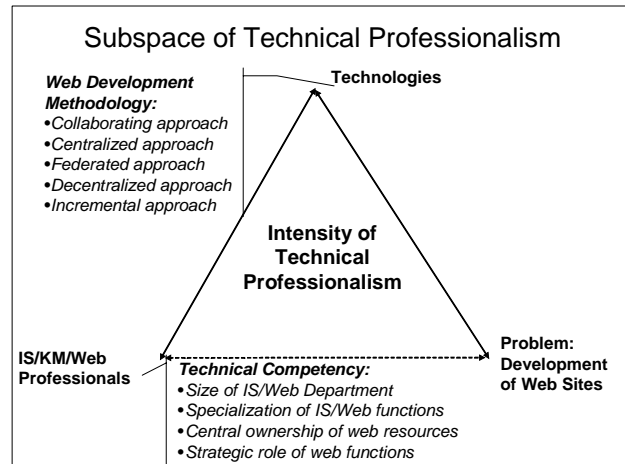


Figure 3c A modified view of the Technical Professionalism Subspace depicting the contributing factors of Intensity of Technical Professionalism.

keep the area for themselves. It is more about power than about moving towards truth (Haraway and Simians 1991). The diffusion level of the objectivist belief in the organization characterizes how control-oriented is the IS and web professionals’ mindset in companies. The authority of the IS and web professionals would increase as the complexity of the represented knowledge and the required technology increases.

The three sub-spaces do not always shape the users’ action space in an equal and regular manner. In participatory design literature, it has been reported that technological knowledge of a project dominates over work knowledge (Greenbaum and Kyng 1991). In an IS development context, the technical professionalism would take up more space leaving the space for user participation small. The technology factor, or the professionalism factor, has been conveniently used by the system professionals to restrict the participation of other non-IS professional actors.

Managerial implications

The adoption and the implementation of an appropriate web development method is not always a straight forward task. The challenge to the managers in the selection of an appropriate web development strategy is to come up with a correct assessment of the conditions (such as corporate culture and structure) prevailing. There can be restraints that hinder the adoption and implementation process. These restraints come from multiple sources: complexity of the problem domain, an overwhelming technical professionalism that restricts participation of the non-technical employees, and an overly authoritarian organizational culture that does not encourage too much democracy among employees. In order for the selected web strategy to be implemented successfully, such restraints will need to be

identified and diffused. In this paper, we discuss the applicability of the Action Space framework as a diagnostic instrument for identifying the sources of restraints that may hinder the implementation of a selected web development strategy.

The Action Space approach can be applied as a framework to diagnose an organization since the approach has substantially covered all the major factors and their interactions involved in the work that needs to be accomplished. Furthermore, the three subspaces identified in the approach (Figure 2) allow the managers to diagnose their companies in a piecemeal manner. The issue of the problem domain complexity is mainly a function of the problem (i.e. the development of the web site), specialization, and the knowledge gap among the members in the organization. A slightly modified view of the domain subspace suitably depicts such interaction (Figure 3a). The issue of an overwhelming technical professionalism is mainly a function of the problem (i.e. the web site to be developed), technological focus, and the type of IS and web professionals in the organization. A slightly modified view of the subspace of technical professionalism suitably depicts such interaction (Figure 3b). The issue of the power orientation of the organization culture (i.e. pro-authoritative vs. individualistic) is mainly a function of the organizational culture, type of IS and web professionals, and the knowledge gap among the members in the organization. A slightly modified view of the social subspace suitably depicts such interaction (Figure 3c). To implement the organizational diagnosis, each of these three subspaces can be elaborated for the development of multiple-item instruments. Such instruments will facilitate the focus of managers on examining only a number of factors in a well defined area of the organization; hence, the complexity of their study will be reduced.

Although companies adopting one web development approach do also use techniques from the other strategy to supplement their overall web development activities, companies should not try to excel at both strategies. Companies straddling multiple web development strategies risk failure. Each strategy calls for a very different set of drivers. A web development strategy adopted by a company should be compatible with the type of the web site in development. Such strategy should be supported by the appropriate human resources, incubated within a matching corporate culture, and aligned with the corporate structure and division of work. Competitive strategy refers to how a company create value for its customers. Human resources refer to not only the strengths and weaknesses of the employees, but also the ratio of IS/KM/web professionals to the general internal web users. Corporate culture within this context refers mainly to the overall attitude that most employees have towards work democracy in the company. Our focus is in the presentation of the Action Space approach and how it can be used as an analytical tool in formulating the organizational web development strategy.

Conclusion

Today a strong presence of web sites is inevitable for organizations. Industrial experience has indicated the importance of adopting an appropriate method for web development. In the current paper, we discuss the applicability of the Action Space framework as a diagnostic instrument for identifying the sources of restraints that may hinder the implementation of a selected web development and maintenance strategy.

The second stage of our study involves field exploration to provide a preliminary confirmation of the propositions made in the first stage. Research methods will include, but are not limited to, a questionnaire to collect data purporting to identify the web development and management approach adopted in the firm, and measure the variables in the Action Space framework. Other methods also include semi-structured interviews to collect information such as the measurement of knowledge work. We believe that our further study would eventually help us understand (1) the interrelationship of the various organizational factors and the web development methodology, and (2) how the different levels of work democracy would impact the successful implementation of a web site.

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