

Literature Review: User Involvement in System Development

Brian D. Otte

Capella University

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Abstract

User involvement is a critical part of the system development process. This literature review reflects on recent published research which includes information on user involvement in system development. The primary source of research utilized in this literature review is online repositories of peer reviewed journals. This literature review surveys the current research connected with user involvement through the system development process by building upon published research presenting the dominant research in the area. Different methodologies which are available for developer use and abstraction tools that aid the developer with respect to user involvement are presented. This literature review concludes with recommendations for further research with respect to user involvement in system development.

Introduction

The system development process has received interest from researchers trying to define the best practices which will produce a product which is delivered better, delivered in a smaller amount time, and delivered with fewer defects. Part of the system development process requires interaction between the developer and the user. The interaction between the software developer and the user is presented in research as important to the development process, required in some cases, yet at other times contentious. Research has analyzed the interaction between user and developer detailing methods which foster better interaction. Suggested practices have shown that increasing the involvement of the user in the process, produces a better product than minimizing the involvement of the user (Swanson & Ramiller, 1993). This literature review will survey the current research connected with user involvement through the development process. The survey builds upon published research progressing through aspects of system development presenting the dominant research in the area.

Discussion

Discovering areas within Information Technologies (IT) that present opportunities to refine are gems which need attention simply due to the potential they offer the world in improvements and efficiency. Swanson and Ramiller (1993) surveyed the published research to present a map of the gems published in Information Technology journals from 1987 to 1992. Swanson and Ramiller used quantitative methods in an empirical fashion to identify the plethora of topics which they derived from articles published in IT journals. One of the topics discovered by Swanson and Ramiller is user involvement. Swanson and Ramiller state “Research questions

focus on issues of measurement, contingencies influencing the effect of user involvement on project outcomes, and process models of involvement” (p. 309). User involvement is further sub-classified by Swanson and Ramiller with the category users, and they assign the themes: IS-user relationships, user perceptions and attitudes, and user information evaluation and satisfaction. IS-user relationships contain connotations of strategy and planning. IS-user perceptions and attitudes are shown by Pekkola, Kaarilahti, and Pohjola (2006) to affect the development process and it seems difficult to believe that user attitudes would not affect user satisfaction. Swanson and Ramiller state that “The category user involvement provides a prominent and important bridge to the area of user studies via its relationships with user information evaluation and satisfaction and user perceptions and attitudes” (p. 319). User involvement, in system development, has many facets one of which is its relationship to strategy and planning.

User Involvement in Strategy and Planning

User involvement is viewed from many different angles in currently published literature. Strategy is “[a] course of action, including the specification of resources required, to achieve specific objective...” (strategy, 2006, para. 1). Business strategy must align its organization such that the user has the ability to present their information which is pertinent to the system development task. This means that some level of strategic information systems planning (SISP) and the business process (BP) are in a state which foster, and in fact require, input from users. Hartono, Lederer, Sethi, and Zhuang (2003) state that “A gap continues to separate the plans and expectations of the developers of an IS strategy from the actual outcome of the strategy” (p.41). Hartono et al. state that the two practices that directly impact an implementation are

“...responsibility for the implementation’ and ‘user involvement during the implementation’...”
(p. 50). Hartono et al. conducted a quantitative study using empirical methods. User involvement during implementation is one of two practices Hartono et al. found to predict the successful efforts of SISP.

Another component of SISP which the research has revealed is that senior management must buy into the project. Byrd, Lewis, and Bradley (2006) support this view. Byrd et al. define two levels of senior management as the CIO, and an IT advisory committee. User involvement is held with such high regard that Byrd et al. suggest that:

...user involvement in an advisory committee should help them better understand the potential of IS applications and build support for IS planning. Furthermore, these users will be able to be more involved in the SISP process because of the knowledge they gained from their interactions with IS managers and senior managers in an advisory committee. (p. 103).

The suggestion is first to get users input directly involved with, and on the advisory committee. Byrd et al. suggest that the users will gain knowledge from the interactions due to the experience. Byrd et al. conducted a quantitative study using empirical methods. The user involvement that Byrd et al. call for is actually hands-on training which enhances the user and knowledge which the user has with respect to system development processes. Perhaps, as Byrd et al. suggests, adding to the user’s knowledge does help the system development process through the SISP process.

