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An Exploration into the Process of Requirements Elicitation: A Grounded Approach *

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Abstract

Requirements elicitation (RE) is a critical phase in information systems development (ISD), having significant impacts on software quality and costs. While it has remained a key topic of interest for IS researchers, a review of the existing literature suggests that there are very few studies examining how the social process associated with RE unfolds. Prior literature acknowledges that this process involves collaboration between RE participants (e.g., user-reps and systems analysts) where knowledge regarding the system requirements is shared, absorbed, and co-constructed, such that shared mental models of the requirements can form. However, collaboration and knowledge sharing within the RE process has been characterized as tenuous in the literature, given that the groups of RE participants bring very different kinds of knowledge into this activity, and trust among the two parties cannot be guaranteed at any point. Despite acknowledgement of the tenuous nature of RE, we are not aware of research that has attempted to present an integrated view of how collaboration, knowledge transfer, and trust influence the RE process. Using data from two different organizations and adopting a grounded approach, this study presents an integrative process model of RE. The study's findings suggest that RE is composed of four different collaborative states. The study elaborates on the four states, and identifies important factors that tend to trigger transitions from one state to another.

Keywords: requirements elicitation, knowledge transfer, collaboration, grounded approach, adapted grounded theory methodology, abduction, user representative-analyst interaction, process model

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An Exploration into the Process of Requirements Elicitation: A Grounded Approach

1. Introduction

In recent years, organizations have experienced an increasing demand for the development of Information Systems (IS) (e.g., Sambamurthy and Kirsch, 2000). Unfortunately, both researchers and practitioners have observed that a large proportion of these Information Systems development (ISD) projects fail (e.g., Armour, 2007), and abandoned/failed ISD projects result in significant costs to organizations (Browne and Rogich, 2001; Guinan, Cooprider, and Faraj, 1998). One of the key reasons for failed ISD projects is the inability of the IS to accurately meet user requirements, a consequence of incomplete and inaccurate information requirements collection during the *requirements elicitation* (RE) phase (Mathiassen, Tuunanen, Saarinen, and Rossi, 2007; Byrd, Kossick, and Zmud, 1992; Bostrom, 1989). Given the criticality of the RE phase in ISD projects (Curtis, Krasner, and Iscoe, 1988), RE has been, and remains, an important domain for IS research (e.g., Mathiassen et al., 2007; Hickey and Davis, 2004; Pitts and Browne, 2004; Marakas and Elam, 1998; Schenk, Vitalari, and Davis, 1998).

The body of knowledge constructed on RE by IS researchers is substantial. Notably the research has enumerated *factors that influence the effectiveness of a systems analyst* (e.g., Misic and Graf, 2004; Pitts and Browne, 2004; Wynekoop and Walz, 2000; Marakas and Elam, 1998; Schenk, Vitalari, and Davis, 1998; Hunter and Palvia, 1996), and *the factors that help improve the RE process*, for example, through the use of different communication technologies (e.g., Ocker, Fjermestad, Hiltz, and Johnson 1998) or through user involvement and participatory design approaches (e.g., Lynch and Gregor, 2004; Iivari, Hirschheim, and Klein 1998; Hirschheim, 1985; Barki and Hartwick, 1989). Researchers have also offered several suggestions for achieving effective RE such as novel interviewing techniques (Browne and Rogich, 2001; Moody, Blanton, and Cheney, 1998), modeling techniques using innovative CASE tools (Martinn et al., 1995), improved conceptual modeling (Wand and Weber, 2002), Delphi approaches (Perez and Schueler, 1982), GSS-aided JAD sessions (Liou and Chen, 1993), cognitive mapping techniques (Siau and Tan 2006), and approaches ensuring a fit between the RE method used and characteristics of the task (Agarwal, Sinha, and Tanniru, 1996).

While the contributions of this body of research are significant, many limitations have been identified by scholars. To start with, the number of proposed RE techniques is arguably more than what is manageable, prompting Mathiassen et al. (2007) to refer to the field of RE as a "methodology jungle." Moreover, this body of work has failed to address the fact that "requirements development… has changed considerably over the past fifteen years" and given the increasingly short project life-cycles, "developers are often challenged to establish effective interaction with would-be users" (Mathiassen et al., 2007, p. 570). Based on their in-depth review of the RE literature, Mathiassen et al. (2007) developed a risk framework of RE, and appealed to the research community to focus on the risk-related issues of RE in an effort to make the process more efficient and successful. Specifically, they call one of their risk dimensions "requirements identity," which emphasizes the "communication gap between developers and would-be users," owing to "physical, conceptual, and cultural distance" between the two stakeholder groups (Mathiassen et al., 2007, p. 574). Urquhart (1997, p. 150) expressed a similar view regarding challenges arising from the communications gap among the stakeholder groups, characterizing RE as an inherently "problematic process," wherein the two participating groups (i.e., analysts and users) bring in "unfamiliar language that is domain specific."[1] Indeed, both Urquhart (1997) and Mathiassen et al. (2007) express the need for researchers to focus on understanding intricacies of the process of RE.

