



User satisfaction and system success: an empirical exploration of user involvement in software development

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Published online: 5 November 2016

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Abstract For over four decades user involvement has been considered intuitively to lead to user satisfaction, which plays a pivotal role in successful outcome of a software project. The objective of this paper is to explore the notion of user satisfaction within the context of the user involvement and system success relationship. We have conducted a longitudinal case study of a software development project and collected qualitative data by means of interviews, observations and document analysis over a period of 3 years. The analysis of our case study data revealed that user satisfaction significantly contributes to the system success even when schedule and budget goals are not met. The case study data analysis also presented additional factors that contribute to the evolution of user satisfaction throughout the project. Users' satisfaction with their involvement and the resulting system are mutually constituted while the level of user satisfaction evolves throughout the stages of software development process. Effective management strategies and user representation are essential elements of maintaining an acceptable level of user satisfaction throughout software development process.

Keywords User Involvement · User Satisfaction · System Success · Software Development

Communicated by: Magne Jørgensen, Mika Mäntylä, Paul Ralph and Hakan Erdogmus

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1 Introduction

The success of a software development project is typically measured by various factors that would result in delivering high quality software on time and on budget (Procaccino et al. 2006). Even with all these factors carefully managed, the dissatisfaction of the system users can result in project failure (Montesdioca and Maçada 2015; Wixom and Todd 2005). For more than four decades it has been intuitively accepted and advocated that user involvement in software development can bring about system success (Abelein and Paech 2013; Bano and Zowghi 2015; Cavaye 1995; He and King 2008; Ives and Olson 1984). However a deeper analysis of the empirical literature has shown that user involvement and system success (UI-SS) relationship is neither binary nor direct, and that there are various confounding variables that play their role in a convoluted way to bring about success or failure for the software system (Bano and Zowghi 2015; Cavaye 1995). The UI-SS relationship is a multifaceted and complex concept comprising a combination of various terms that are not used consistently by researchers and practitioners, leading to multiple interpretations.

The first problematic term is “*user*” which is not considered harmoniously in the literature (Iivari et al. 2010). A user can play various roles on different levels in an organization or a team. Typically a user is considered to be someone who would be actually using the system. The definition of a “*user*” is contextual and for any specific software project it depends on the software development methodology being adopted.

Second, in the literature “*involvement*” is used inconsistently as a synonym for “*participation*” and “*engagement*”, even though since 1989, Barki and Hartwick have made a clear distinction to define user involvement as “*a subjective psychological state reflecting the importance and personal relevance of a system to the user*”, and user participation as “*a set of behaviors or activities performed by users in the system development process*” (Barki and Hartwick 1989). Whereas “*user engagement*” has been used synonymously in the literature as an additional term to both concepts of involvement and participation (Hwang and Thorn 1999).

Third, defining and exactly measuring “*success*” is hard and is not addressed uniformly in the literature. A successful system is usually defined by a composite of various performance measures such as time, cost and quality (El Emam 2008; Procaccino et al. 2002). However, due to the fact that most projects are over time and budget, another perspective on system success has been adopted which involves user acceptance and satisfaction and is one of the highly cited factors that leads to system success (Abelein and Paech 2013; Bano and Zowghi 2015; McKeen and Guimaraes 1997). User involvement in software development is meant to bring about higher level of user satisfaction, which is a psychological state that comes when users perceive that they have control over the system development process (Baronas and Louis 1988; Cavaye 1995).

With this ambiguity of words and concepts, the UI-SS relationship is a double-edged sword and requires careful management practices; otherwise it can cause problems and would lead to project failure rather than success. The UI-SS relationship has been studied from various perspectives to determine the best practices for the effective management of user involvement in software development, that is, psychological (Baronas and Louis 1988; Cavaye 1995), managerial (Wagner and Piccoli 2007), political (Robey and Farrow 1982), cultural (Iivari 2006), or methodological (Muller et al. 1997). Viewed from any perspective, the main objective of user involvement or participation is to achieve the benefits that would ultimately be used in measuring system success (Rouibah et al. 2009).

This paper presents the results of our on-going empirical exploration of the UI-SS relationship. This exploration began in 2012 when we undertook a systematic literature review (SLR) in parallel with a case study in a software development organisation. The complete analysis of the SLR was published in (Bano and Zowghi 2015). Our overall research project aims to explore various dimensions, factors and aspects of the UI-SS relationship in order to understand the effectiveness of managing user involvement in software development. The preliminary results of the analysis of our case study data that focused only on the problems and challenges of user involvement in software development were published in (Zowghi et al. 2015). In this paper, we present the complete results of this case study focusing primarily on the UI-SS relationship where *user satisfaction* is considered to have contributed to *system success*.

In our case study, the software development project under investigation was perceived to have been successful because the users expressed positive attitude towards the delivered system. However, we observed that their overall satisfaction evolved over various stages of software development. We identified several factors that were reported to have contributed to the evolution of user satisfaction. We conceived two interrelated aspects of user satisfaction in this case study: user satisfaction with their involvement *process*, and user satisfaction with the delivered software *product*. The main contributions of this paper are two fold: the conceptualization of these two aspects of user satisfaction, and the presentation of the evolving nature of user satisfaction in software development.

This paper is organized as follows: Section 2 summarizes the background on the concept of success and its relationship to user involvement and user satisfaction. Section 3 gives an overview of the research design. Section 4 details the case study design, conduct and results. Section 5 discusses the findings and Section 6 describes the limitations of our study. Section 7 concludes the paper and briefly discusses future directions.

2 Background

2.1 System Success

Measuring ‘success’ has been the focus of much research in various disciplines including information systems, project management and software engineering. Researchers have attempted to explore alternatives to traditional financial measures to understand the multifaceted concept of success (Petter et al. 2008). A number of models for success have been proposed to better understand the factors that impact success and their interrelationship (Ballantine et al. 1996; DeLone and McLean 1992; Seddon 1997). However, what exactly defines a system or a project to be either ‘successful’ or a ‘failure’ is debatable (Dalcher 2009). The traditional view of a successful system is the one that is delivered on time, on budget and is of acceptable quality. Not all projects meet the time or budget limits and yet they are not always considered complete failures (Ralph and Kelly 2014). Success is dependent on the desired outcomes that are expected from the delivered system. Therefore success is often measured or assessed by the criteria that are agreed upon at the outset of the system development (Savolainen et al. 2012).

The dichotomy between a successful and a failed project is also not very distinct; rather, a project can be successful in one dimension and failure in another. At times, this concept is referred to as “challenged” projects (Dalcher 2009), rather than a complete success or an

outright failure (Ralph and Kelly 2014). However, without the satisfaction and approval of the people who will pay for the system and eventually use it, a project can be declared as failure regardless of being delivered on time and according to the budgetary constraints.

2.2 User Involvement and System Success

Ives and Olson (1984) define user involvement as “*participation in the development process by a member or members of the target user group.*”. For four decades researchers have investigated the axiomatic notion of a positive UI-SS relationship. Despite some of the discrepancies in the empirical literature in early research on the topic (Cavaye 1995; Ives and Olson 1984), over the years it has been shown that with effective management practices, user involvement tends to lead to system success (Abelein and Paech 2013; Bano and Zowghi 2015; He and King 2008).

Figure 1 summarizes results from our previous analysis of UI-SS relationship (Bano and Zowghi 2015) by presenting the additional factors that play their role in successful outcome of software systems. This figure includes two distinct but related parts. The top part of the diagram illustrates that the UI-SS relationship is not direct. User involvement/participation leads to target objectives and benefits from different perspectives, which in turn leads to system success. These benefits are based on 5 different perspectives that emerged from thematic analysis of the sample of 87 included primary studies in our SLR. These perspectives are: Psychological, Managerial, Methodological, Political and Cultural. The bottom part of Fig. 1 represents additional factors that also influence the UI-SS relationship.

The overall aim of involving users is to deliver a successful system. However, what exactly is meant by “*success*” is highly contextual and depends largely on various factors making it difficult to measure (Harris and Weistroffer 2009). It has long been recognized that success cannot be assessed purely in economic terms alone. As Cavaye (1995), states this form of evaluation is hard because the intangible costs and benefits of systems are difficult to identify and articulate in financial terms. That is one of the main reasons why “*user satisfaction*” is the most widely used alternative to assess system success in the majority of empirical studies. Users who feel involved in software development will have a positive attitude and perceive the system as more useful, thus they are more satisfied with the system (Klobas and McGill 2010). As the level of user acceptance as well as the understanding of the system increases, the system will be used more effectively, and the increased participation in decision-making leads to a more democratic organizational culture.

