Building User Engagement for Successful Software Projects: Meaningfulness, Safety, and Availability

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Abstract

User participation in Information Systems Development improves project outcomes. However, past research fails to provide a basis for determination of the preparation required to participate. Job Engagement Theory provides such a theoretical basis and describes three psychological conditions – meaningfulness, safety and availability – which influence an individual's engagement and suggests practices engendering engagement to enhance job performance. A matched pair survey of developers and users indicates an engagement approach to development improves project success and that users should be provided clearly defined roles and training, have adequate incentives, and be chosen on a variety of abilities to realize desired benefits.

Keywords: job engagement theory, software development, user participation, project management

Introduction

It is commonly accepted that a large share of Information Systems Development (ISD) projects run over time, over budget, omit deliverables, or otherwise end in failure (Applegate, Austin and Soule, 2008). Many researchers identify the lack of effective user participation as one major cause of difficulty (He and King, 2008; Markus and Mao, 2004). This lack is in spite of cumulative research that users represent the business interests, application requirements, and psychological involvement that lead to higher quality software (He and King, 2008). Most development methodologies and practices include users or their representatives to ensure functionality, but require active and involved participation or invite failure due to risks associated with the users (Barki, et al., 1993; Baroudi, et al., 1986; Schmidt, et al., 2001; Wallace et al., 2004). User related risks include: 1) failure to manage end-user expectations, 2) lack of adequate user involvement, 3) lack of cooperation from users 4) failure to gain user commitment, 5) conflict between user departments and 6) improper definition of roles and responsibilities (Schmidt, et al., 2001).

As a means of insuring active and involved participation, researchers have investigated pre-emptive approaches. For instance, Jiang (Jiang et al., 2006) considered pre-project partnering which focuses on actions taken with users before the start of the project that promotes collaboration between users and IS developers (Cowen, et al., 1992). The use of partnering methods readily benefits development efficiency by improving responsiveness of the development team which is deemed crucial to success (Lee and Xia, 2010). Similarly, in order to overcome difficulties achieving adequate participation, Martin and colleagues suggest customer focused practices to encourage and prepare users for intense collaboration in agile development teams (Martin, et al., 2009).

Even though researchers agree that successful ISD projects require active user participation and researchers have begun to look at methods of pre-emptive approaches to support active participants, there is little guidance on the preparation required to ensure the user is a productive contributor (Martin, et al., 2004). In general, greater levels of task and psychological involvement have been shown effective in achieving favorable outcomes, but these results focus on software development activities during the development process instead of addressing user preparation prior to the development process (He and King, 2008; Maruping, et al., 2009). Even in a life cycle approach, participation such as user reviews maintain design integrity, add to the quality of the system, and enhance buy-in on the part of the user (Hsu, et al., 2008). However, the basic relationships considered in the literature are whether methods, tasks, or team performance lead to better outcomes. This prevalent perspective ignores crucial emergent elements of participation and, in particular, the pre-conditions for effective participation. As such, the literature fails to provide a comprehensive theory to explain and study the impact and effective antecedents of user participation in software development (Markus and Mao, 2004).

Our approach is to develop and test a model of user engagement in software development, both in preparation and productive activity (Kahn, 1990). Job Engagement Theory (JET) serves as the lens and defines the conditions of participation that lead to more productive outcomes (Rich, et al., 2010). We will illustrate how these conditions of participation link to outcomes and project success. Further, JET presents psychological conditioning as antecedents in a sequence leading to positive effects on engagement behavior and performance. In turn, beneficial behaviors of engagement lead to desired performance outcomes. This sequence suggested by JET permits isolation of our primary research question - what measures can be taken to prepare a user to be productively engaged in software

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development? A secondary question addresses whether intensive activities in a job engagement framework support the achievement of success in a software development project.

The consideration goes beyond specific user participation techniques associated with ISD, to the concept of full "user engagement" falling within the job engagement framework. Specifically, we define psychological conditions of user motivation, role clarity, training, and efficacy as identifiable antecedents from JET. From this theoretically backed antecedents of user preparation are recognized. This leads to the extension of the concept of user participation to full user engagement, where users take added responsibility beyond traditional participation in areas of problem solving, open communication, and governance. Engaging the user fully requires that more than the physical processes and emotional commitment of the user are secured, as in the engagement of any worker in their job (Rich, et al., 2010). With this theoretical foundation, we can identify critical user preparation needed for full engagement of the user in the ISD process and, thus, increase the likelihood of a successful outcome. The theory is modeled in the IS development context and tested for veracity in order to provide direction for future researchers in considering user related issues and guidelines for practice.

Background

The concept of user participation has evolved in the literature since initial conception. Early on, user participation considered the tasks a user performed during software development (Markus and Mao, 2004). Beyond task activities, it was believed that achieving psychological involvement on the part of the user would lead to higher quality software. Research suggested that greater levels of task and psychological involvement effectively achieve favorable outcomes including enhanced user satisfaction and increased system quality, but key in on development activities instead of user preparation (He and King, 2008; Maruping, et al., 2009). The basic relationships reported in the literature are whether methods, tasks, or team performance lead to better outcomes. However, there is no consideration of a comprehensive theory to describe behaviors preparing users for the required levels of participation. The prevalent perspective ignores crucial emergent conditions of participation, pre-conditions for effective participation, and the multiple criteria of successful development (Markus and Mao). Neither the fullness of participation nor the breadth of preparation for users to participate is well defined or understood (Markus and Mao, 2004).