Through this paper, we seek to respond to this call to further explore and conceptualize *the process of RE*, with specific focus on the *dynamics of the interaction* between the analysts and the users of the information system being developed.

[1] Specifically, the users/user-representatives bring in descriptive, procedural and reasoning knowledge about business processes, while the analysts provide knowledge related to systems development process and their applications.

The rest of the manuscript is organized as follows: First, we provide a brief review of the literature focusing on the interaction between the different stakeholders within the RE process. Then, we describe our methodological approach, followed by a discussion of our theoretical sensitivity, or the theoretical ideas that informed (not drove) our theorizing. The following section presents a discussion of the boundary conditions of our study. Thereafter, we provide an elaborate discussion of our process model including states, triggers, and enablers/inhibitors. Finally, we conclude with the contributions of this endeavor to both research and practice and its limitations

2. Literature Review

Given our focus in this manuscript is on the "process" of RE, in our review of the existing literature, we have restricted ourselves to examining past research focusing on the RE process. We summarize the studies resulting from our review in Table 1.

As is evident in Table 1, past literature investigating the RE process has focused on uncovering the different elements of the process. A significant body of this literature is non-empirical and attempts to depict the RE process as a staged sequence of activities and/or task objectives (e.g., Sommerville, 2007; Browne and Ramesh, 2002; Hickey and Davis, 2002; Deifel, 2009). Apart from describing and elaborating on the nature of the activities and task objectives (see first half of Table 1 for detail), this body of work also discusses the nature of intermediate outputs, appropriate techniques that could assist such an activity (Sommerville, 2007; Hickey and Davis, 2002), specific problems faced while completing tasks (Browne and Ramesh, 2002), means of assessing uncertainties and dependencies (Deifel, 1999), and appropriateness of adopting from conceptually analogous activities such as knowledge acquisition (Byrd, Cossick, and Zmud, 1992).

While this body of literature has been invaluable in terms of providing insights about the nature of the RE activity, it tends to represent "processes like programs which do not integrate all the interactive aspects" of the RE process (Rolland, 1993, p. 3). Further, an implicit assumption in this body of work is that the RE process is normative and deterministic, which in some ways contradicts the reality of RE, often described as "chaotic and non-linear" (Davidson, 2002, p. 330) and non-deterministic (Rolland, 1993). This view is echoed by Thanasankit (2002) who describes RE in terms of the dialectic between an objective rationally-ordered view and the subjective socially-constructed view that acknowledges the influence of factors like social concepts, power, control, legitimacy, privilege, justice, and equity.

Therefore, we shift our focus for the rest of the review to the literature that has adopted a non-normative view of the RE process (see bottom half of table 1). This also includes some examples of non-empirical research. Rolland (1993) conceptualizes the RE process as one that is contextual and non-deterministic and unfolds in terms of *situations, decision actions, and arguments*. Pohl (1993; 1994) visualizes the RE process to be bounded by a three-dimensional space within which project teams traverse a path that transitions from an *initial output* characterized by opaque specification, informal representation, and personal views to a *desired output* characterized by complete specification, formal representation, and common views. Jarke and Pohl (1993) build on Pohl's framework of RE by integrating the concepts of *vision* and *context. Visions* are conceived as non-functional requirements that are a function of the constraints imposed by the *context. Context* is organized based on a socio-cognitive view of stakeholders and is comprised of the "*application domain (subject world), organizational context (usage world), existing systems (system world), and the development environment itself (development world)"* (Jarke and Pohl, 1993, p.1). While the works of Rolland (1993), Pohl (1993; 1994), and Jarke and Pohl (1993) represent a significant step toward viewing the RE process as non-normative, and, thus, context-specific, we believe that they do not provide us with an in-depth understanding of the subtle nuances of the process and the interactions that take place between the different stakeholders during RE. As Marakas and Elam (1998, p. 38) highlight, a clearer understanding of the RE process may be obtained only if one can develop insights into the behavioral/social processes associated with RE and related micro issues "such as just how and when" the processes unfolds.