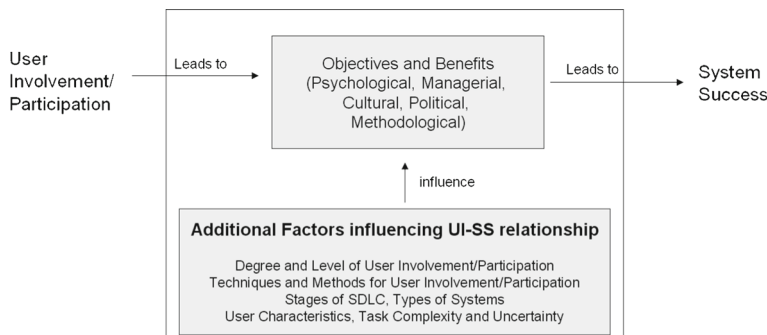


Fig. 1 Factors found in SLR for UI in SD (Bano and Zowghi 2015)

2.3 User Satisfaction and System Success

User satisfaction is both one of the highly cited factors for measuring system success and at the same time considered to be difficult to measure (Melone 1990). The notion of user satisfaction has its roots in psychology and it involves the attitudes and feelings of the users towards some phenomenon in their workplace (Bailey and Pearson 1983). A great deal of research has been conducted to understand the notion of user satisfaction, with the aims to understand the psychological processes related to the performance of a system and to translate them into different levels of satisfaction or dissatisfaction expressed by the user. User satisfaction is a multifaceted concept that has been defined in different ways. For instance, Ives et al. (1983) define user satisfaction as the extent to which a user perceives a system to satisfy their needs. Au et al. (2008) define user satisfaction in terms of a cognitive response based on a pleasant experience from using a system. The notion of user satisfaction has been theoretically explored by Briggs et al. (2012) in order to enumerate the satisfaction effects that can be observed for measurement in any project. Table 1 shows the descriptions of these satisfaction effects:

Following are some of the noticeable research streams on user satisfaction that are generally based on satisfaction effects enlisted in Table 1:

- **Measurement Perspectives:** This stream of research has focused on developing instruments that measure the satisfaction of users with the system. These are built on the assessment of requirements or users' needs being fulfilled (Doll and Torkzadeh 1988; Doll et al. 1994; Ives et al. 1983; McHaney et al. 2002)
- **Attribute Perspectives:** This line of research focuses on characteristics of the systems that are related to user satisfaction. These attributes are judged by the users in determining their

Table 1 Satisfaction effects (Briggs et al. 2012)

| Satisfaction Effect | Description |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Goal Attainment | <i>satisfaction is achieved on the attainment of desired goal or state; dissatisfaction is felt when the desired goal or state is thwarted</i> |
| Confirmation Effect | <i>satisfaction is achieved when outcomes match the expectations; dissatisfaction is felt when outcomes are less than expectations</i> |
| Disconfirmation Effect | <i>a neutral state is felt when outcomes match expectations; satisfaction is achieved when outcomes exceeds expectations; dissatisfaction is felt when outcomes are lower than expectations and desires</i> |
| Anticipation Effect | <i>satisfaction or dissatisfaction depends on future goal attainment where the goals have not yet been achieved or thwarted</i> |
| Nostalgia Effect | <i>satisfaction or dissatisfaction depends on the past experience of goal attainment or failure to attain goal</i> |
| Differential Effect | <i>multiple users associate different levels of satisfaction to the attainment of a goal of the same utility</i> |
| Hygiene Effect | <i>only neutral or negative feelings are associated with goal attainment and never positive</i> |
| Mentor Effect | <i>feelings of satisfaction or dissatisfaction depends on discussions with trusted advisors</i> |
| Mixed Feelings | <i>feelings of satisfaction and dissatisfaction at the same time</i> |
| Attenuation Effect | <i>feelings of satisfaction or dissatisfaction change over time</i> |

Attenuation normally refers to a reduction or loss of something, not something that can increase as well decrease. The use of this term by Briggs et al. (2012) can be misleading. However we will stick to the term as provided in the paper by the authors

- satisfaction with the system, e.g., system flexibility, reliability, usefulness (DeLone and McLean 1992, 2003; Gregor 2006; Hirschheim 1989; Lawrence and Low 1993; McKeen et al. 1994).
- Goal Attainment Perspectives: Various empirical studies have focused on the Goal Attainment Model (Briggs et al. 2006; Reinig 2003) which gives rise to predictive theories of satisfaction (Gregor 2006) where the users will be considered satisfied once their goals are achieved.
 - Confirmation Perspectives: This line of research is also based on predictive models that are based on *Confirmation Effect of Satisfaction* (Bhattacharjee 2001; Igbaria and Wormley 1992; Rushinek and Rushinek 1986).
 - Disconfirmation Perspectives: Another predictive model based perspective for the studies on satisfaction are based on the expectations of the users from the system in comparison to the actual achievements of goals and desires (McKinney et al. 2002; Oliver 1996; Srijumpa et al. 2002; Suh et al. 1994; Susarla et al. 2003).
 - Aggregated Models: Several studies have combined different models of satisfaction in order to gain a more complete understanding of the notion of satisfaction (Liu and Khalifa 2003; Palmer and Griffith 1998; Yoon et al. 1995).

Although the relationship of user satisfaction to system success has been studied extensively over the last four decades, not much attention has been paid to investigate UI-SS relationship that focuses on user satisfaction contributing to system success.

3 Research Design

Our empirical research commenced with collecting data from two case studies¹ conducted under the constructivist research paradigm, in parallel with the analysis of data from a SLR (Bano and Zowghi 2015). In this section we give a detailed description of our integrative qualitative study.

Our research project began by conducting a minor literature review to gain just enough information on user involvement to understand the basic facts and concepts and to inform our conversations with practitioners to scope the focus of the case study. Later, as we appreciated the complexities of the concepts of user involvement, and in parallel with data collection, we conducted a systematic review. The primary interest of the SLR was to provide the basis for our ongoing research about user involvement and to increase our understanding for the work carried out in this field. The SLR resulted in 87 primary studies published for the duration of 1980–2012, out of which 68 % showed a positive UI-SS relationship. The results of the SLR were used to analyze the data collected from the case studies. Figure 2 represents the overall research design; the parts shaded in grey have been completed so far.

According to the results of our SLR, the highly cited benefits of user involvement were to achieve ‘user satisfaction’ and ‘system acceptance’. In our case study we aimed to investigate

¹ Only the first case study is presented in this paper; the data from the second case study is currently undergoing analysis and the results will be published in the future.

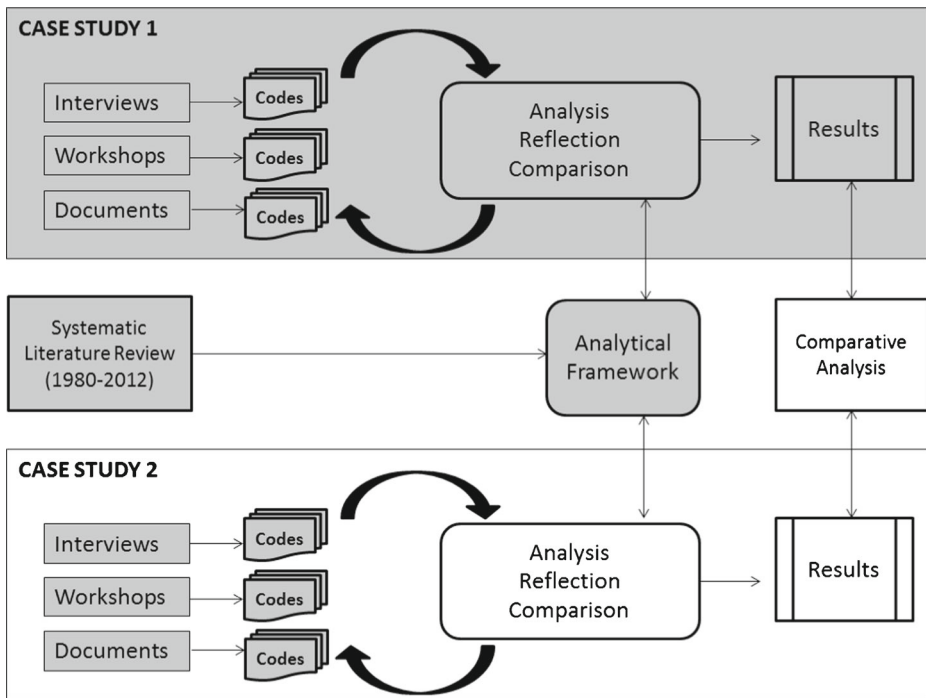


Fig. 2 Research design of the longitudinal study

user satisfaction within the context of UI-SS relationship. We have thus adopted a bottom-up approach for analyzing the case study data (Fig. 3).

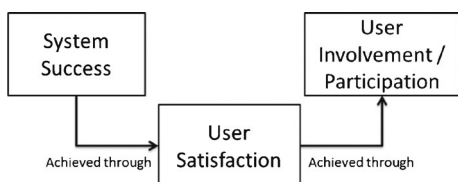
The case study was longitudinal in nature where data was collected in four stages of the software development, which enabled us to analyze patterns over time to see how user satisfaction was achieved through user involvement and participation. In this case study our main aim was to discover how the *process* of involvement contributes to *user satisfaction* with the resulting *product* (i.e., the software system). We had two main research questions for our case study:

RQ1: What is the relationship between satisfaction of the users with their involvement in the software development and their satisfaction with the resulting system?

RQ2: How does user satisfaction with their involvement and the resulting system evolve during the software development leading to system success?

Case studies are widely acknowledged for their applicability to real-life contexts or industrial settings, and their flexibility, in which the researcher uses multiple sources and employs a variety of methods for data gathering (Myers 1997). The case study presented in this

Fig. 3 Bottom up approach for data analysis



paper (case study 1 in Fig. 2) was exploratory and interpretive in nature (Walsham 1995, 2006). An interpretive qualitative research inquiry is based on the assumption that the reality can be understood through the social construction of language, consciousness and shared meanings (Myers 1997). A phenomenon under this research paradigm is understood through the meanings assigned to it by the people in that social context. The role of the researchers in this paradigm is challenging in order to objectively study and analyze the interpretations of a phenomenon as reported and experienced by other people. To ensure the credibility of our research under this paradigm, we collected data from multiple sources (i.e., data triangulation) and used an iterative analytical approach, including emails and follow up interviews with the case study participants, to confirm our interpretation of the data.