To more precisely define the larger scope of user participation and provide a relation to existing theory, we turn to Job Engagement Theory from the management literature to clarify the role of the user in software development, both in preparation and productive activity (Kahn, 1990; Rich, et al., 2010). Job engagement presents the psychological conditioning and the energy expanded as a sequence leading to positive effects on behavior and performance. To distinguish this model from prior work, we call the concept "user engagement". We first present a brief description of job engagement theory and user engagement as related to IS development activities, present the psychological conditions of engagement and how these conditions influence project success, then follow with hypotheses development.

2.1 Job Engagement Theory

Job engagement is the utilization of an employee's full self in terms of physical, cognitive and emotional energies to task performance (Kahn, 1990). All three elements must be present to achieve engagement. JET not only offers this complete framework to describe the elements of job engagement, but also provides a more comprehensive explanation for job performance effects and required

preparation as antecedents to engagement (Rich, et al., 2010). In Kahn's seminal article on job engagement, he explored the conditions at work within organizations under which people engaged or disengaged. Kahn described personal engagement as "the simultaneous employment and expression of a person's 'preferred self' in task behaviors that promote connections to work and to others personal presence (physical, cognitive, and emotional), and active, full role performances" (Kahn, 1990, p. 700). Engagement expects that individuals be open to others by sharing knowledge, emotionally connecting with others and the process to work on a goal, and become actively involved in the accomplishment of a task.

Three psychological conditions considered to be the antecedents of job engagement are meaningfulness, safety, and availability (Rich, et al., 2010). Psychological meaningfulness is associated with work that creates incentives to personally engage. It is a feeling that one is receiving a return on investment for expending physical, cognitive and emotional energies. Psychological safety includes elements of social systems that create non-threatening, predictable, and consistent social situations in which to engage. Components of psychological safety include interpersonal relationships, group and intra-group dynamics, organizational norms and expectations. These expectations are established through defined roles that allow an individual to safely pursue engagement and completion of tasks assigned. Psychological availability considers whether the individual has the personal resources and skills to pursue the activities required in their roles.

Rich and colleagues applied JET to consider specific antecedents and consequences (Rich, et al., 2010). Their study confirms that job engagement activities mediate relationships between antecedent variables corresponding to meaningfulness, safety and availability and outcome variables of performance and behavior. These results suggest Kahn's conceptualization of job engagement is a mechanism that transforms individual and organizational conditions to job performance. Should the concept apply to ISD, then identifiable conditions of meaningfulness, safety, and availability would yield positive contributions to the completion of a software development project by encouraging engagement.

2.2 User Engagement

The engagement aspect of JET suggests the next step in the evolution of user participation. Beyond simple contributions to requirement specifications that user participation stressed and the emotional investment considered by user involvement, engagement represents a complete set of behaviors that involve physical, emotional, and cognitive contributions to role performances essential to system development (Barki and Hartwick, 1989). Engagement is a broad concept and need not be viewed as method dependent, instead being rooted in the roles required of the performer for the specific job (Rich, et al., 2010). For example, agile development methods call for intense collaboration between users and developers that may vary in specific tasks, but, nevertheless, require a focus on the cognitive and emotional sides as well to ensure effective partnering (Conboy and Morgan, 2010).

Traditional life-cycle approaches continue to add responsibilities to the user in terms of ensuring correct requirements, monitoring the development for quality, and assuring a successful implementation (Alter, 2010; Spoher, et al., 2007). Still, the structural tasks and behaviors of an engaged user are not clearly delineated, spanning a variety of tasks that do not fall into a single framework (Markus and Mao, 2004). Further, specific elements of user participation are not well understood in their relationship to project success (Harris and Weistroffer, 2009). This may be due to a limited view of user participation that focuses on system development activities but over-looks behind-the-scenes behaviors that contribute

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to functional working relationships within and outside the development team (Shim, et al., 2010). In addition, current research does not consider the full emotional ties a user may develop with the software and development team (Markus and Mao, 2004). To add clarity to the diverse collection of ideas about user participation and involvement, we begin with the general model of job engagement shown in Figure 1 and provide established concepts from the IT project literature as representative components in JET.

2.3 Psychological Conditions of Engagement

JET also sets requirements of psychological conditions for an individual to perform a required role (Kahn, 1990). The psychological conditions include meaningfulness, safety, and availability. Meaningfulness involves a sense of return on the investments made in role performance (Rich, et al., 2010). Meaningfulness is influenced by tangible and intangible incentives to perform expected roles and behaviors. The information system and project management literature all consider both intangible and tangible motivation features to be critical to achieve active participation (Dietrich, et al., 2010; Etgar, 2008; Wang, et al., 2011). Psychological safety is experienced when one meets role expectations without a threat of negative consequences (Kahn, 1990). Safety derives from clarity and consistency of behavioral expectations that can derive from clear statements of expectations in the job, group dynamics and interpersonal relations (Rich, et al., 2010). Clearly defined roles are essential for fruitful collaborations in the information system, project management, and management literature (Dietrich, et al., 2010; Etgar, 2008; Thakurta and Roy, 2012). Psychological availability is an individual's readiness to contribute personal resources to the job (Kahn, 1990). A participant must feel confident in their physical and intellectual preparedness to perform the tasks required of their role (Rich, et al., 2010). Training for the role and prior efficacy in the tasks are important factors in performing required tasks (Chang, et al., 2010; Cicmil, et al., 2006; Hoyer, et al., 2010; Tabassi, et al., 2012; Vadapalli and Mone, 2000). Though there are a large number of potential variables that might compose each of the psychological conditions, the set of motivation, role clarity, efficacy, and training are established in the relevant literature as precursors to the collaborative effort necessary to examine proposed relationships of job engagement. Confirmation of the model then determines the appropriateness of the model in the ISD project context.

