Beyond normative provisions of usability: integrating the activity perspective in IS development process

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Abstract

The present paper explores the organizational and intentional issues of ensuring usability during the development of large information systems (IS) in the services sector. It argues that the process of arriving at a high quality IS has both normative and intentional parts The normative part can be dealt with by normative provisions (i.e. methods and tools for design, development and testing). The intentional part cannot be prescribed, but can be influenced by explicitly reflecting on the relations between actors from the procurement stage and as the project unfolds. The paper proposes a conceptualization of project dynamics in terms of different actors' capability and perspectives (i.e. business, technical and human activity). It contends that different systems need a different balance between perspectives, but emphasizes the fact that in large systems development projects in the services sector the human activity perspective needs to be fostered.

Keywords: usability, user involvement, system development, perspectives

1. Introduction

In the present paper we focus on ISs that are intended for use in organizational settings in the services sector. Such systems present a challenge to conventional usability methods for a number of reasons; i) the intended user population has many different profiles and many different needs, ii)the systems introduced tend to alter the work structure and users may have great difficulty in foreseeing their future needs, iii) the usability of such systems does not depend so much on the visual interface but on the underlying business logic, thus calling for more interaction both with systems' and business analysts. Traditional usability interventions tend to focus on the interface surface separated from the work content [Bannon and Bødker (1991)] and in most cases are treated as a separate if not a supplementary task in system design. In

the services domain in particular, usability is given little priority due to the widespread assumption that –since the interaction style of business software is commonplace– the human interaction characteristics can be largely dealt-with at the level of platform usability guidelines.

2. Actors, Capabilities and Perspectives

2.1 Context, Issues and Objectives

The primary purpose of undertaking the development of an IS in organizational settings is streamlining work in terms of business processes and operations. These represent the organizations' reality in an abstract level of description which has the merit of being both compatible with abstract IS notations and also appropriate for communication to higher and middle management. However, even with IS mediation, most business processes and operations ultimately need to be actualized at the concrete level of human activity.

The human activity level has attracted attention in a number of IT application domains. For example, in safety critical systems such as air-traffic [Endsley, et. al. (2003)] and process control plants [Vicente, (1999)], or in client focusing systems such as e-commerce or e-banking. In these domains significant effort is spent on the human interaction side. Often, interaction design is specified at the front end of the development process or even as part of the procurement specifications. In the Service Sector and especially in public services, only recently traditional methods of IS acquisition have started being questioned. Borrowing from the advances in other domains, procurers start to investigate the importance of quality reviews during the development lifecycle, staged procurement and bottom-up development [Cross (2005)]. Still, up to now it is evident that when not explicitly committing to usability requisites up-front –due to various pressures– developers and procurers alike will usually steer their attention away of these issues.

Striving to secure that usability will be considered adequately throughout the IS acquisition is not merely a technical matter. As [Ulrich (2001)] suggests, IT systems development is an ongoing judgmental and argumentative process. Explicitly considering who the different intervening actors will be, who will have a say in what and when, is essential in order to ensure that not only the letter but also the essence of the specifications' provisions will be met. The next section focuses on distinguishing these actors, the type of their involvement and their influence on the resulting system's quality.

2.3 The Actors Involved

In the development of ISs for the services sector we have distinguished 5 quazi-independent roles with potentially diverging motives, interests and objectives: i) the

owner of the investment or Procurer, i.e. the economic entity that decides for the investment, sets the objectives to achieve, is responsible for its fulfilment and eventually pays for it, ii) the Owners of the processes, i.e. the organizational entities that are the direct beneficiary of, or are directly affected by the IS to be developed, iii) the end-Users of the system meaning individuals or groups of individuals actually to work with the system, iv) the Developer who will perform programming and or parametrization and v) the Analyst of the system, who's role is to analyze the business processes to be supported by the IS, and to produce a more or less specific representation of the system in descriptive format

It is evident that the above definitions do not presume all 5 roles to be necessarily present in every project or to be undertaken by distinct entities. For example there are many cases where there is no Analyst distinct from the Developer or many other cases where Procurer and process Owner are indistinguishable. Users can also be process Owners, Procurers or even Developers. The proposed distinction between key roles is a pragmatic approximation of our experience in numerous projects. Its purpose is to be flexible enough in representing a variety of IS project realizations under the same terminology providing a framework for the description of emergent project structure dynamics. In order to simplify the conceptualization we omitted external players or mediators such as standards, regulations, trade unions, software platform proprietors etc. who may at times have a significant role in large projects.