Table 1: Process-Based Studies in RE

Research Category	Citation	Process metaphor	Details of RE Process characterization
Normative approaches	Sommerville (2007)	RE process broken up as an iterative process consisting of *high level activities, intermediate outputs* and *activity specific techniques*	Activities categorized as – *requirements discovery, requirements classification and organization, requirements prioritization and negotiation, requirements documentation.* Identification of iterative paths between activities
	Browne and Ramesh (2002)	Multi–stage RE process where each stage is characterized by *Input-Task objective-Output*	Process differentiation based on three distinct task objectives - *information gathering, representation, verification* Enumeration of specific problems/impediments faced at each stage
	Hickey and Davis (2002)	Requirements belong to a static unchanging problem and solution domain. Process iteration characterized by evolution of an (objective) state of knowledge about the system requirements	RE proposed to consist of iterations in each of which two activities dominate - *capturing and understanding requirements, selection of specific elicitation techniques* Identification of triggers that cause shift between iterations and improvement in the knowledge state of requirements
	Deifel (1999)	Distinct and different views : *Market view, system view* and *development view* The process model is linear and progresses through sequential definition of each view as independent phases	Definition of each view broken up into sequence of activities that attempt to assess uncertainties, dependencies, requirements, system architecture and version planning.
	Byrd, Cossick and Zmud (1992)	RE process characterized to be similar to the Knowledge Acquisition (KA) process. Both processes characterized as iterative chains of task based activity	Four task based activities identified – *identification, conceptualization, formalization, implementation* and *testing*
Non-normative approaches	Gasson (2006)	"Actor-Network", specifically, a trajectory of human interactions, mediated and stabilized by non-human intermediaries such as documents, technology artifacts and formal procedures.	*Episodes* representing states of equilibrium that were punctuated by disruptions in which design goals were redefined. Each episode is characterized by - *inscription/boundary object, translation of interests, boundary object role*
	Nguyen and Swatman (2003)	"Catastrophe-cyclic" nature of RE process characterized by points of crisis triggered by increased complexity where requirements model get reconceptualized, restructured and simplified	Identification of two types of complexity, representing the inherent complexity of the system and representational complexity Description of change dynamics of such complexity and their relationship with comprehension of system requirements

Table 1: Process-Based Studies in RE (Continued)

Research Category	Citation	Process metaphor	Details of RE Process characterization
Non-normative approaches	Thanasankit (2002)	Dialectic between the objective rational, ordered view of RE vs. subjective socially constructed view of the RE process	The objective "front stage" of RE consisting of the describable formally modeled rational and ordered set of process The subjective "backstage" that epitomizes the socially constructed RE process influenced by underlying subjectivist social concepts, power, control, legitimacy, privilege, justice and equity in addition to factors like existing technology, IS discipline, organizational context
	Davidson (2002)	RE process as an evolutionary process characterized by *technology frames* and *shifting salience of technology frames*	Identification of candidate technology frames and tracing the process of shifts in frame salience Identification of change triggers that lead to shifts in frame salience
	Urquhart (1997)	Collaboration dynamics based on *variation of interaction tactics, evolution of conceptualization of information system*	RE process broken down into the following interaction tactics - *reframing, imagining, props, rapport building,* Changes of conceptual schemas about the IS through - *actions, processes. & information*
	Potts, Takahashi, Anton (1994)	RE as a process of text based conversation consisting of iterations between distinct *activity phases*. Shifts between which is marked by specific *actions.*	Three activity phases – *requirements documentation, requirements discussion* and *requirements evolution* Three actions – *challenge, discuss* and *change*
	Pohl (1993;1994)	Dimensions of RE based on three main goals of RE	Three dimensions – specification, representation and agreement RE process characterized as a path that transitions from an *initial output* characterized by opaque specification, informal representation, personal views to *desired output* characterized by complete specification, formal representation and common views
	Jarke and Pohl (1993)	Social/Cognitive viewpoints of stakeholders - *system vision* Three dimensions characterizing RE activity	Four worlds – *usage, subject, system* and *development.* Three dimensions of RE activity – *specification, agreement* and *representation*
	Rolland (1993)	RE process conceptualized through the *situations,* which explain the decision context, the *decisions* that guide the RE process, the *actions* performed to enable the product transformation and the *arguments* that support the decision-making	Distinction between micro and macro contexts and the process of decomposition of macro-contexts A hierarchical taxonomy of decisions and distinction between compound decisions (multiple action outcome) atomic decision (single action outcome), primitive decisions and dependent decisions