4 Case Study

We found no longitudinal study in our SLR that has collected data over a considerable period of time to study how user satisfaction with their involvement or the delivered system changes over different stages of software development. This presents an acceptable justification for the conduct of our case study. A much deeper analysis is needed to understand the complex interplay between user satisfaction with their involvement (process) and their overall satisfaction with the resulting system (product) in the context of UI-SS relationship. We thus analyzed the data collected from this case study using the specific lens of user satisfaction in the UI-SS relationship.

4.1 Organizational Context

The case study was conducted in a financial institution of one of the Australian State Government organizations (ASG).² One year before the commencement of the case study project, ASG conducted a large-scale survey among its clients as part of the “*Client Experience Program*”, whose main aim was to improve the clients’ experiences with ASG. The survey results identified that clients of ASG wanted to use better technology in their transactions with ASG and to simplify their work. One element of ASG’s strategy to address this expressed need was to replace the existing Client Information System (CIS), a bespoke Lotus Notes based software, with Microsoft’s Client Relationship Management System (CRM project) for the internal users (Clients Relationship Team) within ASG. The second part was dedicated to the development of a web portal (Portal project) to enable their clients to conduct their day-to-day transactions with ASG through a secure online access. The presentation of our case study conduct and findings in this paper will be structured according to the two projects of the larger client experience program (i.e., the CRM project and the Portal project).

ASG engaged an External Consulting Company (hereafter referred to as ECC) to customize Microsoft’s CRM product according to ASG’s needs. ECC specializes in customization of Microsoft products. They were discharged with the duty of eliciting specific requirements from the ASG internal users for software customization as well as managing the full development of the CRM and Portal.

² The real name of this organization cannot be mentioned due to ethical considerations and a non-disclosure agreement signed by the researchers.

The software development methodology adopted was mainly plan-based Waterfall with occasional prototyping. ECC had already started the requirements elicitation phase and initial development when we commenced our data collection. In the CRM project the ECC lead consultant was collaborating with an internal IT development team to communicate with the business unit within ASG (see Fig. 4). Major participants for this case study were selected from a small internal team of developers from ASG including the Technical Project Manager (TPM), Project Manager (PM), Business Analysts (BA), the Subject Matter Expert (SME) from the Client Relationship team, and the lead consultant from ECC. Figure 4 presents the communication structures among all the stakeholders and participants.

The case study was conducted over two sequential projects (i.e., CRM and Portal). In the CRM project, a developer from ECC was largely in charge of the customization effort, assisted by ASG internal developers. In the Portal project, the ASG internal development team led the implementation, and the developer from ECC was only assisting for specific Microsoft customization efforts. At a critical stage of the larger project (between the conclusion of CRM and at the start of the Portal stage), the Technical Project Manager from ASG was sacked and subsequently replaced by a new manager who introduced agile practices such as standup meetings, frequent releases of prototypes to users, weekly project meetings involving all team members including the SME, and formal review of all documentations. Monitoring and controlling the project was changed so that the ECC staff reported to the ASG Project Manager rather than the TPM as had occurred in the CRM project.

4.2 Data Collection

We collected data in four rounds over the various stages of development of CRM and Portal projects as shown in Fig. 5. Our data gathering activities included semi-structured interviews,

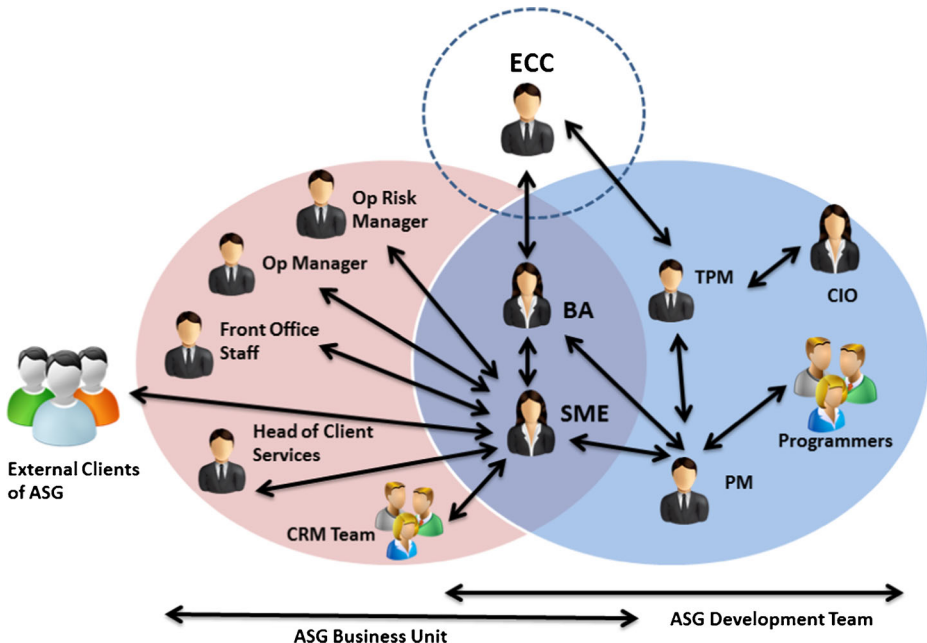


Fig. 4 Communication structure in asg

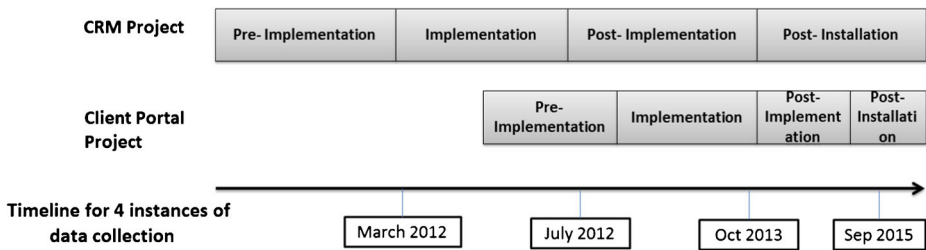


Fig. 5 Timeline of data collection at various stages of CRM and portal

informal face-to-face and phone conversations, and follow-up questions and responses by emails. Three other data sources were used, namely, observations in various workshops, project documentations, and hand-written notes of informal conversations with relevant ASG employees. The multiple sources of data allowed the ‘triangulation’ of evidence that improves the reliability and the validity of the data and findings.

4.2.1 Interviews

We conducted a total of 29 semi-structured interviews with 12 subjects: 5 people were interviewed once, 3 interviewed twice, 3 interviewed 3 times, 1 person (Subject Matter Expert) 4 times, and 1 person (Project Manager) was interviewed 8 times. All interview recordings were professionally transcribed. Suggestions from key stakeholders and users within the organization determined the list of those to be interviewed. In the first instance the Chief Information Officer (CIO) arranged an interview with the Technical Project Manager, who then introduced us to the Project Manager. The PM suggested staff members from different business units to be interviewed based on the relevance of their position in the ASG and their stake in the project. Interviewees included the Principal Consultant of the ECC, Business Analysts, Client Relationship Managers, Operations Managers, Risk and Compliance Managers, an in-house programmer, and the Head of Client Services who was also the Project Owner and a Steering Committee member.

One of the Client Relationship Managers considered as the Subject Matter Expert was assigned by the Head of Client Services to the project team as the business representative (product owner) with the authority to review and sign off project-related documents. She was interviewed 4 times and played a crucial role both in the SD project and in the information gathering of our case study. The SME attended all the relevant project meetings and was the main source of information about the system being developed for all her team members. She also was responsible for collating and consolidating opinions and feedback of her team to the project team throughout the stages of software development. She was the main reviewer of the specifications and the primary point of contact for both the business unit and the development team and acted as a bridge in articulating the requirements of both the internal and external users (see Fig. 4). As the project unfolded and participants mentioned other important users, the interviewee pool was expanded in consultation with the PM.

Each interview typically lasted between 30–60 min. As Hartwick and Barki (1994) emphasise, it is important that subjects report “*whether or not events have taken place*” rather than giving “*subjective assessments of an abstract concept (i.e., participation)*”. This approach “*does not rely on users’ self-assessments of the relative importance of different participation dimensions or different participation activities*”. The dimensions of participation and their

importance are empirically derived from responses. We mostly followed this approach in our case study.

The first round of interviews occurred during the CRM project's development stage. All subjects answered a core set of 20 questions, and the BAs answered an additional 3 questions (see Appendix A). Participants described their role in the organization, and reported when and how they had been involved in specific activities including scoping, requirements gathering, design workshops, reviewing specifications, user acceptance testing, training, and post-implementation evaluation.

We conducted the semi-structured interviews with an initial set of questions and when appropriate, we sought more detail on unanticipated areas of inquiry, drawing out implicit views and deeper accounts of participants' actions. We also included some informational questions to understand the SD methodologies used, project time-lines, budget, personnel, and employment background with the ASG. Although most of the interview questions required answers based on facts rather than opinions, unlike Hartwick and Barki (1994) we considered that people's evaluation of how the project and user participation could have been improved was indeed very relevant, and hence we elicited some subjective responses as well. These personal insights and perceptions are important for our analysis in this paper as we consider the satisfaction of the user as part of their attitude towards the system. Users' feelings about the process of involvement and software product, has more influence in shaping their level of satisfaction. The user who was identified as a "*champion*" (i.e., the SME), appeared to have no hesitation about sharing her subjective assessments about the project and the consolidated view of both internal and external users of the end product. In this first round of interviews, two very specific questions were asked of the participants about their satisfaction of being involved in the project thus far (see Appendix A for full set of interview questions):

14. Are you satisfied with the extent and degree of users involvement in this project so far?
15. If not, why not? If yes, why?