2.4 The Interplay between Actors

The different actors intervening in an IS project will, in general, have different interests and different objectives according to their role in the organization and project. Although it is not possible to predefine the interests and objectives of each role out of their specific context, we can identify some stereotypes held in the business world. These stereotypes are only a set of common predispositions for each role, which should be subject to reflective reconsideration informed by the particularities of each project.

- The Procurer tends to focus on timely delivery within cost limits of the strategically outlined outcome;
- The process Owner(s) tends to focus on fitness of the outcome with organizational and operational constraints and smooth transformation to the new state of affairs ;
- The Users tend to focus on minimizing the adaptation efforts and ensuring utility
- The Analysts tend to focus on capturing requirements bounded by metrics, measurements and formal methods trying to take an externalist-observer stance;

- The Developers tend to focus on delivering software that will work and cause minimum problems (at least in contractual terms).

The amalgam of interests and objectives in each particular project will have a pervading influence on the outcome. The need to explicitly cater for this divergence between actors during IS development in organizational settings has been stressed by researchers in a variety of disciplines such as organizational theory [Evan and Freeman (1993)], [Mitroff (1983)], socio-technical systems theory [Checkland and Scholes (1999)], cultural-historical activity theory [Engeström (1999)], information systems theory [Avison and Wood-Harper (1990)], [Klein and Hirschheim (1991)], [Mumford (1983)], [Eason (1988)] and CSCW [Grudin and Poltrock (1997)] among others.

As the literature suggests, explicitly considering conflicting interests and diverging objectives among the various actors is a critical part of successfully managing IS projects. However, strictly adopting this view implies that ultimately, successful ISs are merely a matter of managing conflicting interests and balancing power of decision between the different actors. Although such a view is useful to a certain extent, it is based on the hypothesis that each actor acts in a totally rational way, being fully knowledgeable and competent in fulfilling his role in the project. Even if this may often hold for Owners and Procurers, it is certainly not true for Users in the majority of cases. Typically, Users are influenced by the Analysts or Developers' rhetoric. They frequently have only a scarce idea of what they need, and are easily directed towards producing over-formalizing accounts of their work and adapting it to specific technological solutions. Empirical research has shown that often technical issues dominate with users involved in the process left feeling that more technical knowledge was needed for them to influence the implementation [Flohr Nielsen and Relsted, (1994)]. When Ives and Olson published their infamous review in 1984, the notion of user involvement in system development was already well established, that review showed positive, negative and inconclusive findings with only 36% of the studies supporting a positive participation - success link. Ives and Olson's paper spurred numerous subsequent investigations that largely addressed their concerns. The effectiveness of users' involvement is affected by the the users' ability to influence the design [Hunton and Beeler (1997)]; [Robey et al. (1989)] which is the result of many other factors: the type and depth of involvement, user–analyst-developer relationships, the nature of communication, the power, capacity, knowledge of users and so on.

2.5 The Capability of each Actor

During any IS project, the capability of each actor to influence the outcome is a combination of his power, capacity and knowledge [Mumford (2000)]. Power is the autonomy of an actor to pursue his own objectives, capacity is the time and resources that he can devote for this pursue, and knowledge is the ability to articulate in a

communicable way his perspective (methods, tools, vocabulary etc.). The structure of the IS procurement has a great impact on the capability each actor will possess in a specific project. The procurement structure, (i) defines contractual and/or economic subordination relations between actors which largely influence their autonomy to pursue their objectives, (ii) prescribes workgroups' synthesis and decision mechanisms, like steering committees where actors may or may not participate, controlling the capacity they devote to the project, and (iii) defines methods and tools to be used, favouring specific actors and impairing the ability of others to communicate their perspective.

Capability is a compound attribute of actors as it is a synthesis of a number of characteristics. Reflecting on the capability of Users to influence IS projects, we can distinguish cases where they are strong. This is so, either because they have the power (e.g. in the case of retail market software that Users have the autonomy to select), or because they have the knowledge (e.g. in the case of decision support tools that are developed by eliciting User domain knowledge), or because they have the capacity (e.g. in safety critical domains where Users are instructed by their management to devote significant time and effort). Still, in most cases in the services sector, the Users capability is limited due to their lack of autonomy, narrow knowledge on communicating requirements and restricted capacity to put time and effort.