The empirical studies on RE have been instrumental in providing some insight into the socio-behavioral processes characterizing RE activity. At the heart of the RE process is the collaborative interaction between multiple stakeholders. Potts, Takahashi, and Anton (1994, p. 21) characterize such interaction as an "incremental inquiry-based process" and describe how such "discussions about requirements" ensue between the analysts and the users through their Inquiry-Cycle model. However, such a dialogue concerning the requirements has been found to be difficult and problematic, particularly because the participants bring in "unfamiliar language that is domain specific" (Urquhart, 1997, p. 150). Any information systems development activity spans multiple knowledge domains (Iivari, Hirschheim, and Klein, 2004; Curtis, Krasner and Iscoe, 1988), requiring the participants to bring into the forum specialized expertise regarding such varied knowledge domains. At the same time, such expertise induces specialized mental models or conceptual schemas about the proposed information system. This diversity of mental models has a significant influence on the overall trajectory of RE the process (Gasson 2006). Given that a focal purpose of the collaborative interaction is for the participants to arrive at a shared frame of reference and conceptualization regarding to the system requirements, it is important to understand the process of collaborative sense-making and knowledge transfer that results in the convergence of diverse mental models. Using a longitudinal case study, Urquhart (1997) examined the user-analyst interaction patterns and the techniques used by the stakeholders during RE. Urquhart (1997) identified four different patterns of interaction tactics — *reframing, imagining, props, and rapport building.* It is important to note that these interaction tactics emphasize both socio-cognitive mechanisms that explicitly facilitate evolution of the conceptual schema, along with behavioral mechanisms that elevate levels of trust within the participants. Gasson (2006) describes the convergence of shared mental models in terms of *episodes,* characterized by *inscription/boundary object, translation of interests, and boundary object role.* Davidson (2002), in turn, describes it in terms of iterations of *technology frames* and *shifting of salience of such technology frames.*

The empirical research described above provides rich descriptions of the RE process and identifies key elements that characterize it (e.g., collaboration, knowledge transfer, trust, and development of shared mental models). However, none of the research (and to our knowledge any research in IS) explicitly integrates all these elements within a unifying framework. This results in a splintered view of the overall RE process that hints at but does not quite provide a holistic conceptualization about it. We feel that this represents a notable gap, and we would like to argue that there is a need to develop a conceptualization of the RE process that is *empirically grounded*, situated within the context of social collaboration processes and integrative of the various perspectives that explain/illuminate the collaborative process (Mathiassen et al., 2007; Marakas and Elam, 1998; Rolland, 1993). Our objective in this study, then, is to address this issue by examining the RE process from *the perspective of knowledge sharing, trust, and development of shared mental models within a collaboration context (involving stakeholders with disparate perspectives), specifically focusing on the subtle nuances of and the dynamics within the RE process.* We utilize an adapted version of the grounded theory methodology to guide our investigation – we briefly discuss our methodological rationale and procedures next.

3. Methodological Approach

Our objective in this study was to develop an in-depth processual understanding of the RE phenomenon that is derived based on the experiences of the human participants (Glaser and Strauss, 1967). Grounded theory methodology (GTM) (Glaser and Strauss, 1967; Strauss and Corbin, 1990) provides a framework that is useful in deriving theories of human behavior while being inherently grounded in empirical data (Urquhart, 2001). This methodological approach is particularly suited when the research motivation is other than incremental verification of existing substantive theory (Strauss and Corbin, 1990; Sarker, Lau, and Sahay, 2001).

3.1. Data Collection

We collected qualitative data, primarily through interviews, from two organizations (TechSource and UnivTech, both pseudonyms). Our motivation to collect data from two different organizations was guided by the following considerations: First, the pattern that would emerge from two different

organizations would enable us to identify characteristics that are specific to the RE phase, and not idiosyncratic to a particular organization. Second, prominent qualitative researchers advise the collection of data from multiple sites whenever possible. In order to obtain the maximum benefits from collecting data from two organizations, we ensured that the organizations differed significantly from each other, both in terms of the magnitude and scope of their operations, and the composition of their ISD teams.

TechSource is the global, technology services division of a multinational organization. It has more than two decades of IT experience and specializes in ISD projects for offshore clients, providing seamless solutions to leading organizations around the world. Currently, the organization has about 348 clients, 138 of which are Fortune 1000 or Global 500 companies. It is also considered to be one of the top players in the North American IT offshore outsourcing market.

UnivTech, on the other hand, is a university IT organization, and its goal is to provide "high quality technology and customer services to a diverse … community." As opposed to TechSource, analysts in UnivTech work on ISD projects for clients who are located in the same geographical location as the analysts.

Any collaboration requires mutuality (Sarker and Sahay, 2003), and we realized that in order to fully understand the nature of the collaboration, it is important to understand the points of view of the different stakeholders involved. Thus, in the context of our study, we sought to understand the view of *both* the analysts and the user representatives. We captured the rich contextual nuances of collaboration during RE through extended semi-structured interviews ranging from 40 – 60 minutes. The interviews were tape-recorded and much of the interviews were professionally transcribed. Table 2 summarizes the sample of our study, which included systems analysts, ISD project managers, and/or leads of ISD projects, and user representatives.