2.4 Project Success as the Outcome

Outcomes in job engagement consider those directly associated with the task (Rich, et al., 2010). This is due to the mediating nature of engagement between the psychological conditions and task outcomes. To be engaged is more than performing tasks for the sake of their performance. Engagement reflects the parallel investment of cognitive, emotional and physical energy in the performance of a role (Kahn, 1990). Thus, engagement is designated as a full mediator between psychological conditions and outcomes with outcomes limited to the direct performance of assigned tasks and not the organizational performance of any product (Rich, et al., 2010).

To stay consistent with this approach, project success considers achieving the goals assigned the project team. Under this limitation, project success is not concerned with the attainment of organizational goals, but those directed at the performance of the team in achieving the more narrow objectives related to the activities of the project. The outcomes consider the delivery of the product scope as promised, producing a quality deliverable, meeting the delivery schedule, staying within the budget, developing new ideas that carry to future projects, and maintaining a productive work atmosphere that encourages efficiency (Tesch, et al., 2009).

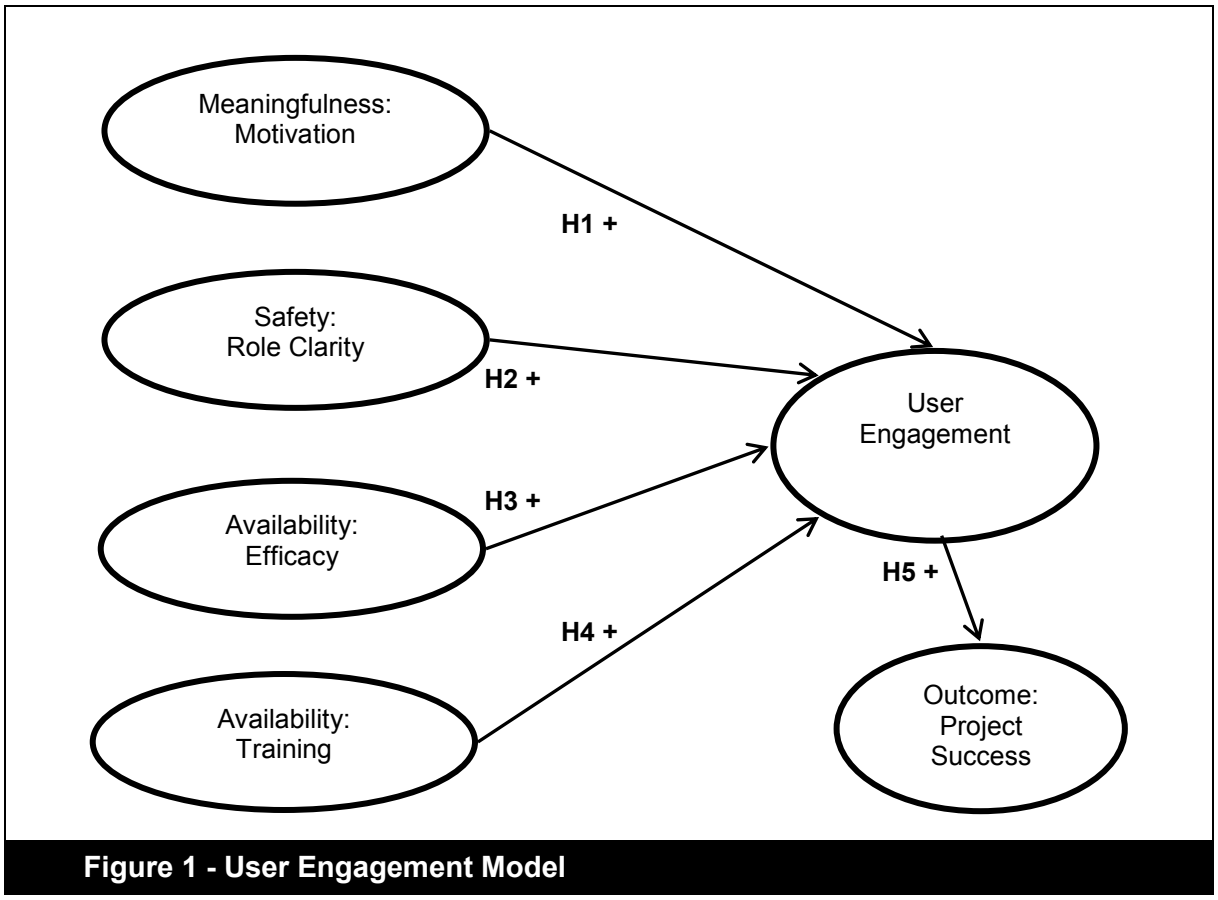

Figure 1 - User Engagement Model

2.5 Hypotheses

Motivation attaches rewards to the completion of tasks in order to stimulate the desire to perform in accordance with task requirements and goals (Chang, et al., 2010). As such, it meets the requirements of providing tangible and intangible incentives for meaningfulness (Kahn, 1990). Motivation considers many forms and outcomes in the history of management research (Steel and König, 2006). In particular, rewards enhance the structures in place to facilitate employee engagement (Sandberg, 2000). However, the essence of motivational theories is that there is a set of expected gains and losses from participating in a set of actions which must be parsimoniously selected for the particular context to make the actions meaningful to the participant. As an individual, such as a user, perceives there to be rewards associated with engaging in the tasks of IS development, the tasks will be conducted to better gain the expected rewards. Thus, expected personal gains from engaging in a development project should lead to greater attention to completing the tasks in a positive fashion.

Motivation is established in the project management and information systems literatures as critical in achieving desired collaboration. Motivational traits lead one to actively work to co-produce value in service and new products that involve client-producer collaboration (Etgar, 2008; Hoyer, et al., 2010; Schneider and Bowen, 2009). Motivation is recognized as a direct influence in collaboration during a project and a synergistic contributor to other antecedents of task participation (Dietrich,

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Eskerod, et al., 2010; Tabassi, et al., 2012). Participation and involvement in information system projects are enhanced by rewards, particularly in those seeking active advocacy by the user (Thakurta and Roy, 2012; Vadapalli and Mone, 2000; Wang, et al., 2011). Given the arguments, JET, and prior results, we propose:

H1: Motivation positively influences user engagement in the IS development setting.

Role clarity is the establishment of task expectations on the part of the worker and is an important indicator of task completion (Rizzo, et al., 1970). In JET, role clarity provides boundaries of safety, providing guidelines that direct action and lessen a chance of negative consequences (Kahn, 1990). To engage in the performance of a set of tasks requires that roles and responsibilities be clearly established. It should then be expected that a clear definition of roles is essential to collaborate to produce a software product.