Therefore, in our view user participation alone is not a panacea for ensuring usability. User participation is just one means for the acknowledgement of human activity as a distinct level of interpretation of organizational reality (i.e. perspective). As a distinct interpretation of organizational reality, human activity should then be in a constant dialogue with the business and technical ones. If the future users do not possess the appropriate capability, it is doubtful that they will succeed as an equal partner in this dialogue. Ultimately then, striving for usability is not about some technical ad-ins, it is about fostering the users capability to describe and represent their perspective.

2.6 From conflict between Actors to dialogue between Perspectives

Actors inevitably adopt diverse perspectives in any actual project. Perspectives are particular lenses, different ways of interpreting reality. For the purposes of IS in organizational settings, we may distinguish a fundamental triad, the technical, the business and the activity perspective. The technical perspective is based on technological determinism and order; it refers to the robustness and performance of the system. The business perspective is based on formal rationality and standardisation; it refers to IT mediating business processes to achieve organizational objectives. The activity perspective is based on the phenomenology of work; it refers to actual work practice, i.e. to human activity as it is experienced when in action. This triad bears some analogy to Mitroff and Linstone (1993) Technical – Organizational – Personal (TOP) multiple perspectives model for dealing with organizational

problems. Actors according to their education and role in the project will tend to adopt one or the other.

Typically, IS development in organizational settings is a discourse between the technical and business perspectives aiming to the progressive translation of abstract processes into computer-manageable algorithms and codification. There are of course difficulties in this translation, but both perspectives strive for order and stability. Be it technological determinism or formal rationality, both managers and IT professionals struggle for control, predictability and standardization [Cooper, (2004)]. The activity perspective does not fit well in this discourse.

The activity perspective is often left out –and this, irrespectively of user participation– because it does not fit well into the positivist epistemological paradigm shared by both IT and business level representations. IT and business level representations are abstract notions transcending the individual workers' level. Moreover, they follow a positivist approach in the sense that they are prescriptive, i.e. need to be described independently of particular contingencies. Human activity issues like usability belong in a different world altogether. They are only tentative descriptions of what is experienced –or worse of what will be experienced– by actual individuals in concrete situations; as such they cannot be fully prescribed [Woods (1998)], [Bannon and Bødker (1991)], [Theureau and Pinsky (1984)]. In other words, human activity descriptions are inevitably situated in their perspective and, at least to some degree, interpretivist in their epistemology. This particularity renders their discourse with the business and technical perspectives difficult at best.

2.7 Fostering the Dialogue between Perspectives

Specifying the process of arriving at a high quality IS has both normative and intentional parts. The normative part can be dealt with by prescribing analysis, design and development methods and tools. The intentional part cannot be specified as such, but can be influenced by explicitly reflecting on the different actors perspectives and capabilities during procurement and as the project unfolds. For example, if a Procurer decides for a turn-key contract, he leaves ample space to the Analyst-Developer duo to build a system echoing their perspectives. In such a case he facilitates seamless Analyst - Developer collaboration, and may expect timely delivery, but to the detriment of his or Owners or Users capability to intervene. On the contrary, if a Procurer opts for a design phase clearly separate to development, he promotes independence of analysis and design from the technical part, but to the detriment of flexibility in revising requirements as the system takes shape.

Usability is among the qualities of the resulting system. It cannot be achieved independently from other qualities. The mix and balance between technical, business and activity perspectives is a critical factor for this. How a balance can be achieved in any particular project will vary, depending on the nature and size of the system and

the organizational characteristics of its Procurer and Owner. However, one thing is certain: in order to ensure usability, the acquiring organization needs to explicitly foster the activity perspective throughout the project. As already stated above, the activity perspective, because of its interpretative epistemological underpinnings, is very vulnerable against the positivist rigour of the business and technical perspectives. If not explicitly considered from the initial stages we risk producing an otherwise functional and robust, but unusable system. Late rectifications at the user interaction level, can be either very costly or with questionable effectiveness.

Although such propositions are not new to the research community [Bødker (1991)], [Grudin (1991)], in the services sector this lesson is far from being learned. The activity perspective is very often, quite simply ignored. In other cases it is considered only as a separate task when the implemented systems, well within the specifications agreed between the Procurer and Developer, are found too cumbersome during actual use. Indeed, a common view is that usability methods can be employed to rectify problems of an almost completed system.