The second round of interviews was conducted during the implementation of the CRM project. With the new interview instrument informed by our initial analysis of the first interviews, we focused on the CRM project's implementation phase and the expectation of the respondents of the system to be installed.

We designed the questions for the third round of interviews to analyze the post implementation stage of the CRM Project and during implementation of Portal project. The third round of interviews required a small number of key participants (the SME, BA, PM, and CIO) to reflect back on the whole project, and to compare the differences in processes and outcomes between the two releases of the project (CRM and Portal). In some instances respondents were also asked to provide feedback they had received from ASG clients who were external users of the Portal. The two specific questions that were asked from the participants in the second and third round of interviews in relation to their satisfaction with the process and the product were as follows (see Appendix A for post implementation interview questions):

18. Are you generally satisfied with the delivered system?
19. Do you feel that your voices as users have been heard and taken into account?

Finally, over a year after the CRM and Portal had been installed and used, we conducted an interview with the SME. The purpose of this interview was to ask her to reflect over the entire software development process and also the usage of the system following its installation. We

sought information on the use of both systems by internal users and external clients of ASG, to examine the evolving nature of satisfaction with their involvement and the resulting system. In this last stage of interviews, we were unable to interview the original PM, BA, or CIO because they had either left the organization or were on leave. However, we consider the data gathered by this one interview to be an excellent source of information and a faithful representative of the rest of the stakeholders because the SME shared the results of a *customer experience survey* that an external consultant had conducted to assess the satisfaction of ASG's external clients with the system. The SME also painted a full picture of how the project had continued after installation and described her emerging role in ASG resulting from her full participation in the CRM and Portal projects.

4.2.2 Workshops

Concurrent with the first round of interviews we attended 4 on-site project workshops where representatives from different business units of ASG were participating. Three were design workshops and one was a “*review wireframe workshop*”, each lasting 2–4 h. First, we identified the attendees and their organizational role. Second, we took handwritten notes of observed interactions between the workshop presenter (ECC consultant) and specific users. Third, we wrote up our reflections immediately following each workshop, focusing on the roles specific attendees appeared to play, their individual communication styles, the facilitator's communication style and presentation methods, and users' expressions of positive and negative affects about the software development project.

In the final stage of our data analysis we reviewed these reflections, identifying whose voices had been the most prominent, which issues they had raised as concerns or criticisms, and whether the participants had expressed similar concerns during our individual interviews with them. Thus the workshop observations both enhanced our understanding of organizational and project's social dynamics, and also later helped validate our interpretations of the analyzed interview data.

4.2.3 Document Analysis

We received 16 project documents for analysis that we categorised by the organisational author: generated by the ECC; developed by ASG; and a survey document from a major external consulting firm. We reviewed and analysed all these documents to obtain a more holistic understanding of the project aims, user roles, requirements gathering processes, project management processes, and the internal evaluation of the successes and failures of the project.

4.3 Data Analysis

The case study spanned 3 years with four stages of data collection including the occasionally overlapping of data collection and analysis stages. Some significant delays in the project timeline, along with researchers' availability, impacted the timing of the interviews. There were four interview phases: 1) pre-implementation of CRM, 2) during implementation of CRM and pre-implementation of Portal, 3) post-implementation of CRM and Portal, and 4) post-installation of both.

We conducted our analysis iteratively over 2 years using NVivo for the “*thematic data analysis*” (Cruzes and Dybå 2011; Dybå et al. 2007). As mentioned earlier (Fig. 2), our SLR

about the UI-SS relationship (Bano and Zowghi 2015) was conducted concurrently with the data collection and initial analysis steps. We first aggregated the answers to all the respective interview questions. During the semi-structured interviews we often asked follow up questions to probe deeper into the relevant concepts. We coded the transcripts of those responses to the first level nodes of the main questions (from which they emerged) that we created in NVivo.

Later when we were analyzing the responses to other interview questions in the entire set of transcripts, we discovered that references were made to the concepts of user satisfaction with the “process” and the “product”. Hence we used these references in our iterative analysis for second level of nodes in NVivo. For example, when respondents discussed the challenges and problems of user involvement they expressed their frustrations, whereas instances where benefits of UI were mentioned, the respondents showed positive emotions of satisfaction. Additional themes relating to the perception of user satisfaction emerged during data analysis that we captured as new nodes in NVivo for third round of coding and analysis, for example, what factors contributed to satisfaction/dissatisfaction of users.

We created an additional hierarchy of nodes (from workshop observation and project documents and personal notes) related to the interview questions. We regularly discussed findings, shared hunches, elaborated nascent concepts, and sharpened our analytical categories.

In the final iteration we conducted focused coding concentrating now on our key analytic ideas i.e., “*user satisfaction with process of involvement*”, and “*user satisfaction with product*” with sub categories as the stages of SD, and factors that influenced the user satisfaction. In our final iteration of data analysis, we selectively coded only for significant references to our two research questions, sorting the key concepts and categories we had captured in our theoretical memos.

The insights we gained primarily arose from iteratively coding the data, and our continued reflection upon, and discussion about, the information in the transcripts. In addition to the analysis of interview transcripts and analysis of multiple sources, we interviewed the SME (who was often described by participants as the ‘user representative’ and ‘product owner’), 1 year after the entire system was installed. Our objective was to invite additional reflection on, and confirmation of, the evolution of user satisfaction with the effectiveness of their involvement and the delivered software. These specific four transcripts of interviews with the SME were analyzed multiple times from different viewpoints in relation to the accumulated factors that emerged from other data sources (e.g., Post-implementation reviews).

4.4 Results

During analysis we categorized the results based on the four stages of software development process of data collection: pre-implementation (participation in requirements elicitation, analysis, design related activities, negotiation and prioritization of requirements), during implementation (review of prototypes, providing feedback about the development processes, attending stand-ups and project meetings), post-implementation (User Acceptance Testing, training, raising change requests, attending the post-implementation review meetings and to resolve outstanding issues), and post-installation (1 year after the users have been using the system). We first give a brief overview of user satisfaction and the turn of events over the course of the project based on these 4 stages:

- Pre-Implementation

In pre-implementation, relevant users were expected to be heavily engaged with the project team to develop, negotiate, and agree on the specification. A significant number of challenges were observed during the CRM stage of the project. The most noticeable related to the communications skills and expertise of all parties concerned, followed by the efforts required by the users to be effectively involved, the SME's unfamiliarity with software development, her availability, and taking appropriate actions in a timely manner. Many of these challenges were addressed and resolved in the second phase related to the Portal.

- During-Implementation

During the CRM phase of the project, using a waterfall plan based software development process (with some prototyping), which was mainly controlled by the external consultants, user involvement was limited and largely ineffective. Various problems were reported that ultimately led to ASG management making drastic decisions about changing both their processes and project management style. During the Portal phase, ASG introduced a few agile practices such as daily stand-ups and formal review processes. Control of the project was transferred completely to the ASG team and the ECC's involvement in decision-making was significantly reduced. Through incorporating a few agile practices and changing the project into fully in-house development, users were actively involved in the Portal project and were given frequent prototypes to review and give feedback. Case study participants reported increased level of satisfaction with the process (section 4.4.1) and the delivered system (section 4.4.2).

- Post-Implementation

In the CRM stage, User Acceptance Testing (UAT) was delayed, training was unsatisfactory, Post Implementation Review (PIR) was ineffective and users overall were raising many issues and concerns. We observed that the changes made by ASG management to the software development practices, resolved many of these issues in the Portal stage of the project. Case study participants declared that the SME and the BA played crucial roles in the project. Their skills, motivation and attitude was reported to contribute significantly to the success of this project.

- Post-Installation

In comparison to the post implementation stage, based on the reported benefits of users involvement (Table 2), the satisfaction level of users was perceived to have increased in the post-installation stage. There had been a transition in the SME's role from *user representative/champion* to *product owner*, based on her active involvement throughout the project and her attainment of an increased level of understanding and knowledge about the product. The system was reported to have been used effectively both internally and externally and the benefits of the system in addressing the overall IT strategy of ASG seem to have been fully realised. Both internal and external users of the system had not reported any noteworthy issues with their usage of either of the systems. ASG engaged external consultants to carry out a "client experience survey" and all the responses around the Portal system were very positive. In relation to the more than expected high number of positive responses received from this survey, in the last interview the SME mentioned: "*those who did our survey said they are not the kind of numbers that they normally see*".