User Involvement through Better Communication

Users and developers must successfully interact to increase the number and quality of successful projects. Pekkola, Kaarilahti, and Pohjola (2006), with respect to their findings, state:

Although direct cooperation between the users and the developers was seen fruitful in terms of generation of suggestions for new features and in establishing a common ground, the interviews with the developers revealed that they did not enjoy the contacts with the users Developers had a need for user input, but no desire for direct communication (p. 25).

Pekkola et al. found that communication is an issue between users and developers. This is an interesting conclusion based on the other research presented thus far which puts such an emphasis on developer and user interaction. However, taken in light of the two completely different domains of interaction which a developer has with systems, and the interaction users have with systems, a gap may exist between the understanding of a developer and of a user. Computer developers are trained to abstract business processes, and apply the process to computer systems, which is a technical field. The computer developer uses different words when describing computer terms like input or output where a user discusses terms like typing or saving documents. These differences are not insurmountable, but can cause tension between the user and the developer. According to Olsson and Gulliksen (1999), "System developers approaching users in a new domain often experience initial difficulties when trying to understand these semantics and associated work practices" (p. 317). One task, which minimizes the difficulties in vernacular understanding, is to obtain a common vernacular between users and developers. Developers and users should share the same understanding about terms to ease the

communication difficulties. Additionally users need to become more knowledgeable about projects and system development.

Pekkola et al. (2006) used mediators to interface between developers and users which helped the communication between the two groups. Philip (2007) envisioned the role of CIO as a technology interpreter who bridged the two different worlds of technology and business. Two different worlds and two different languages are bridged through an intermediary: the mentor role of Pekkola et al. (2006), and the CIO role of Philip. The mediator has proven successful, but is expensive as the mediator is an extra component which may not be needed if both developer and user communicate more effectively. System development requires better communication because the developer and user interact to obtain user requirements.

User Involvement in Obtaining User Requirements

User requirements are needed for successful system development. However, the methods to gain user requirements are open to the developer to choose which methods they would like to use to ascertain the information. There are many published methods to elicit user requirements. Some methods take the process of gathering data and try to get the largest amount of data (Browne & Rogich, 2001), while others may try to get the most precise and applicable data from the research.

Others seek out user involvement via alternative methods in hopes to obtain a larger quantity and different types of user requirements. Jain, Tanniru, and Fazlollahi (1991) propose a method "...for generating and evaluating alternatives when the user requirements are expressed in terms of certain operational criteria such as time, cost, risk, etc." (p. 223). Jain et al. call their approach the multiple criteria decision making (MCDM) approach. Jain et al. break the

requirements analysis phase into two parts: requirements determination, where needs are translated into system requirements and thus translate into system architecture, and requirements evaluation.

Jain et al. (1991) operationalize their research through three objectives: time related, cost related, and risk related. Jain et al. state “In the proposed methodology, a goal programming algorithm is used to generate multiple solutions that will satisfy the system requirements to varying degrees” (p. 224). The results allow the designer to select a system architecture which meets the requirements from the user’s perspective (Jain et al.). Jain et al. use theoretical methods to augment an algorithm which determined alternatives to user requirements and then provide an empirical example where the process is tested with an actual companies’ system design.

Management is willing to contribute time to these processes because according to Jain et al. (1991) “...the methodology made them an integral part of the system selection process” (p. 238). The process requires a ranking of the users’ requests with a relative weight which allows management to maintain a control aspect of the results. Jain et al. propose that management of the process is accomplished through a steering committee.

The method Jain et al. (1991) present is a method which quantifies user’s requests, assigns a weight to them and in the process presents and evaluates alternatives in requirements analysis. The process also allows management to assign different weights to be to the request based on altered priorities. The process attempts to involve users by discerning alternatives to user’s requirements during the requirements analysis. This information is presented to users to engage users with options which are in alignment with the business strategy and ultimately

garner increased user involvement in the process. This method involves an additional entity similar to a mentor that Pekkola et al. (2006) use. Jain et al. requires the use of a steering committee to assign weights to users' requests. These methods seek to increase or manage user involvement. An understanding of how effective these methods are will help the system developer choose a methodology appropriate for the system development process.