Introducing and maintaining an activity perspective throughout a project is not only a matter of specifying and applying the appropriate methods and tools; it is also a matter of ensuring a particular intentional stance towards the project. Therefore, it is important not only to specify methods and tools but also to provide independence to actors who maintain the activity perspective. Independence is particularly important in order to avoid contradictions between different objectives within an actor. Cycles in development and testing are inherent parts of design for usability. But such cycles inevitably burden development. It is only natural that an actor assigned with both tasks, even if he possesses expertise in both domains, will find himself in a contradictory situation, being unable to maintain both activity and technical perspectives at the same time. Although, independence of each perspective is critical, it is also risky. It may well result in a constructive dialogue, but it may also lead to a deadlock. In order to avoid attrition we need to clearly prescribe the conversational character of IS acquisition and prepare actors to anticipate the need for a dialectical process [Gasson (2003)].

For applications not demanding operational innovation, and for applications intended to support individual or small group human activity, business requisites are close to activity requisites. For such systems, a UCD phase may well be performed before technical development starts. In fact, dealing with the activity perspective at the front-end and by designing from the outside-in, the acquiring organisation can secure a high level of human interface design, and deal with the technical side later.

However, when there is simultaneous IS development and organizational change, it is evident that there is no way to apply UCD at an early stage. This is because the necessary business objectives for guiding UCD cannot be specified to a useful level of detail in advance. Such requirements cannot even be regarded as fixed during

development. For example, in large government projects the analysis and development may last for several years. During this time requirements are always subject to revision as development proceeds, changing the nature of future user activity [Underwood (2001)], [Vidgen (1997)]. In fact, as Goguen (1997) observes: *"requirements evolve as system development proceeds, and a reasonably complete and consistent set of requirements for a large, complex system can only emerge from a retrospective reconstruction".*

In such projects the acquiring organization should mainly focus on the process of progressive specification of both business and activity requisites. Therefore, in order to ensure the usability of a large and complex IS the acquiring organization, apart from specifying methods and aspects of the outcome as early as possible, it also needs to explicitly consider the dialectical process of arriving at it.

2.8 Discussion

We have suggested that two decisive dimensions of project dynamics are perspectives and capability (as a function of power, capacity and knowledge). Selecting the actors to be involved and the sequence of their involvement, the Procurer balances the number of advocates of each perspective. Also, more importantly, while defining management controls, delegating decisive powers, allocating resources and selecting methods and tools, the Procurer strongly influences the capability of each actor.

We have argued that in order to ensure systems' usability, the human activity perspective should be particularly fostered to avoid the all too common pitfall of technical and business domination over it. Ensuring the independent expression of the activity perspective is very important but it is not sufficient by itself. The capability of this perspective should also be strengthened in terms of capacity and knowledge. The Users of the system, who are the natural advocates of the activity perspective, even when given a central role and some decisive power in the project, have difficulty in envisioning their future work until they experience the system-in-use. Moreover they are frequently intimidated by IT jargon and have difficulty in communicating their views in a disciplined way. Their views can be supported by introducing an entity having adequate knowledge and provide him with power. This can be achieved in various ways depending on the specificities of each project, but the important thing is to ensure his independence form Developers and Analysts, and to incorporate this role ensuring adequate management controls.

In our view, such an entity can be an expert in ergonomics or HCI. Undertaking an advisory role throughout the procurement lifecycle of the system, this role can mediate with Analysts and Developers ensuring the continued presence of the activity perspective in the dialectical design process. Thus, contribution can be ensured both to the normative part with methods and tools and also to the intentional part, having an effect on the emergent power relations of all other actors. To enact such an

involvement one should ensure however, that the proponent of the activity perspective is not only competent in his own domain, but also sensitive and knowledgeable in the other two; this is more so in large-scale projects, where the technical and business stakes are both complex and high. After all, the resulting artefact is a single entity exhibiting qualities that are affected by all three. Ambiguity in use can equally result from cumbersome interaction dialogue design, as from technical deficits or from poor business logic integrity. The advocates of the activity perspective should have the ability to understand and communicate on technical and business issues and be ready for trade-offs. It is evident that in order to foster usability proponents of the activity perspective need to be given more power to influence the outcome. However, this power increase also presents a new challenge to them, to equally increase their knowledge and understanding of business and technical perspectives. Only then will they be in a position to convince or make judicious trade-offs. We believe that this last issue needs to be given more consideration by the ergonomics and HCI communities in the near future.

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