Throughout the above-mentioned 4 stages of data collection we closely analysed the two aspects of user satisfaction with: the process of involvement, and the end product. In relation to

Table 2 Summary of user satisfaction observations from case study

| Stages of SDP | | CRM Project | | | | |
|-----------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| | | Pre-Implementation | Implementation | Post- Implementation | Post- Installation | |
| | | | | Portal Project | | |
| Pre-implementation | Implement ation | | | Post-impltn | Post-installati on | |
| Dates of Data Collection | | March 2012 | July 2012 | October 2013 | September 2015 | |
| Responses to Satisfaction | Level of Involvement | Partially Satisfied | Partially Satisfied | Fully Satisfied | Fully Satisfied | |
| | Effectiveness of Involvement | Not Satisfied | Partially Satisfied | Partially Satisfied | Fully Satisfied | |
| | User representation | Fully Satisfied | Fully Satisfied | Fully Satisfied | Fully Satisfied | |
| | Top management support | Partially Satisfied | Partially Satisfied | Partially Satisfied | Fully Satisfied | |
| | User-Developer Communication | Not Satisfied | Partially Satisfied | Partially Satisfied | Partially Satisfied | |
| | System usage | Not Applicable | | | Fully Satisfied | |
| | System quality | Not Applicable | | | Fully Satisfied | |
| Category of satisfaction | | PROCESS of User Involvement / Participation | | | | |
| | | PRODUCT Expectation | | | PRODUCT Realization | |
| Top Problems and Challenges of UI | | - Miscommunication - Conflicts | - Managerial Problems | - Ineffective training - Time delay - Cost overrun | - Negotiation | |
| Core Benefits of UI | | - Better understanding of user requirements - Developing realistic Expectations - Facilitating knowledge-sharing - Helping in conflict resolution | - Better understanding of user requirements - Facilitating change - Improving users' skills (training) | - Assist in maintaining long term relationship with users - Better communication - Facilitating change - Improved management practices - Improving quality of resultant application - Improving users' skills - Positive perceptions of team members - User system acceptance - User system satisfaction | - Assist in maintaining long-term relationship with users - Better communication - Democracy in workplace - Facilitating change - Facilitating knowledge-sharing - Improved management practices - User system acceptance - User system satisfaction | |

their opinions about the product, in the early phases of the SDP our data analysis was primarily about their *expectations* while in the later phases it was about product *realisation* as depicted (see Table 2). We now discuss the important emerging factors that were observed to be affecting both aspects of user satisfaction throughout the SDP.

4.4.1 User Satisfaction with their Involvement and Participation (Process)

The “Attenuation Effect” (see Table 1) of user satisfaction was prominently observed in various stages of software development. The post-installation phase showed a higher level of satisfaction from the users regarding their involvement in software development in comparison to the Pre-implementation phase. In this case, the SME was fully involved and participated throughout the SDP, but not all the relevant stakeholders were motivated to participate. For example, the PM stated “*key users...[were] reluctant to get involved*”, and

identified “*stubborn users ...ultimately if people choose to ignore things that are put out and not listen then there’s not much we can do*”. The BA also highlighted: “*I don’t think the people really took it seriously to review those requirements because during the peer review we didn’t really have many comments or feedback*”. Even though there were problems and challenges reported during each phase of the SDP, post-installation reviews and the SME’s assertions during interviews showed a higher level of satisfaction with their involvement and participation in all stages of software development. For example, in the second round of interviews when we asked: “*Do you feel that your voices as a user has been heard and has been taken into account?*”, the SME responded: “*I think it has to a point*”. But by the third round of interviews she stated that her involvement was “*much more effective*” because she “*could see more positive results coming through*”. Upon the completion of our analysis, we developed a thorough understanding of the big picture and observed that various factors played important roles in user satisfaction with their involvement throughout the project. These factors are as follows:

Level and Degree of User Involvement and Participation The project had varying levels of involvement of users throughout its different phases. In the CRM phase, users were involved during pre-implementation and post-implementation phase but not much during the implementation. This created a feeling of isolation from the project for an extended period of time. Once the users were called upon to engage with UAT, they needed to be reminded about what the system was all about and the UAT being delayed compounded this situation. However, in the Portal phase, the users were actively participating in the stand-ups and were given prototypes regularly to test and give feedback. Hence when UAT began, they already knew the system well and had developed a sense of ownership and control. This evolving level and degree of their involvement ultimately impacted their opinion on the effectiveness of the process of user involvement. In the third round of interviews one person’s remarks captured the sentiments of others: “Overall you feel satisfied when you feel that your voices are being heard, what you say matters and make a difference”.

Effectiveness of User Involvement and Participation Involving users during software development requires time, cost and effort, and requires careful management and planning. Not all users carry equal importance to the system. It is crucial to select the “correct and key” people with right expertise, motivation and communication skills for user representation. In the case study the “impressive” SME played this critical role from Pre-implementation to Post-installation and was appreciated by both management and other team members of the team for her excellent contributions. This had a huge impact on the outcomes of the satisfaction of the users. According to the BA, the SME “made herself available...was very vocal as well which was good...willing to speak up”.

User-developer Communication Software development is arguably as much a linguistic activity as it is a technical one. Communication between users and the development team is considered a vital aspect of user involvement and participation in an SDP and can turn the tables at any time if not carefully handled. The main criticism of communication skills came from the users, as the PM, the SME and the BA all indicated that the ECC had not communicated effectively in a number of areas. Information overload resulted in

the main users being “*probably more informed than they’d like at times*”, the PM said. Likewise, the SME described the CRM workshops that the ECC ran as a “*nightmare*”, and “*disorganised and ineffective...repetitive*” meetings caused “*frustration*”. Differences of opinion, disagreements about goals, and conflicts about what should have been delivered, can arise in any SD project. Users reported conflicts that arose at various stages of the project life cycle. These conflicts produced delays, generated mistrust and user dissatisfaction, and ultimately propelled management to change project roles, and personnel for the Portal phase. Introducing some agile practices such as regular feedback though providing prototypes to the users surely assisted in enhancing the communication between the business unit and the development team but even in the last interview the SME referred to the communication being a challenge when she referred to the need for a skilful BA by saying: “*I just want to have someone who understands and can interpret what I need to a programmer*”.

User Representation Identification of the right type of users, who will be involved, and who will participate is a key factor in effective management of user involvement. There are three categories of users (Eason 1989): primary, secondary and tertiary. “**Primary users** are those likely to be frequent hands-on users of the system; **secondary users** are occasional users or those who use the system through an intermediary; **tertiary users** are those affected by the introduction of the system, or who will influence its purchase”. Not all the users participated equally in the project and their presence in the meetings was not of equal importance. However, they considered themselves to be involved because the SME regularly communicated to them about what was going on and at the same time took their consolidated opinions back to the development team. The choice of user representative (i.e., the SME) played a pivotal role in system success as she was trusted and admired by all her own team members as well as the development team for her professional and personal qualities and high degree of motivation. Our analysis revealed that the SME possessed a number of personal attributes that resulted in her colleagues regarding her as a “*champion*” or “*key*” user. She was an effective communicator, highly committed and motivated, organized and methodical whilst also being flexible when necessary. She had a can do attitude, was both consultative and assertive, all qualities which contributed to her being an effective decision-maker.

Top Management Support The level of management support people referred to was dependant on their own positions, either as employees within a very hierarchically structured government organization, or, in the case of the ECC, as an external service provider dealing with that same hierarchy. Therefore, we might assume that individual perceptions of the degree of managerial support were influenced both by people’s professional status in relation to the organization, and also by their own power to resolve problems. The management’s support played a crucial role in keeping users’ motivation for involvement and participation, as reflected by the SME’s responses. Her opinion about the management support evolved throughout the project. In particular, this was apparent when the management took action in response to her complaints at the end of the CRM stage and made changes to project processes and governance in the Portal stage. Also, management had promised to support the Client Relationship team when the SME was seconded to the CRM project two days a week but this did not happen effectively and the SME ended up working many weekends and long hours to cope with the additional responsibilities. However, they finally made additional resources

available in the Portal stage. As the SME said: “*we were lucky we did argue for an extra resource and we did get [another person] on Board*”.

4.4.2 User Satisfaction with the System (Product)

“Mentor”, “Confirmation” and “Goal attainment” effects (see Table 1), were observed regarding user satisfaction with the software system. The SME played the role of user representative and her opinions and feedback regarding her satisfaction were observed by the researchers to have impacted other users’ attitudes towards the system. Her role changed from representative to product owner by the post-installation phase due to her level of knowledge of the system gained throughout her involvement and participation in the software development process. The SME expressed a high level of satisfaction with the system and considered that the system has become “*vital to [their] jobs*”. She was pointed out in her post-installation interview that “*we had a vision a long time ago about what we wanted We never thought at this stage ... how important the portal is to our business ... we never thought it would become this important to us.*” She declared: “*So it (system) has very broad acceptance...I think they (users) are very happy with it (system)*”.

We perceived that the following factors emerging from our thematic analysis have contributed to the user satisfaction with the resulting system (product):

User Expectations In initial stages of the development, we came across many instances from the PM, SME and CIO of the ASG that the vendor promised more at the outset than what they actually delivered, hence raising the expectations of the ASG staff. The PM identified: “*a feeling at the start that the issue of Lotus Notes integration was not made explicit enough by the vendor*”. In the CRM project, apart from the SME who spent a substantial amount of time participating in the SD project, other users were not active participants. The SME considered that management had not clearly articulated at the outset what the degree and level of her involvement would be. Furthermore, the responsibilities of the ECC manager (who conducted all the requirements elicitation and design workshops) were not clarified. The SME was dissatisfied with how the ECC manager handled the process of requirements elicitation during the workshops for CRM. These workshops did not have clear agendas, no minutes were taken, and often it seemed that no follow up actions were taken. Overall, from her comments we inferred that her expectations of the ECC were not met in the CRM project. The BA believed that the business unit was not deeply involved enough in UAT for the CRM project and therefore did not get well enough acquainted with the software.

However, in the post-implementation stage, the delivered system was considered to have exceeded users’ expectations and offered more than what they initially expected. In the last interview, the SME stated: “*we are actually closer to our clients because of the portal because we see everything they’re thinking about doing and they look to us more regularly now because we have daily updates for their balances and we have daily statements there so they log-on much more often now and look at what we got to offer or what reports we have there for them, what statements, what balances and it’s probably at this stage still a slightly underutilised opportunity for us to build on the*

contact we have with our clients but I think it's been a very positive outcome from our point of view."