Measuring the Effectiveness of a Method Pertaining to User Involvement

Protocol analysis is utilized by Browne and Rogich (2001) to measure the effectiveness of a method to elicit system requirements from users and state that “prompts based on this theoretical analysis are likely to lead to the elicitation of more system requirements from users” (p.246). Communication issues are also discussed by Browne and Rogich; these are issues which exist between user and analyst. Brown and Rogich conducted an empirical investigation resulting primarily with quantitative measures from their research, but they were able to discern some qualitative data from their research. Research has shown that interaction between the developer and user is a topic which receives much attention. Some of the research conducted focuses on the developer's methods or querying the user differently (Pekkola, Kaarilahti, & Pohjola, 2006) (Lamb, & Kling, 2003). Much research is presented to address the developer's interests; tools and techniques help the developer, but the research does not address the underlying interaction issue between developers and users with respect to user involvement. The research primarily attempts to aid the developer (Pekkola, Kaarilahti, & Pohjola, 2006) (Lamb, & Kling, 2003). Research which advocates training or enabling users for the system development process is minimal. Research aids the system development process for efficiency, but does not prepare the user. The end result in system development is a better product as the

research shows that user involvement affects the results of system development, but does this translate to the organizations' financial wellbeing?

User Involvement to Minimize Software Maintenance Costs

Wu (1992) presents an empirical study where an Information Systems (IS) auditor is part of the software development benefiting the software maintenance phase of system development. This is presumably due to a better process of system development. Wu believes that the definition phase contains misunderstandings. Wu states:

In summary, review in the definition phase may be the most effective because if requirements are not clearly understood by system developers, and design specifications do not match user information needs, problems could result such as improper file specification, incorrect programming, inappropriate selection of hardware configuration, and inappropriate reporting. Ultimately, users will request that existing code be corrected or rewritten if the system does not fulfill their information needs (p. 3).

Wu presents another example where a third party is brought into the system development process as an IS auditor. This helps the process, especially with respect to the expensive maintenance phase of the system development lifecycle, and indicates that the information from the user is important with respect to software maintenance. In addition the research presented by Wu also implies that the utilization of system developers is more efficient as they do the job once, but get it right the first time. Wu conducts an empirical examination on the effectiveness of an IS auditor. The issues which exist between the developer and user involvement are only minimally affected, but the results impact the organization financially as user requirements are misunderstood and system maintenance requirements are increased. Research which analyzes

the user, as a separate entity or unit, in the process of user involvement is appropriate as users are an integral part of the equation in user involvement.

Understanding the User in User Involvement

User involvement in projects is an important factor to get input from the users and to understand the need that the user has. According to Lamb and Kling (2003) who discuss information and communication technologies (ICT) state that “The most common conception of the user in IS research is of an atomic individual with well-articulated preferences and the ability to exercise discretion in ICT choice and use, within certain cognitive limits” (p. 198). This is a view which according to Lamb and Kling may not be the best way to view a user. Lamb and Kling discuss that this view, while not wrong, misses some important influences which act on the user and their perspective. Lamb and Kling conduct a “multidisciplinary literature review, and are grounded in our own empirical findings” (p. 198). Lamb and Kling present the view of the user as a social actor. Lamb and Kling form the user as a social actor as they discuss the development of systems:

...with respect to the adoption, development and use of technologies, the actions of organizations are shaped by the institutional environment. From this perspective, we see that social actors are pressured to perform legitimate actions and interactions within institutionalized arrangements (p. 202).

With that understanding Lamb and Kling attempt to reconceptualize the user through socio-technical approaches, socio-constructionist approaches, and institutionalist approaches. Lamb and Kling “inform an alternative view of the ICT user as a social actor characterized by four main dimensions: affiliations, environments, interactions, and identities” (p. 204). This process

will help the user to become more involved with the system development process as the developer will understand the surrounding dimensions from which the user acts and can pose relevant instances which the user interprets correctly and understands the meaning. The user does not share this understanding nor are they able, without training, to utilize this framework.

Lamb and Kling (2003) found that to understand users "...it is critical to examine the network of relationships that call for the exchange of information and the use of ICTs" (pp. 205-206). Thus the dominant view of the user as an atomic unit is not an adequate view of the user. Rather, as Lamb and Kling propose, a view of an ICT user has a higher degree of understandability through "...four interdependent dimensions that emerge from our findings: affiliations, environments, interactions, and identities" (Lamb & Kling, p. 211). The system developer has four dimensions with which to understand a user. However, the developer may not be part of the organization, and the user is not aware of this framework without training, so the user has no dimensions with which to understand the system developer. Lamb and Kling (2003) call for more research on the multidimensional social actor, and see the need for a "...concerted effort by IS researchers to shape a comprehensive understanding of interaction technologies in the network society" (p. 224).