Table 2: Interviews

Organization Name	Details	Nature of Project	Interviewee Designation
TechSource	Multinational IT services vendor engaged in projects with a US based utility Company specializing in generation and distribution of electricity	Customer Service System Work asset management Systems	1 Project Lead 5 Analysts 3 Users-representatives (from the client organization)
UnivTech	Public University based in the north-western region of US	Payroll-related systems Web-based Learning System	1 Project Lead 3 Analysts 1 User representative

4. Analysis procedures and clarifications about the GTM variant used

It might be a good idea to precede the description of how we utilized GTM procedures with an acknowledgment that GTM resembles a tapestry that is both abundant and "contested" (Bryant and Charmaz, 2007, p. 3), with documented variants such as the Glaserian school, the Strauss and Corbin school, and the Constructivist school. These variants tend to adopt different assumptions and emphasize different methodological procedures and practices. GTM researchers such as Urquhart (2007, p. 354) acknowledge this point, suggesting that appropriation of this methodology is deeply contextual to the researcher's particular investigative endeavor. In line with Urquhart's observation and the recommendations of other researchers (e.g., Bryant and Charmaz, 2007), we draw upon Strauss and Corbin's overall methodological guidelines (1990), utilizing the underlying logic of the coding procedures, and adapting the procedures as necessary.

It is worth noting that our data analysis and theorizing involved induction as well as abduction. This is consistent with previous conceptualization of the analytic logic of GTM (e.g., Reichertz, 2007). Reichertz (2007) proposed that abductive logic elevates grounded theorizing from mere mechanical coding to a creative process. In other words, abduction involves imaginative interpretation while at the same time forcing the researcher to repeatedly seek "accountability" from the empirical data (Bryant and Charmaz, 2007). Specifically, in our study, induction played the predominant role in our open coding, while the role of abduction became more pronounced in the later part of the data analysis.

Another related point of clarification concerns the idea of "grounding," and the role of theoretical sensitivity. Glaser and Strauss (1967) emphasized the need to avoid preconception or forcing of existing concepts or theory, and instead allowing concepts to emerge from the data; however, Strauss and Corbin (1990) explicitly acknowledged that the discovery of theoretical categories during the coding process would need to draw on " existing stocks of knowledge" (Kelle, 2007, p. 197). This points to the importance of "theoretical sensitivity" in that it facilitates the recognition of the relevance of raw data to the theoretical project (Strauss and Corbin, 1990). Without "theoretical sensitivity" the researcher may end up focusing on description rather than on abstraction (the goal of this study). Thus, we develop and present our theoretical sensitivity, primarily in the areas of collaboration, knowledge transfer, trust, and cognitive models in the following section. Of course, we strive to ensure that pre-existing theory is not forced on the data, as this would be against the spirit of any GTM variant.

Finally, we clarify how we model the social *process associated with our focal phenomenon* (RE). We adopt the conception of "process" offered by Van de Ven (2007, pp. 197-199):

> *… process is a sequence of events or activities that describe how things change over time… variables are not the centerpiece… the central focus... is on progressions (i.e., the nature, sequence, and order)… over time.*

Strauss and Corbin (1990) offered the "paradigm model" as an aid to developing process models. However this has been critiqued by previous researchers (Sarker et al., 2001; Urquhart, 2007; Kelle, 2007) as being too restrictive and not adaptable to many contexts. Kelle (2007) suggests that researchers construct their "own coding paradigm" consistent with their particular objectives and traditions. For this research, therefore, we have chosen to adapt the vehicle of *state transition diagram,* often used to describe the behaviors of finite state systems (Booth, 1967), to model the social process underlying RE. This primarily involved conceptually describing the different "states," and identifying the enablers/inhibitors and triggers for transitions.

5. Background for the Process Model

5.1. Theoretical Sensitivity

In the above methodology section, we highlighted that contemporary grounded theorists have expressed the need to be sensitive to and be *inspired by bodies of work* in the literature, even when developing a grounded theory or model (e.g., Suddaby, 2006). Consistent with this perspective, in this section, we provide an overview of some of the streams of thought that informed our theory-building. For example, we borrowed labels and the idea of having different paths to goal attainment from Time Interaction and Performance (TIP) (McGrath, 1991); in other cases (e.g., ba in the knowledge transfer literature), we were sensitized to look for certain patterns in our RE data. Further, we would like to note that in this study, we adopt a connectionistic epistemology to knowledge transfer. The connectionistic approach focuses on relationships and interactions, and views knowledge transfer as being a sense-making process, where communication is the primary mechanism through which knowledge is shared and transferred. We elaborate on these perspectives below.