System Quality If we consider the quality of the system only by its fulfilment of all user needs, then according to the overall interview responses, the system delivered the functionality that had been specified by the users.

The BA collated feedback and worked "*closely*" with users, communicating their requirements directly to the IT group, so the Development Team could just "*focus on development*", delivering a successful system. This perspective was supported by others in the ASG; for example, from the development side the PM said that programmers could "*concentrate more on the development and the coding side of things*" because the BA "*was doing most of the communications with our users*".

Decisions about system design will be better informed when they are based on users' understanding, skills and their workplace environment. Development teams need to have a contextual or situational understanding of how the software is to be used, and who will be using it if they are to design systems that will be relevant to both organizational needs and users' capabilities. However, to maximize this potential benefit users must possess the requisite technological and/or domain application knowledge to communicate their needs to developers. In this instance, during the CRM project Business "*were being asked questions that they didn't have sufficient understanding on how to answer them*".

System Usage The Post-installation phase showed that the new system had become valuable to the users. According to the SME: "*.. it [system] has very broad acceptance... I think they [users] are very happy with it*". Internal users did not resent the time they spent testing prototypes because the end product would match their requirements. Although testing the development system "*took more effort*" and "*they needed to be more involved*", the result was that they were "*much happier with the outcome*". In our last interview with the SME, in response to the CRM/Portal system's acceptance she stated, "*It's become vital to our job, we're very dependent on CRM now*". Although we observed a high level of acceptance of the system, we should point out that ASG staff and their clients did not have any choice about using the system because there were no other alternatives available to them once the system had been installed.

User Attitude Towards the System Users showed positive attitudes towards the system because user involvement had created a positive psychological feeling of control in the system development, which resulted in the perception of ownership of the delivered system.

During initial stages of development there were reports of negative user attitudes towards the change that the system was going to bring. "*Users' resistance to change*" was mentioned by the BA. She suggested that such legacy thinking might be related to some users' inability to understand written requirements or to follow what had been agreed on in workshops. Later they were somewhat confounded by the new system "*because the mindset is still way back on the old system*".

Users' negative attitudes in general may result in them resisting the implementation of the new, or changes in the existing, system. In particular, if users have negative feelings about the overall project, this will impact their involvement. As the SME related, she felt

herself “*bearing the burden of colleagues’ resentments or frustrations*”, and she had received “*some comments that we’re being laden with a lot of BRS [Business Requirements Specification] and FRS [Functional Requirements Specification], a lot of specs, but on the other hand I think we need them*”.

The ECC manager claimed that some users were unwilling to get involved, for example, not testing the prototypes, or not attending meetings: “*we always have been encouraging them [users] and making the system available during the rollout stage. However none of them really took the opportunity to get on to that kind of hands-on*”. In reference to training, he further stated: “*All the IT guys turned up and none of the users turned up to it*”. This may have been due to lack of interest, or perceived relevance to their work. But upon our deeper analysis of comments made by the PM, SME and BA, we conclude that in this case study, if users did not always participate as expected by the development team, it was primarily due to their lack of time (because they still had to do their day to day job) or their dissatisfaction with too many ineffective meetings (especially during the CRM project).

In the post-implementation stage, the attitude of both internal and external users towards the system was reported to be satisfactory after the product was delivered. The “*really expert user*”, that is, the SME, continued to give informal training after the SDP had finished. We surmise that because users encountering software problems knew they could access this expert (who importantly spoke their language, and knew what they were trying to do from a business angle), this fostered a positive attitude.

We now return to our research questions for the case study and present our findings in this regard:

RQ1: What is the relationship between satisfaction of the users with their involvement in software development and their satisfaction with the resulting system?

Our inferences from the analysis described in section 4.4.1 and 4.4.2 is conceptualized as a *reinforcement relationship* between user satisfaction with their involvement and their satisfaction with the delivered system. The effective management of user involvement can contribute to user satisfaction concerning their involvement and this in turn can create a psychological impact on users. Based on our analysis of the transcripts we conjecture that the satisfaction with the system after installation resulted in positive reflections of past experiences of involvement during software development process, even though the same users had perceived it as challenging, frustrating and time-consuming previously. Figure 6 presents our conceptualization to illustrate the factors that were perceived to have played key roles in the level of satisfaction with the users’ involvement in the development of the system.

At a very high level we can identify two classes of users, (a) *internal* users who belong to different business units of ASG and (b) ASG clients who are *external* users. A small group of external users were selected as pilot users. Overall the results show a high degree of system satisfaction by both classes of users. According to the CIO, one reason why the ASG’s external users were satisfied with the system was that during the pilot phase the “*invitation*” remained open for them to “*make improvements wherever they could*”. The lead developer in the Portal project would regularly notify the Business unit when they had made a significant extension to the development system. His goal was to encourage internal users “*to play with it*”, long before formal UAT (that was still 2 months away). Likewise for external users, the PM describes the SME and her manager giving external pilot users something that would be “*somewhere*

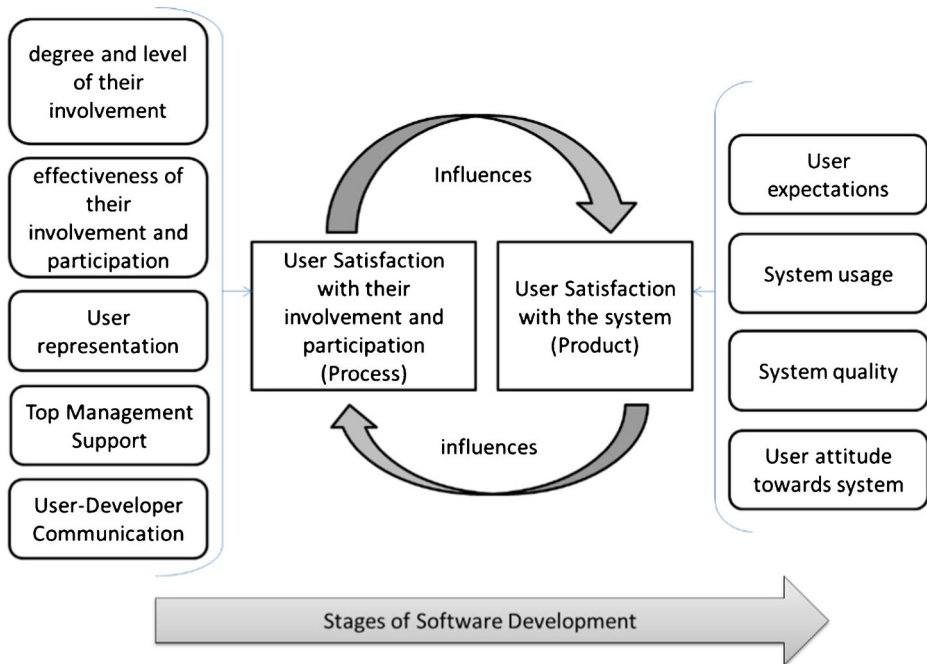


Fig. 6 Relationship between user satisfaction with involvement and system

between play and test scripts”. We identify “play” as a critical idea here. If users are invited to freely explore new software, the self-directed learning that occurs can facilitate people accepting and adapting to a new software environment. In this case, the IT team had made a strategic decision to include this “extra phase” of play “to get them more involved so that it’s less of a surprise when they get to UAT”. When people are invited to take on the role of pilot user (a role that has a certain social status), and if they feel confident that reasonable requests for improvement will be attended to, then this appears to positively affect system satisfaction.

In the initial phases of development the users were not happy with their involvement, as the PM put it: “there was a bit of dissatisfaction and there were things that we didn’t do in the best possible way”. Towards the end of the project, the users showed a better attitude towards the system and a higher degree of satisfaction, which, according to the BA, was due to changing the mode of user involvement: “things improved dramatically when we took the project more in-house”. The SME declared that she was “overall happy with [her] involvement”. She pointed out the management was to be credited for this shift in the attitude of the users for making right decisions on time, “It really depends on the project team. The team ...were great and I would work with this any time. It has to be give and take with the users involvement team cohesion and their level of being organized and well-structured made a big difference in the overall conduct of the project in the portal project.” She further pointed out that the users felt happy once they appreciated the management’s efforts in considering their feedback “overall you feel satisfied when you feel that your voices are being heard, what you say matters and make a difference”. The CIO termed the project as a “good outcome” and said “it was very successful in the sense that it was ... what the business wanted, basically, they were very happy and our clients were very impressed with it”.

As satisfaction is an attitude based on positive experiences we have considered it from users' subjective perspectives. The main observation in the case study was that satisfaction differed throughout the various stages of the software development process based on the satisfaction with involvement and with the delivered system. Our post-installation interview with the SME elicited her reflections on the differences in her level of involvement in the two projects; she reported more positive emotions about her recent involvement as compared to her earlier experiences.

Our answer to RQ1 is that users' satisfaction with their involvement and the delivered system are *mutually constituted*. The mutual constitution in this context refers to the reciprocal way in which the satisfaction of the users with the process of involvement could be influenced by their satisfaction of the delivered system and simultaneously their satisfaction with the delivered system could contribute to their satisfaction with their involvement. The two modes of mutual constitution in this context are not inextricable. They are both independent and interdependent. By this we mean that there are those users who did not actively participate in the software development at all but ultimately they expressed satisfaction with the delivered system.

RQ2: How does user satisfaction with their involvement and the resulting system evolve during software development leading to system success?