Recommendations exist that establish guidelines for defining participation in software development teams to achieve the best product (Dubinsky, et al., 2010). This relationship from role clarity to the role activities is suggested by the literature and consistent with psychological antecedents of safety (Bettencourt, et al., 2002; Etgar, 2008; Rich, et al., 2010). Defining roles in projects is important to an effective project team (Hamburger, 1992). Projects managed in virtual environments require greater clarity to run smoothly (Lee-Kelley and Sankey, 2008). Collaboration during projects is enhanced when the roles are clearly established (Dietrich, et al., 2010). The process of IS acquisition decisions are improved with clearly delineated roles (Verville and Halingten, 2003). Users are more involved during development when their participation in the process is clear (Thakurta and Roy, 2012). Given the arguments, theory, and prior works, the expectation is that:

H2: Role clarity positively influences user engagement in the IS development setting.

Efficacy is an individual perceiving a self-ability to accomplish the tasks required of an organization (Schwarzer, et al., 1997). To engage in the development of a service or product requires that each member of the team be able to contribute according to their roles and responsibilities. Though composed of various forms of competence (Sandberg, 2000), our focus is on efficacy to work on the development team as a participating member performing a set of desired tasks.

This self-recognition of talent is a crucial aspect of the IS development environment and a success factor of participatory development methods (Misra, et al., 2009; Prahalad and Ramaswamy, 2000). In participating in a process, including projects, value is attained from users with varying levels of expertise (Cicmil, et al., 2006; Prilla and Nolte, 2012). Users with higher levels of self-efficacy achieve higher rates of participation (Hunton and Beeler, 1997). Attributes of competence increase user collaboration with developers (Chang, et al., 2010). Further, the relationship is consistent with engagement considerations requiring one's availability and readiness to perform (Rich, et al., 2010). This adds the expectation:

H3: Efficacy positively influences user engagement in the IS development setting.

Training represents an organizational commitment to prepare employees for their roles (Lee and Lee, 2007). Greater knowledge held by the member of a team related to current and potential positions within an organization provides additional capital to draw on for completion of tasks. Having greater knowledge about conducting a task should lead to better performance of the task.

A large body of evidence supports the supposition that effective training of

employees by an organization leads to higher achievement of the assigned tasks and improved job performance (Aragón-Sánchez, et al., 2003). The particular link from training to the activities of user engagement is suggested by the job engagement literature as preparedness to contribute (Andrew and Sofian, 2011; Rich, et al., 2010). In the information systems literature, user training increases the use of formal development methodologies, greater user integration into the development process, and more successful deployment of participation structures (Axtell, et al., 1997; Vadapalli and Mone, 2000; Vijayasarathy and Turk, 2012). Thus, the expectation that:

H4: Training positively influences user engagement in the IS development setting.

In an engaged environment, the client focuses on producing value through intensive involvement in the development process. The client stays directed toward the product, so that it meets expectations of the deliverable in terms of quality and functionality (Hoyer, et al., 2010). The intense working environment moves the project along at a measured pace for efficiency while constrained to the desires of the client so that rework and errors are minimized, all while maintaining cordial working relationships that promote exchange of ideas toward attainment of objectives (Etgar, 2008). Such engagement of employees is expected to improve both task performance and encourage positive behaviors that advance working conditions (Rich, et al., 2010).