Collaboration

Our work is informed by a collaboration framework called the Time, Interaction, and Performance (TIP) theory (McGrath, 1991). TIP argues that each group is involved "one or another of four

[different] modes of group activity" (McGrath, 1991, pp. 155-156). The four modes identified by McGrath (1991) characterize the start-up activities, identifying the "most appropriate means" of achieving goals, resolution of conflicts or differences arriving from "conflicting preferences, values or interests within the group," and, finally, attainment of the goal and creation of some "end product." These modes of activity are argued to apply to every group situation. However, McGrath (1991, p. 153) warns group researchers that these modes are "potential, not required, forms of activity." That is, while each group's endeavor must begin with the start-up activities characterized by the first mode and end with the creation of an "end-product" or goal attainment, groups may choose to skip the other two modes depending on the situation (or complexity of the group task). McGrath (1991, p. 158) specifically argues that the "direct path" from mode I to mode IV is the "default path for...most group projects." He adds that groups will tend to always use "the least complex path that its purposes, resources, and circumstances will allow" (p. 158).

Knowledge transfer

Knowledge transfer researchers characterize the process as one where a "complex, causally ambiguous set of routines" is "recreated and maintained" in a "new setting" (Szulanski, 2000, p.10). Other researchers (e.g., Boisot, 2002; Davenport and Prusak, 1998) view knowledge transfer as requiring "resonance" between the source and the recipient. Any type of knowledge transfer requires a shared context or "ba" (Nonaka, Toyama, and Konno, 2001, p. 22). The term ba originates from Japanese, and refers to a space where "participants with their own contexts can come and go, and the shared context… continuously evolves" (Nonaka et al., 2001, p. 22-23). The key to understanding the concept of ba is to view it through interactions and relations. Fayard (2003) argues that "exchanges of data, of information and opinion, collaboration and mobilization on a project" convey the "ba within an organization." In the context of our study, thus, ba could refer to the context of requirements elicitation that provides the platform for knowledge sharing and transfer between the analysts and the user representatives. Different types of ba need to be considered while examining knowledge transfer within the RE process: originating ba, dialoguing ba, and exercising ba. Originating ba refers to an initial mode where individuals "share their experiences, feelings, emotions, and mental models" (Nonaka et al., 2001, p. 24). The dialoguing ba refers to deeper interactions where individual mental models are not only shared, but slowly begin to merge into common terms and concepts. Finally, exercising ba synthesizes all of the different components of knowledge into a unified form, and puts it into action. It appears that in the context of RE, where development of a shared frame of reference is critical, the three types of ba mentioned above can play an important role.

Trust

Trust is the glue that holds together any collaborative and knowledge transfer effort. The literature on knowledge transfer has maintained that trust plays a critical role in the extent of knowledge transferred between a source and a recipient (e.g., Joshi and Sarker, 2003; Szulanski, 1996). Similarly, the general literature on requirements engineering has also indicated the important role played by trust within this process (e.g., Sutcliffe, 2006).

A review of the literature reveals many different streams of thought on trust. The three types of trust that have been viewed to be the most dominant are: 1) personality-based trust; (2) institutional-based trust; and 3) cognitive trust (e.g., Sarker, Valacich, and Sarker, 2002). In addition, recent literature points to the importance of swift trust (e.g., Jarvenpaa and Leidner, 1999).

Personality-based trust often develops during infancy when one seeks and receives help from one's caretakers (Bowlby, 1982), and for many individuals, this results in a general propensity to trust others (Rotter, 1967). The role of personality-based trust is particularly important when examining trust within a dyadic relationship as opposed to within a group (as in our study). The *institutional approach to trust* holds that norms and rules of institutions (such as organizations) guide individuals' trust-related behaviors. In organizations, bureaucratic administrative structures and norms represent "proper procedures, orderliness, predictability and an attitude of moralized anonymity" (Berger, Berger, and Kellner, 1973), and ensures that everyone behaves in a trusting way (Scott, 1992).*Cognitive trust* can be best described by drawing on Lewis and Weigert (1985, p. 970), who state that "we cognitively

choose whom we will trust in which respects and under what circumstances, and we base the choice on what we take to be 'good reasons,' constituting evidence of trustworthiness." As individuals get to know others, they gain more information about them. This information is processed, often through categorization (Feldman, 1981), and then turned into schemas and stereotypes, which are cognitive structures that represent the knowledge about a concept/person (Fiske and Taylor, 1991). These structures are used as the basis for developing trust toward others. McKnight, Cummings, and Chervany (1998) propose the use of three types of categorization processes to develop trusting beliefs: unit grouping, reputation categorization, and stereotyping. Unit grouping refers to the fact that when there is a general perception that the parties involved in the relationship share common goals, they tend to view each other trustingly (Kramer, Brewer, and Hannah, 1996). Reputation categorization suggests that individuals with good reputation are generally trusted (McKnight et al., 1998), while stereotyping suggests that in social encounters, individuals form impressions about others based on physical appearances or other interaction modes (Baldwin, 1992; Sarker et al., 2002). Further, in today's competitive era, where groups often work with very tight deadlines and work under tremendous time pressure, group members do not have the time or opportunity to focus on "relationship building" and developing trust, and consequently, they need to "import" trust. This is called "swift trust" and enables groups to start their collaboration on a solid foundation (Jarvenpaa and Leidner, 1999, p. 794). However, as groups continue with their task performance, different actions (engaged in by the stakeholders) can either help maintain the high level of trust or hinder it, thereby driving the levels of trust downward (Jarvenpaa and Leidner, 1999).