We have aggregated the results in Table 2 to show the evolution of users' level of satisfaction throughout this project. Table 2 shows the timeline of the stages of both CRM and Portal projects and their corresponding overlap as well as the data collection dates. These results are inferred from the analysis and interpretation of the qualitative data about the factors impacting satisfaction with involvement and the end product. We analyzed the data for three types of responses regarding these factors: *fully satisfied*, *partially satisfied*, and *not satisfied*. The questions we asked respondents in pre-implementation and during implementation were mainly about the process of user involvement and their expectations of the resulting system, whereas in the latter two stages we asked about their satisfaction both with the process and the product. Responses about the product are therefore further divided into *product expectation* and *product realization* categories. This is reflected in Table 2 by the *Category of Satisfaction* row.

The aggregation for the responses to the level of satisfaction was done in two stages. When we were analyzing the full data set to extract the 'benefits' and 'problems or challenges' of user involvement, we did a frequency analysis of the number of times each respondent has mentioned a particular issue or challenge. This complete procedure is published in (Zowghi et al. 2015). The benefits of UI as reported by the respondents and our personal inferences are shown in Table 2. We conjecture that the increase in the benefits of user involvement with passage of time seems to have contributed to creating a positive attitude and perception of the users towards the system. Our extensive qualitative analysis has revealed that the roles played by, and full commitment of, the user representative together with responsive management strategies during the project contributed to a successful outcome.

Focusing on the *Responses to Satisfaction* row of Table 2, the following evolution is observed:

1. The satisfaction with the level of involvement changed from *partially satisfied* in the first two stages of data collection to *fully satisfied* in the latter two.

2. The opinion of the users about the effectiveness of their involvement changed from *not satisfied* in the pre-implementation stage of CRM to *partially satisfied* in the post-implementation stage of the Portal leading to *fully satisfied* at the post installation stage of data collection.
3. User representation was one of the factors that remained consistently as *fully satisfied*. Many comments made by case study participants indicated to the researchers that this complete satisfaction could only be attributed to the selection of a competent, committed and knowledgeable user representative (i.e., the SME).
4. Our perception of the Top management support was *partially satisfied* at the CRM stage of the project when users and the development team faced several reported issues and challenges. This attitude was observed to have been changed towards the end once the users appreciated the changes that management made in the Portal project to improve the process and their involvement and expectations were better managed
5. User-developer communication was problematic from the outset (*not satisfied*) and remained to be a challenge even in the post-installation stage (*partially satisfied*). This was observed clearly in our data collected throughout the software development process that has also been reported repeatedly in the literature to be a fundamental challenge of user involvement.

5 Discussion

We observed positive UI-SS relationship in this case study where “*user satisfaction*” contributed to system success even though the project was well over time and over budget. However, the most important objective of this project from the outset was to fulfill users’ requirements as part of the overall organizational strategy of enhancing their clients’ experience. It was made clear to us that time and money was of secondary importance. In the final interviews with the CIO, she expressed that although the project was “*over-budget hugely*”, it was “*too important for us ... from our perspective, it’s our reputation*” that matters. She further explained: “*it ran over.. [but] we did end up with very high quality result*” that was acceptable for the clients. Similarly in the post-installation interview the SME concurred with CIO’s view that time was not as important and the focus was that the project “*has to be right, it has to be secure before it comes out, so we weren’t ever worried about the timing*”. Furthermore, this was an in-house development project, there was already a system in place to use, and there was no competitor to be concerned about from the ASG’s point of view.

The fact that in this case study, schedule and budget were not as important as the quality of the software and the corresponding acceptance by the users provided us with an opportunity to focus primarily of the study of ‘*user satisfaction*’ through their involvement in the project. The longitudinal nature of the case study allowed us to analyze the patterns of user involvement and user satisfaction over the various stages of software development. Just like UI-SS relationship, the concept of user satisfaction is also multi-faceted. It involves a number of contextual factors that play a pivotal role in successful project outcomes. Although there was a significant number of problems and challenges reported by the users in each phase of the software development (Zowghi et al. 2015), they were eventually dealt with by effective user representation and management practices introduced in the Portal project.

The analysis from our SLR (Bano and Zowghi 2015) gave rise to the following five high level questions to be considered throughout projects that involve users. While some of these questions from the literature may appear to be somewhat obvious, we observed that in practice the ability to answer these questions well, and pay specific attention to addressing them at the outset is challenging and can have a significant impact on the effective management of user involvement. We now briefly discuss these high level questions by referring to both the literature as well as our personal observations from the case study.

- **WHY to involve:** One of the most important factors revealed from our SLR is to define the goals, objectives, needs and desired benefits that management wants to achieve for their system through UI, as depicted in top part of Fig. 1. In our case study, the main objective of user involvement was to achieve the psychological benefit of user satisfaction.
- **WHO to involve:** Identification of the right representatives of user community is essential in achieving the benefits. In our case study we observed that the SME possessed specific attitudes to her work in general, and the project in particular, that, in combination with some of her personal attributes, equipped her to be an excellent customer representative, product owner and champion user. We believe that her evolving role in, and contribution to the project, played a major part in user acceptance and system success. Furthermore, we posit that SME's attitudes and attributes that were observed by her peers and mentioned many times in the interviews are also the ones that make up the characteristics of an effective customer representative. We argue that organizations should proactively and systematically use these attitudes and attributes to select the best-equipped user/s to fulfil this role in software development projects.
- **WHEN to involve:** User involvement in one stage of software development is said to influence the level of participation in the subsequent stages (Palanisamy 2001). Some researchers have stressed that involving users in early stages of development is more beneficial than other stages (Kujala 2003), claiming that after effective involvement of users during requirements related activities, further involvement may not be required in later stages (Wu and Marakas 2006). However, we have previously ascertained that sufficient empirical evidence is not available to support this claim (Bano and Zowghi 2013). In this case study, the CRM and Portal projects followed different strategy for when to involve the users. During CRM project the users were essentially involved in requirements related activities and later in testing. Users were largely ignored during implementation, which gave rise to a significant number of communication problems. In Portal project the management changed their strategy and involved the users throughout all stages of development. According to the PM this continuous involvement helped in resolving conflicts and addressing communication issues. We posit that the important decision about when to involve the users can contribute to users' satisfaction of the process and the product.
- **HOW to involve:** The management practices surrounding user involvement in any system development project reflects the philosophical stance of the organizational culture and their approach towards their human resources (Cavaye 1995). Hirschheim and Klein (1989) have described two main paradigms used in Information Systems literature in respect to user involvement. First is the widely used *functionalism* approach where the system is the central focus for efficiency and effectiveness. Users' involvement and participation is a means to an end: "*it can help provide better information on*

requirements, overcomes resistance, and validates design options” (Cavaye 1995). Therefore the user involvement is only sought when it is absolutely necessary and mandatory. Second is the *neo-humanism* approach where the potential users of the system are considered most important, which has given rise to the field of participatory design. In neo-humanism the system is built to improve the work environment of its users by improving the understanding between the users and developers: *“the end result of participation should be a human being with increased understanding, an expanded workplace, and an enriched working life.”* (Cavaye 1995).

In this case study, our results indicate that the management style was mainly leaning towards *“functionalism”* at the outset with the CRM project. The ASG executives made the decision to purchase the Microsoft CRM system and employ an external consultant to customize it to the requirements of the Business unit. So user involvement in the CRM was primarily to elicit those requirements to make an effective transition to the new system. In this case, the system was at the center of the managerial decisions. There was, however, a paradigm shift towards *“neo-humanism”* during the late stages of CRM and early stages of the Portal project. The need for this change was made very clear towards the end of the CRM project through the SME’s complaints to the CIO and also feedback from other stakeholders expressed in the Post Implementation Review. The ASG management introduced a number of practices and strategies to improve communication and increase shared understanding between the development team and the Business unit. They made user participation meaningful by encouraging more frequent and effective communication between the two, and by ensuring that the users’ feedback was taken into account in a timely manner. This transition also enhanced the management of users’ expectations and participations, according to the CIO.

- HOW MUCH to involve: In the highly cited work of Ives and Olson (1984), the degree of user involvement is defined as *“the amount of influence the user has over the final product”*. They have categorised the level and degree of user involvement into these types: **“No involvement:** *users are unwilling or not invited to participate;* **Symbolic involvement:** *user input is requested but ignored;* **Involvement by advice:** *advice is solicited through interviews or questionnaires;* **Involvement by weak control:** *users have sign-off responsibility at each stage of the system development process;* **Involvement by doing:** *a user is a design team member, or is the official liaison with the information systems development group;* **Involvement by strong control:** *users may pay directly for new development out of their own budgets, or the user’s overall organizational performance evaluation depends on the outcome of the development effort”*. In this case study we observed all these levels and degrees of involvement. For example the SME had “involvement by doing” throughout both projects and only “strong control” in the Portal project. Her manager on the other hand had “weak control” in both, the client relationship team had “involvement by advice”, and the external users of the Portal had “no involvement” while the other business units in ASG only had “symbolic involvement”. Our observations in this study indicate that the type of system, the organizational culture, user availability, their motivation, and the project uncertainty or complexity could be the deciding factors for the right level of user involvement.

The management team should appreciate the two aspects of user satisfaction: satisfaction with the *process* of involvement and satisfaction with the resulting *product*. These two are

intertwined and mutually constituted. We observed multiple “*satisfaction effects*” (see Table 1), when data was collected at various stages of the software development process:

- The overall measure for the user satisfaction in this case study was “*Goal Attainment*” where the users wanted the system to do what it was supposed to do.
- Due to the variation in level of user satisfaction over the period of time resulting from various problems and issues, an “*Attenuation Effect*” of user satisfaction was observed throughout the stages of software development.
- During post-implementation and post-installation phases a “*Confirmation Effect*” was observed where the users experienced that the delivered system not only worked well and was of high quality, but it exceeded their expectations.
- “*Mentor Effect*” was also noticed during workshops and interviews where SME was highly praised and trusted by all of her colleagues. Thus we conjecture that because the SME as the “*user representative*” was an effective liaison between the business unit and the development team, her positive opinion about the delivered system seemed to have influenced her colleagues who had entrusted her as their spokesperson.