Project management has always promoted the collaboration of participants and is borne out by research on multi-partner projects and teamwork in general (Dietrich, et al., 2010; Hoegl and Parboteeah, 2007). In the IS literature, environments are proposed that mimic engaged conditions to produce positive functional outcomes (Markus and Mao, 2004). Even participation conditions less intense in the development of information systems tend to result in positive behaviors and project results (He and King, 2008). This leads to the final hypothesis of the research model:

H5: User engagement positively influences project success.

Research Methods

The data collection technique selected was a survey of developers and users. To investigate the preparation of the users in the engaged environment requires that a variation in engagement be present in the projects represented by the users and developers. Further, the sample should include users to measure key variables associated with the client perspective and variables of personal preparation in addition to the provider perspective from the developers who have better knowledge of the project success details and formal preparation. A last requirement is that the users and developers complete paired instruments to match their pairing within the same development project.

The study employed two separate survey instruments, one for the users and one for the developers. Each survey contained items to measure the latent variables and demographic information. Incremental pretesting was conducted. First, approximately 30 doctoral candidates in the business college of two major universities in the US were requested to complete a pretest of the survey instruments online for content and clarity purposes and provide feedback via email. Instructions were clarified based on this initial feedback, no items required correction or removal. The measurement model indicated no reliability issues. Subsequently, four practitioners were enlisted to evaluate the content. Minor wording adjustments were made based on their comments about items and instructions.

3.1 Sample

The sample pool accumulated over a two year period. Contacts were first established at regional professional societies and several major corporations in a southern city

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in the United States home to numerous Fortune 500 corporate headquarters. Researchers solicited volunteers to complete the survey at professional society meetings rather than mail surveys to the entire membership list. Phone calls to IT management of local Fortune 500 headquarters sought further volunteers. Lastly, the initial collection of volunteers provided the names of one successive potential volunteer. Not all those identified were located in the original city.

Each volunteer identified projects within the organization where methodologies involving users were employed in the development of a software project. Project managers for the identified projects were approached and asked to specify a user and developer pair who worked as partners in the development of software regardless of the formal technique employed. Once identified, participation of the user-developer pair was solicited by mail or email. Questionnaires were distributed in hardcopy for the user and on survey monkey for the developer. Data tags identified matched pairs, but no personal identifiers were maintained with the collected data. Initially, 200 pairs were identified in 42 organizations. 131 pairs were completed and returned. Three pairs were eliminated due to excessive omissions on the part of either the user or the developer.

Demographics of the projects and final sample are shown in Table 1. As can be seen, there is a diversity of experience on the part of the users and developers as well as project characteristics. All demographics were independently tested against the dependent variable of project success with only age of the user and project duration showing a significant relationship. Both are included in the analysis as control variables to project success.

Table 1 - Demographics

Users	**%**	**Developers**	**%**	**Project**	**%**
Gender		Gender		Industry	
Female	49	Female	40	Service	58
Male	51	Male	56	Manufacturing	42
Age		Not reported	4	Duration	
21~30	31	Age		0-1 yr.	37
31~40	37	<= 20	1	1-2 yr.	40
41~50	22	21~30	26	>2 yr.	23
> 50	9	31~40	29	Involved User Count	
Position		41~50	29	<= 3	16
Senior Manager	30	> 50	12	4 - 7	24
Manager	37	Not reported	3	8 - 15	22
Professional	32	Work Experience		> 15	30
Other	2	0 – 5 yrs.	18	Not reported	8
Work Experience		6 – 10 yrs.	21		
0 – 5 yrs.	38	11 – 15 yrs.	15		
6 – 10 yrs.	22	> 15 yrs.	42		
11 – 15 yrs.	12	Not reported	4		
> 15 yrs.	29				

3.2 Measurement

An emerging consideration in the recent literature is to examine the close participation of users and developers as a full coproduction relationship (Hsu, et al., 2013; Shim, et al., 2010). This trend provides direction for the measurement of user engagement. Coproduction arises out of the services development literature and closely aligns to an emerging perspective of software development as the delivery of information systems being the construction of a service for users (Alter, 2010; Spoher, et al., 2007). Coproduction applies to developing an innovative product for clients, whether they be external or internal to an organization (Bettencourt, et al., 2002). In addition to having specific role expectations in developing a software product that dominate the literature on traditional user participation, indirect aspects of emotional, cognitive, and supportive activities are crucial (Etgar, 2008). In such a role, the user becomes more than just a source for defining requirements, but rather becomes an integrated part of the development team with duties associated with decision making, communicating, and building stakeholder support (Alter, 2010; Conboy and Morgan, 2010).

Coproduction emphasizes a range of behaviors that contribute to the effective functioning of the organization and increase the likelihood of goal achievement. Coproduction implies expertise integration, a mechanism by which individually held knowledge is integrated and applied at the project level (Tiwana and McLean, 2005). In addition, coproduction places emphasis on the role of individual participants in managing a successful partnership. For software development projects, these define an extremely high level of engagement. These behind-the-scenes behaviors and emotions relate to the physical, cognitive and emotional energies discussed by Kahn as engagement properties (Kahn, 1990). Not only are the users conducting required tasks and governance to co-produce a software product representing the physical dimension of engagement, they provide cognitive contributions through open communications, accommodating knowledge of the developer, and sharing the responsibility to work toward better solutions. Emotional ties are considered in the tolerance of other views, a passion to advocate to others, and a dedication to the job at hand. Early examination of the coproduction perspective finds that project outcomes are enhanced as is the broader application of expertise as suggested outputs of job engagement (Hsu, et al., 2013; Shim, et al., 2010).