Rowlands (2006) extends the work of Lamb and Kling (2003) on social informatics. Rowlands presents a social actor framework where the "...unit of analysis of their model – the user as social actor – is scrutinized..." (p. 1542). Rowlands data is qualitative and attempts to understand system development methodology. Rowlands studied "IT professionals comprising project managers, systems developers, and method support personnel within the systems support and systems development division" (p.1542). Rowlands (2006) believes "this research has

illuminated the applicability of the social actor framework at the individual, organisational and institutional level” (p. 1544). Rowlands believes that the technology itself relates to the IT worker. Rowlands research used an Australian bank as its focus, and calls for a closer examination of institutional factors that influence the system development method (SDM). Specifically Rowlands believes that cultural, political, and social factors require a closer examination. Rowlands specifically mentions a research topic of the Lamb and Kling (2003) research, which Rowlands did not answer, and reiterates “...the framework needs to more finely consider the impact of the technology itself (in this case a conceptual artifact) on the actions of the IT workers” (p. 1545). The developer has many tools available from current research to aid in the system development process with respect to user involvement. The tools available to the user in research would provide the user the ability to prepare for the process.

Research on the User of User Involvement

The research on the user of user involvement with respect to interaction between user and developer is a topic which still deserves much attention. This literature review has many references which focus on user involvement which research the environment, technology, and the developer in the system development process. This literature review presents recently published research which enforces the belief that user involvement is an important component in system development and calls for more research into empowering the user in the system development process. A method to empower users is through strategic planning.

Organizations need to align Information Technologies (IT) with the Business Process (BP). Much research is focused on the subject of aligning BP and IT. These alignment practices manifest themselves in the daily activities that the company operates. For instance Lamb and

Kling (2003) state "...in industries with high institutional pressures, firms produced more documentation, and so used online services more intensively. In industries with high technical pressures, firms performed more profiling activities..." (p. 214). More institutional pressures result in more documentation produced, which in turn requires more online use. This is an example of the results from business alignment and user involvement from a practical perspective. According to Lamb and Kling "People respond to technical and institutional pressures in their local environments, make constrained choices about gathering data and using information resources, and coordinate with individuals in their own firm and other firms to accomplish their assigned tasks" (p. 215). User interaction with the organization is a result of merging the Business Processes (BP) with the organizations' Strategic Information System Planning (SISP), and according to Lamb and Kling, cannot be viewed separately. Lamb and Kling state "A social actor is an organizational entity whose interactions are simultaneously enabled and constrained by the socio-technical affiliations and environments of the firm, its members, and its industry" (p. 218). Their view appears to give more voice to the user involvement aspects than modern corporations. Lamb and Kling believe that users are not just cogs in a machine, yet the research does not advocate formal training for the user with respect to the system development process. Lamb and Kling state "...IS researchers can address the social actor as an organization member who is representing the interests of the firm or department (as well as her own interests) rather than as a user" (p. 224). Is the user really just a user, or as Lamb and Kling present an organizational member who is representing the interests of the firm? If the user is an organizational member who is representing the interests of the firm, they are part of the process and have a part to play. Users who understand more about the

system development process are also more than just users. Research with respect to training users for optimal user involvement in the system development process is lacking.

Conclusion

The aspect of user involvement, according to this literature review, is important to system development project success. User involvement is surprisingly more important than some organizations give credit or are likely to admit. The ultimate cost of a software package is more than the development costs; software maintenance is also a factor in the total price. Additionally, user attitudes, and willingness to be involved in the process will energize the process as opposed to drain energy and momentum from the process. Pekkola et al. list one key aspect to the success of a project by stating “One person, unaware or unmotivated, could easily spoil the whole situation and atmosphere by having a negative impression of the process” (p. 26). User involvement in the process, as the research has shown, needs an analysis of the effects of training users for system development processes. Specific training for users within system development is also a topic which needs research attention. Having energized, knowledgeable users willing to give important feedback will help developers create a product which is well received, well used, and creates high productivity. Conversely, the other view where users are not energized will produce systems which are only as good as the user has communicated to the developer. Research has shown that user involvement with respect to communication between developer and user is much to be desired.

This is not a call for users to become system developers, as this is not realistic, but rather some level of an introduction into the system development process, and an understanding of the

methodology requiring an investment from the organization. This system development training will provide a knowledgeable user who can contribute throughout the system development process. This user also may become a resource to the organization beyond the initial system development process as this investment is knowledge. The return on investment may show benefits to the user, system developer, software system deliverable, and the organization through the long term.

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