6 Limitations of the Study

Case study as a research methodology has some well-known weaknesses such as difficulty in replication, researchers’ bias and generalization of results. However, these weaknesses can be overcome by a strong design and planning for data collection and analysis (Yin 2013). The main threat to the validity of the results of a case study are considered to be the context-specific variables of the projects (including organization size and type, project complexity, software development methodology, number and diversity of interview subjects, and size of data set), which makes it difficult to generalize the findings that emerged from the data analysis (Runeson and Höst 2009).

In regards to the qualitative analysis in a constructivist paradigm of inquiry, it is impossible to claim absolute exactness of the results free from researchers’ bias. Moreover, the case study research methodology is inherently reliant on researchers’ inductive reasoning capabilities. Inductive (and abductive) reasoning entails subjective cognitive processes that to some extent embody and reflect the history and expertise of researchers (which might include also their own biases). Researchers draw on their knowledge to attend to hunches, produce insights, develop theoretical sensitivity, and build concepts from which their theory emerges. With this in mind, we consider that we have provided sufficient details of the process of data collection and analysis in this paper to indicate the reliability and increase the trustworthiness of the results.

Lee and Baskerville (2003) put generalizability of research in one of four types: from empirical statements to other empirical statements, from empirical statements to theoretical statements, from theoretical statements to empirical statements and from theoretical statements to theoretical statements. In our case study, we have relied on the first two types of generalizability: from empirical data collected through interviews (presentational data) over the course of 3 years to our observations in workshops and project documents (operational data); and from empirical data and observation to our analysis and theory building (through coding and thematic analysis). Our interpretation of the case study data uses the constructs that we have built from our extended

journey through the records of the verbal interactions between the participants and ourselves. Therefore the subjective elements influencing interpretations of empirical data are based on the accepted guidelines for the interpretive case study (Charmaz 2006) as best as possible.

Although initially we had a plan for investigating the concepts of user involvement in field settings, the research design was conceived after a minor review of literature to understand the basic concepts. The data collection techniques were well planned at the outset and the analysis was conducted after the results from systematic review were finalized. The analytical framework that we have used in this study is based on the aggregated results from a large number of empirical studies included in the SLR, and each of these studies would have had its own specific context too. Therefore the comparison we have provided with the SLR results puts our work in perspective with the existing body of knowledge in this area. We consider our research design to be reliable and strong with the data triangulation we employed. We used follow-up emails and phone calls with participants to confirm our understanding and assumptions, along with iteratively analysing transcripts, documents and field notes to minimize the researchers' bias especially during high-level conceptualization where we were merging themes from coding to answer the research questions.

However, we concede that the selection of research participants was constrained by several factors such as unavailability or unwillingness of a few suggested team members. The researchers were not allowed to attend certain meetings such as Post Implementation Review meeting or User Acceptance Testing sessions. Also, we were not given the opportunity to observe the end users interacting with the system, neither were we allowed to interview the external clients of ASG. This could have been due to the fact that ASG is a financial institution of the State government and they deal with sensitive and confidential data.

We have provided full details of the context in which we analysed the data. Relevant quotations from the participants are provided in places to demonstrate the emergence of the concepts from the data. For confirmation and required clarification of concepts, during the second, third and fourth set of interviews, the researchers discussed the understanding developed from the findings of previous interviews with the respondents.

7 Conclusion and Future Work

In this paper we have presented our findings from a comprehensive analysis of rich qualitative data collected from an explanatory and longitudinal case study of user involvement in a software development project. The main aim of our exploration was to study the relationship between user involvement and system success with a major focus on the role that user satisfaction plays in this relationship. Our data collection occurred in four stages over 3 years by means of interviews with key stakeholders, workshop observations and document analysis. We have performed extensive iterative analysis of the significant amount of qualitative data to unpack the complex concept of user satisfaction within the UI-SS relationship.

This analysis has revealed that the software developed in this case study was considered successful where user satisfaction was used to indicate system success. We have observed that 'user satisfaction' in this study evolved over time and was affected by various factors. Furthermore, this attitude (user satisfaction) is not static and is subject to change throughout software development process and beyond. Our results extend the previously published

literature about the multifaceted concept of user satisfaction within the context of UI-SS relationship in two ways:

1. We have presented the analysis of the factors that we observed to have played a role in impacting the evolution of user satisfaction with the process of their involvement as well as the resulting system (Fig. 6). Due to the longitudinal nature of the case study we were able to infer the evolving nature of user satisfaction over various stages of the SD. Based on our analysis we posit that there is a mutually constituted relationship between user satisfaction with their involvement process and their satisfaction with the delivered system.
2. Even though there were various reported problems and challenges of user involvement throughout the initial stages of the CRM project, the benefits of user involvement were more visible and increased in the Portal project (Table 2). This contributed to developing a positive attitude of the users towards the final system and changed their initial perception of their involvement in the CRM project. Our results suggest that two important factors played crucial roles in increasing the benefits of user involvement in achieving user satisfaction: (a) Dynamic management strategies introduced in the Portal project, and (b) Effectiveness of the user representation (SME) throughout the project.

The findings from our research have provided a deeper understanding of the nature and extent of user involvement that can assist project managers to develop responsive strategies for increasing the effectiveness of user involvement. The management must develop a full appreciation of the two separate but mutually constituted aspects of user satisfaction that we have discussed in this paper. Our longitudinal study has resulted in focusing on five high level questions to guide decision making about user involvement in software development. Furthermore, we believe that the development teams must give careful consideration to the timing and extent of user participation at different stages of SD.

We have already replicated this research in another case study conducted in a different organization for further comparative analysis. Based on the findings of our previously published SLR and the synthesis of the results from these two case studies in near future, we aim to develop a framework for the effective management of user involvement in software development.

Acknowledgments We would like to express our gratitude to the ASG management and staff for allowing us to conduct this study. We also acknowledge the funding provided to Muneera Bano by the University of Technology Sydney, and Schlumberger award of the Faculty For The Future (FFTF).

Appendix A: Interview Guide Questions

Questions for First Phase of Interviews

General Questions

1. What is your position title in the organization? Perhaps explain what are the core tasks you perform daily.

2. How long have you been with this organization? Have you always been in the same position?
3. What is your role in this project?
4. Are you going to be a main user of the system being developed?
5. Are you a key stakeholder in the system being developed?
6. If the answer is yes to 4 and 5, how would you/your team benefit from the system? Your anticipation of overall benefit of the system.

Involvement in the Software Development Lifecycle

7. Please explain your involvement in this project from the beginning till now? When did you start? What is the nature of your involvement?
8. What would be the nature of your involvement from now till the end of the software development?
9. Who in the organization decides about the involvement of appropriate personnel in the software development project?
10. To what extent have you contributed to the scoping and requirements gathering process in this project so far?
11. Are you likely to be consulted again about the system from now on?

Communications

12. Can you comment on the communication channels between the core project team? And between this team and those external to the project team, in particular stakeholders.
13. What form of communications is mostly used?

E.g. (a) Face to Face: One on one (BA talking to individual stakeholders to elicit requirements), One to many (BA talking to a group of stakeholders), Facilitated Workshops (where an independent facilitator is involved between development team and stakeholders), focused groups,

(b) Emails, Telephone, Fax

(c) feedback via web sites/SNS, e.g., skype

14. Are you satisfied with the extent and degree of users involvement in this project so far?
15. If not, why not? If yes, why?
16. Is there anything that could be done differently to improve the process of scoping and requirements gathering and analysis?

Change/Change Management

17. Are there any/many business process changes in the new system?
18. Have these changes been identified at the outset and documented?
19. Is there a change management process in place to ensure the smooth roll out of the new system? If so, how are the users involved, informed, consulted about the potential changes to:
 - Business processes
 - New/modified workflows
20. Is there any training planned for the users? If so, who is in charge? Has the plan been articulated and consulted with users?

Post Implementation Interview Questions

UAT

1. How was this done? Process followed?
2. Who was involved? Level of involvement? Sign off?
3. How many rounds of UAT?
4. Did you develop any test scenarios?

Training

5. How was it carried out? Who was involved?
6. Quality?
7. Quantity?
8. Are you satisfied?
9. Documentation?

User Manual

10. Is there any?
11. When was it prepared/given to users?
12. Quality?

Post Implementation Review

13. When? How? Will they be involved?
14. User feedback sought? How? When?

Changes to Business Process/work Flow

15. Were there many?
16. Did you know about them before the system went live?
17. Any frustrations, interruptions to existing work, impacts over your work, possible delays?

Overall Satisfaction with the System

18. Are you generally satisfied with the delivered system?
19. Do you feel that your voices as users have been heard and taken into account?

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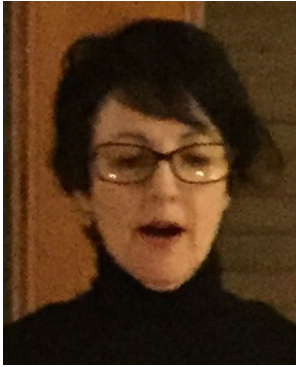
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