One well received conceptualization of coproduction exhibits behaviors of communication, shared problem solving, tolerance, accommodation, advocacy, involvement in governance, and personal dedication, as defined in Table 2 (Bettencourt, et al., 2002). On the whole, coproduction meshes well with the larger model of job engagement for users and identifies a specific framework for contributing to the development of knowledge-based products and services, such as new software. Coproduction activities by users are effective at improving the performance of software development by tying the collective behaviors of individual users to the success of software development projects (Shim, et al., 2010). The similarity between the user engagement mediator in Figure 1 and the concept of coproduction is that both have the aspects of physical, cognitive, and emotional energies. Coproduction requires effort be expended on creative activates in an advocacy role (Bettencourt, et al., 2002). Still, while coproduction provides linkage to the activities a user enjoins, there is no guidance about preparing users for the coproduction process explained by JET; nor is there a theoretical reason for the achievement of desired outcomes (Hsu, et al., 2013; Shim, et al., 2010).

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Table 2: Coproduction Elements	
Element	**Description**
Communication	communication openness requires the client be forthcoming in sharing pertinent information rather than serving as a source of information to be mined
Responsibility	responsibility is shared between the client and provider to develop solutions and resolve issues
Tolerance	tolerance requires patience in the face of project encumbrances and inconveniences
Accommodation	accommodation requires the client accept the professional judgment of the provider
Advocacy	advocacy requires vocal promotion of the project from client to other clients
Governance	involvement in project governance includes an active role in monitoring progress and directing the project toward the goals
Dedication	personal dedication on the part of the client that leads to performing responsibilities in a conscientious and responsive manner

Each of the traits in Table 2 was measured by a single item on a five-point Likert-type scale (from 1=Strongly Disagree to 5=Strongly Agree) applied to the IS context (Shim, et al., 2010). The items measuring coproduction are formative in nature and reduced to two reflective items measuring the latent variable by partitioning the formative items into two common factors (Treiblmaier, et al., 2011). The split of the items is based on a principle components and canonical correlation analysis of the items and grouped as indicated in Table 3. The canonical correlation using the partitioned items provide weights to compute the values of the common factors. The process explicitly followed the steps for a common factor implementation of formative constructs (Treiblmaier, et al., 2011).

Nine items represent project success as have been employed in numerous studies of information system projects (Tesch, et al., 2009). The items include considerations of efficiency, amount and quality of work, and meeting project goals. The items are on a Likert-type scale (from 1=Strongly Disagree to 5=Strongly Agree) about the level of project outcomes. Role clarity was measured using the items suggested by Bettencourt, et al. (2002). Motivation is the potential gain of the user from the development process and subsequent software product. It is measured using the construct of Chang, et al. (2010). Efficacy is the perceived possession of skills necessary to participate as a team member in development. It is measured with an international efficacy construct applied to a team context (Schwarzer, et al., 1997). Training considers general opportunities of learning as measured by the construct of Lee and Lee (2007).

3.3 Data Analysis

Table 3 shows the items measuring the latent variables. Users responded to the items associated with the engagement process as they are the focus in a client centered development project. Further, users responded to the items of motivation and efficacy as those are related to personal knowledge. The developers responded to the items for training, role clarity provided to the user, and project success as they are typically responsible for the ongoing quality and operations of the development project, as assuring the completion of training, and delineating the process roles. The model further considered variables of mutual support (Hoegl and Parboteeah, 2007), team flexibility (Lee and Xia, 2010), and leadership (Bettencourt, et al., 2002) to control for aspects of culture and climate. Project duration is included as a control variable to represent size.

Table 3 - Latent Variable Items		
Construct and items	loading*	Itc**
User Engagement (Cronbach's α = .91, composite reliability (cr) = .93, Average Variance Extracted (AVE) = .87)		
Common factor 1: As a user, we …	.94	.74
… share honest, clear, and pertinent information for project success with the IS development team.		
… advocate the project and sell its merits to other stakeholders.		
… commit to project success by satisfying responsibilities in a persistent, conscientious, and responsive manner.		
Common factor 2 As a user, we …	.91	.75
… take an active role in monitoring progress toward stated project goals.		
… take individual initiative and shared responsibility for developing solutions.		
… respond in an understanding and patient manner in the face of project encumbrances, difficulties, and inconveniences.		
… seriously consider the approaches and judgment of the developers.		
Role Clarity (α = .80, cr = .94, AVE = .68)		
IS developers have a thorough understanding of the range of behaviors that constitute the responsibilities of users.	.68	.84
Users have a clear understanding of the tasks and behaviors expected of them for an effective partnership.	.74	.89
Users have sufficient motivation to perform their role responsibilities.	.55	.75
Efficacy (α = .91, cr = .94, AVE = .75)		
I am fully capable of participating as a member of the team.	.92	.79
I am confident of my ability to participate as a member of the team.	.93	.79
Being involved as a member of the team is well within my abilities.	.91	.77
I do not feel that I am qualified for the tasks (reversed).	.69	.65
My past experiences increase my confidence that I will be a successful member of the team.	.86	.73
Motivation (α = .84, cr = .89, AVE = .68)		
Involvement with the team will provide me with convenience.	.82	.73
Involvement with the team will allow me to advance more quickly.	.74	.61
Involvement with the team will get me what I want.	.88	.67
Involvement with the team will provide me more control over the system.	.83	.60
Training (α = .79, cr = .85, AVE = .53)		
Developers create opportunities with users to develop relationship norms	.71	.41
Our organization provides opportunities for informal individual development	.60	.52
Our organization encourages members to attend seminars, symposia, and other learning opportunities	.78	.69
Our organization provides various programs for learning	.67	.54
Our team members are satisfied by the content of training programs	.85	.68
Project success (α = .91, cr = .92, AVE = .56)		
Project goals were met.	.74	.74
The expected amount of work was completed.	.77	.79
Completed work was of a high quality.	.78	.61
The schedule was adhered to.	.70	.69
The budget was adhered to.	.67	.61
Task operations were carried out efficiently.	.84	.83
High work morale was maintained.	.79	.73
The project actively produced new and useful ideas.	.73	.60
The project was a technical success.	.67	.55
*all significant at p < .05; **item to construct correlation, all significant at p < .05		