5.2. Mental models and cognition

The role of knowledge transfer is to help create, share, and refine stakeholders' mental models. Cognitive processes and mental models are especially important during the RE processes, where the user representatives and designers/analysts bring different models into the process, and the goal of the requirements elicitation process is the development of a shared mental model regarding the requirements specification (e.g., Browne and Ramesh, 2001; Kirs, Pflughoeft, and Kroek, 2001). The concept of "technology frames" has been used to understand the cognitive processes that play a role during systems development (Davidson, 2002; Orlikowski and Gash, 1994). Three different technology frames have been proposed: nature of the technology, the strategy behind the technology development and implementation, and "technology-in-use." Among these, the "nature of the technology," which refers to the requirements and features of the technology, plays a more critical role in RE.

Before presenting our process depiction of RE, it may be useful to establish some of the *key assumptions* and *boundary conditions* of our investigation, so as to clarify which stakeholder groups we are focusing on, and our assumptions regarding the nature of the RE context.

5.3. Boundary Conditions

First of all, the requirements elicitation process can involve a wide range of stakeholders, and it is important to specify the type of stakeholders that a requirements elicitation study is focusing on (e.g., Westfall, 2005). Typically, any software requirements process involves "customers," that is, individuals who "request" and perhaps even pay for the system, users who use the systems, systems analysts who are responsible for "eliciting the requirements from the customers, users, and other stakeholders" (Westfall, 2005, p. 100), and even developers in many cases. The users can further be composed of the "end-users, who actually use the product directly or use the product indirectly" (Westfall, 2005, p. 100), and user representatives. In large organizations, it is fairly common to have user-representatives who are domain experts (i.e., those who not only have an intricate knowledge about the users' business processes, but are also somewhat familiar with systems analysis techniques) (e.g., Tuunanen, 2003). Along similar lines, Fraser, Kumar, and Vaishnavi (1991) suggest that the role of this business domain expert is usually to "mediate" between the user group and the analysts/designers, and to transmit necessary system requirements to the analyst/designer. In this study, we focus on 1) the RE processes that involve user-representatives (representing the business organization) and systems analysts (representing the technology providers), and 2) on the interactions between these two stakeholder groups. Please see Figure 1, where we represent our focus area.

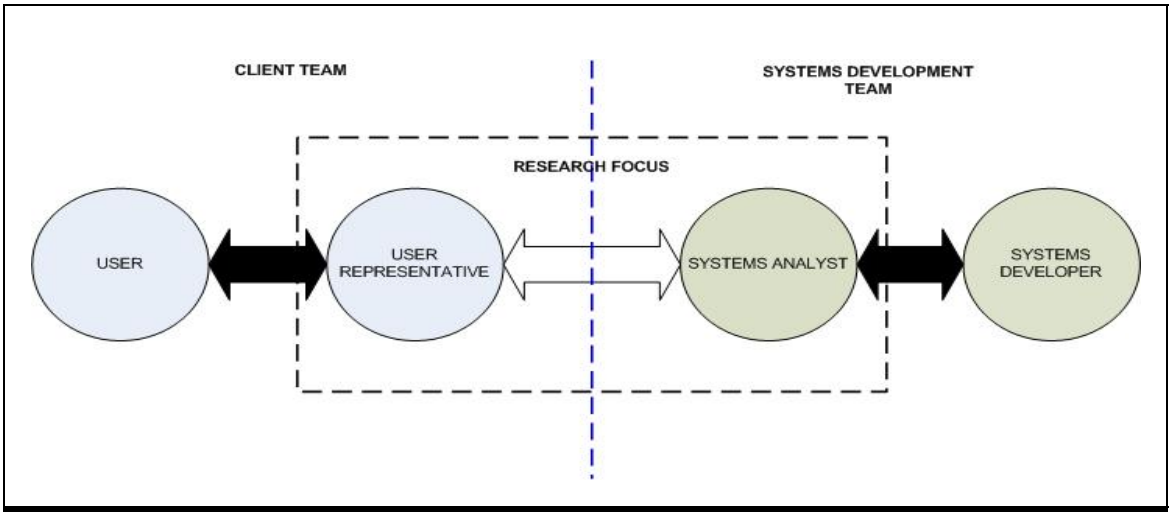

Figure 1: The primary RE participants in this study – user representatives & systems analysts