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This study follows a two-step process that considers the measurement model prior to a subsequent assessment of the structural model. SmartPLS was the software selected to establish validity of the measurement model and later analysis of the structural model with partial least squares analysis (Ringle, et al., 2005). Item reliability is highlighted in the factor loadings of Table 3, all of which are significant at $p < .05$. Internal consistency reliability is assured through measures of composite reliability and Chronbach's alpha which all exceed a recommended level of .70 (Hair, et al., 2011). Convergent validity is established with the average variance extracted (AVE) of .50 or greater (Hair, et al., 2011). Common method bias is addressed in part by the solicitation of variables from multiple sources and an analytical one-factor test that finds only 25% of the variance explained by one factor and 67% explained by seven factors (Podsakoff, et al., 2003). The cross loadings of each indicator all fall below the primary loading and the square root of each AVE exceed the correlation with any other latent construct to assure discriminant validity (Hair, et al., 2011). The correlations are shown in Table 4.

Table 4 - Latent Variable Correlations

	User Engagement	Role Clarity	Ability	Motivation	Training	Project success
User Engagement	.93					
Role Clarity	.17	.82				
Ability	.47	.13	.87			
Motivation	.48	.11	.43	.82		
Training	.27	.06	.04	-.03	.73	
Project success	.23	.34	.24	-.01	.52	.75

Note: Bolded diagonal values are the square root of the average variance extracted (AVE)

The subsequent partial least squares analysis of the structural model estimated the path coefficients. A bootstrap resampling procedure (200 resamples) generated the t-statistics to test the significance of each path. Table 5 shows the results of the analysis with each link in the model having a significant ($p < 0.05$) relationship as proposed by the hypotheses. Thus, JET serves as a representative model for the inputs to and consequences of user participation in the completion of projects. Specifically, the antecedents of user training, motivation, role clarity, and efficacy are shown to be significant contributors to creating the engaged environment that is shown in the literature to lead to success.

Table 5 - Path Coefficient Tests of Hypotheses

H_x	Statement of Hypothesis	Coefficient*	Result
1	Motivation -> User engagement	.26	supported
2	Role Clarity -> User engagement	.17	supported
3	Efficacy -> User engagement	.34	supported
4	Training -> User engagement	.26	supported
5	User engagement -> Project success	.22	supported

*all coefficients significant at $p < 0.05$,
R^2 for user engagement = .33, R^2 for project success = .31

Discussion of Results

As argued earlier, user participation in the software development process has long been considered a means to achieve project success. However, software projects continue to fail to meet expectations and inadequate or ineffective user participation continues to be a major problem. Still, new methods, such as agile approaches, arose as a means of involving users further in the software development process but maintain an emphasis on activities instead of user preparation or involvement. In addition there is sparse consideration of a theoretical background to describe user preparation or user behaviors. Our intent in this study was twofold: 1) to formulate and test a theoretical framework for user engagement in software development projects that helps determine what measures can be taken to prepare a user to be productively engaged in software development, and 2) whether intensive activities in a job engagement framework support the achievement of success in a software development project.

4.1 Implications for Researchers

This study served to enhance our understanding of software development antecedents required to achieve full and active participation by the user. The analysis of the data supported the first four hypotheses regarding antecedents. These hypotheses stated that the relationship between the four antecedent variables motivation, role clarity, efficacy and training positively influence the engagement of users. These four antecedent variables are representative of antecedents of meaningfulness, safety and ability in JET. Further, considering the active and full participation defined by user engagement, project success is more likely to be achieved with greater engagement. Thus, this study models and confirms a single theoretical basis for enhancing our view of user participation as user engagement that includes not only the activities of participation but considerations of preparation and results. This extends the current view of user participation which focuses on the user's system development related activities without considering behaviors that contribute to working relationships and the emotional ties between users and developers over physical, cognitive and emotional energies. Overall, the theory and model expand the perspective on achieving intense engagement on the part of the user and open a venue for future investigations.

This study also served to enhance our understanding of engagement as an intensive environment, and its influence on project success. The structural tasks and behaviors of user engagement are not well defined and span a variety of responsibilities that are not cohesively considered part of an emergent framework. The main thrust of measurement of user engagement as a coproduction between users and developers is the recognition of intense collaboration on a project providing a sound backdrop for investigations into a fuller set of user engagement activities. Further, our fifth hypothesis, engagement is positively related to project success, was supported. This lends credence to the use of a coproduction process for fully engaging users in the development to promote a successful project. Future studies should explore a larger set of variables that fall in the job engagement framework of psychological conditions and consider different dimensions of user engagement as having variable contributions to success, and consider impact to different aspects of successful projects.

4.2 Implications for Practice

This research offers a framework in which to view user engagement, that of job engagement and its antecedents of meaningfulness, safety, and availability. Characteristics of employees and organizations drive beliefs regarding these three antecedents. In addition this research presented coproduction as a possible view of user engagement. Coproduction places

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emphasis on the role of individual participants in managing an extremely high level of engagement.

Motivation, an operationalization of meaningfulness, is a set of expected gains and losses from participating in a set of actions in aligning with the context of the task and therefore attaches rewards to the completion of the task. People experience meaningfulness when they feel worthwhile, useful, and valuable. It is important that users attached to development efforts be properly compensated in terms of rewards, but also are released from commensurate competing duties. Team recognition should include users as well as the IT staff on the project. The benefits of the system for the users must be explicit, communicated, and tangible. Further, pre-project partnering techniques should be applied to promote the intangibles of teamwork, ownership, and morale. Pre-project partnering includes team building activities and establishment of conflict resolution procedures before work on the project commences. This approach to considering both practice before and during the development activities is essential in motivating the users to join in the activities needed for successful development. Motivations can include the tangible factors such as advancement in the organization and financial considerations as well as recognition, collegial environments, and those less intangible.

The concept of role clarity, our chosen measure of safety, is the establishment of task expectations on the part of the user and the production of clear role definitions. Individuals can have different perspectives of their role than that of other team members, and this lack of shared understanding within the team can lead to challenges. In addition to understanding their role, a user must also understand how their efforts will fit in with the overall objectives of the team. Project managers must make certain that objectives are clearly established, with task responsibilities specified and linked to the objectives. Responsibility matrices should be a common document in a project that includes users. At all times, team members, including users, should be allowed to ask for clarification of roles and responsibilities without concern for humiliation. Overall, promoting an understanding of the roles to be played by users not only focuses on conducting the correct activities but in providing psychological safety by defining boundaries. Other considerations for safety should be designed into the activities of the users, such as security issues, a culture that rewards risk, and team dispersal plans upon project completion.

Availability is represented as both efficacy and training in our model. Users should be selected based on having the skills needed to contribute appropriately to the development of the product, but also have confidence in that ability. If the skills are not present, then training is critical to complete any lacks the users may have. Key users should be identified based on efficacy considerations or on those desiring training. Users should not be selected solely because they are available, but those selected should be carefully chosen to be certain they possess the necessary knowledge and skills for completing the responsibilities and tasks assigned. Consider the ability of the user to communicate effectively in addition to their knowledge of the business processes targeted by the system. Most organizations will need to train users in the role requirements of engagement, where expectations go significantly beyond just process knowledge and communication abilities. The training process must start early, in some aspects long before a user works on a development with designers, which may imply that an organization must strategically plan for the engagement process to accompany the development tasks.

Overall, this work stresses that it is important to recognize concerns of full engagement during the development project as well as in user preparation. Over the years, the importance of user participation

evolved to ever increasing intensity (Hoda, et al., 2011). More recent participatory development methods try to develop software efficiently so as to satisfy customers, which requires that users are committed to the project and they involve/engage themselves closely with the development team. One practice that addresses the preparation aspect is referred to as customer boot camp (Martin, 2009). This pre-project training focusses on the user's perspective. The thrust of the boot camp is to help users buy into the process, gain a practical understanding of their role, and understand what they need to do on the project, thus supporting the user in becoming an effective member of the whole team. Communication structures are built, conflict resolution guidelines agreed upon, training provided, and team cohesion established.

4.3 Limitations

One limitation of this study is the cross-sectional survey data which limits our conclusions regarding causality. Secondly, overall project success was examined as the sole indicator of success. Other performance measures, such as business benefit attainment, were not considered. Future studies are strongly encouraged to adopt diverse project outcomes to generalize the results and consider more outcomes in the user participation literature. Similarly, a limited set of antecedents were considered, while user engagement allows for a much broader set. Exploration of a larger set of potential explanatory variants and organizational differences may yield greater, practical advice for project managers. Lastly, all constructs are perceptive measures and may have an associated bias or recollection error. The results should be confirmed with objective metrics or case approaches.

Conclusion

Since IS development increasingly involves users in design, development and implementation, it is crucial to understand how to more completely involve them in the process. What differentiates this study from prior studies is both the development of user engagement as an offshoot of JET and the aspects of engagement activities as intensive preparation for coproductive development processes that achieve success. These features serve as the cognitive, active, and emotional components of engagement. The user engagement framework describes the intensive, interactive environment more fully than prior frameworks, plus suggests antecedents that are rooted in the literature. Further, the model advocates a positive relationship from full and active user engagement to successful completion of a system development project. The factors projected to be important in preparing a user for active engagement based on the theory are confirmed. These include role clarity, motivation, efficacy and training as expressions of safety, meaningfulness, and availability.

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