Second, a variety of specific techniques/approaches may be used to elicit system requirements in different situations (e.g., Tuunanen, 2003; Davis and Monroe, 1987). For example, a user may state to the analysts the following: "I can't really tell you what I need; work something up and let me have a look at it. If I see it, I'll know it" (Davis and Monroe, 1987, p. 105). Such a scenario may prompt the use of prototyping approaches to elicit the requirements. Similarly, other techniques such as group elicitation and protocol analysis (e.g., Tuunanen, 2003) can also be used. However, Mathiassen et al. (2007, p. 577) suggest that often, the most commonly used techniques "do not naturally fall into a single category of techniques." We adopt a similar perspective in this study. In an effort to keep our process model general across multiple approaches, we avoid associating our model with a technique. We assume a RE process where the user representative(s) have some knowledge and understanding of the system requirements, and the analysts use techniques such as interviews, focused group meetings, review of organizational documents, etc. to arrive at a shared understanding of those requirements. We believe that such an approach enables us to focus on the overall knowledge transfer and group collaborative efforts, as opposed to getting tied down in ensuring that the proper protocols associated with a specific technique were being used faithfully.

Finally, Mathiassen et al. (2007, p. 575) argues that one of the key risks in requirements elicitation is "requirements volatility," which refers to the "stability of requirements," and the pace at which the requirements change. Often, market and environmental factors cause the requirements to change rapidly, which could trigger very different dynamics within the requirements elicitation process. While acknowledging that "software evolves over time and requirements therefore inevitably change [maybe not greatly]" (Mathiassen et al., 2007, p. 575), we assume relatively stable requirements (i.e., having low volatility).

6. A Process-Based Theory of RE

Next, we discuss our theoretical framework (Table 3, Figure 2 and Table 4). As discussed earlier, we view our framework through the "state transition" perspective, composed of the different states, the enablers/inhibitors of each state, the transitions between the states, and the triggers that initiate the different transitions. Further, within each state, we discuss the role of the three primary components: the nature of the knowledge transfer, trust, and mental models/cognition.

6.1. The Collaborative States of RE

Analysis of our data re-confirmed the findings of previous research (e.g., Urquhart, 1997) that RE is a collaborative activity between user representatives and analysts, the success of which lies not only in the ability of the two groups to develop a shared frame of reference, but also in developing the ability

to work together. In this regard, an analyst at UnivTech asserted that it is important to "work … as a group, and get their requirements as a group." Another TechSource analyst felt that RE fundamentally involves "a group interaction."

Table 3: An Overview of the States in the RE Process

	Scoping	Sense-Making	Dissension	Termination (for successful RE)
Objectives	Formal breaking of the ice; ceremonial start of the RE process; users engage in initial articulation of the broad business needs/goals of the information systems to the analysts	Understand the problem boundaries, and develop a shared frame of reference regarding the system requirements	Resolve conflicts (both issue-based and interpersonal), that may have arisen during the sense-making state	Create the specification document, and get user representative sign-off on the document
Knowledge Transfer	Reflects an "originating ba;" sharing of the core issues related to the systems requirements; sets the foundation for the sharing of more complex and tacit knowledge later on	Reflects a "dialoguing ba;" attempts at conscious co-construction of requirements; bi-directional sharing of knowledge ("push"), and continuous tapping into each other's knowledge bases ("pull")	Reflects a "dialoguing ba;" explicit sharing and transfer of knowledge to detect the nature of the discordance, and also help in understanding the other's point of view	Reflects an "exercising ba;" explicit knowledge about the requirements specification shared by the analysts to the user representatives
Trust	Development of trust; Institution-based trust; "swift trust;" reputation categorization-based trust	High levels of trust; Mechanisms to retain high levels of trust; primarily cognitive trust based on stereotyping	Low levels of trust between the two groups; formation of negative stereotypes, and attempts at re-categorizing these stereotypes by relying upon interactional cues and contractual agreements	High levels of trust; based on unit grouping
Mental Models	User representatives and analysts have their own "separate" mental models and heuristics; often, these mental models are inconsistent among user reps and analysts	Less asymmetry in the mental models of the user reps and analysts; several cognitive biases of both the user representatives and analysts (e.g., overconfidence, recall bias, satisficing) are in play	Significant discordance in the mental models of the two stakeholder groups; attempts at reducing discordance through techniques such as direct or indirect prompting	Shared frame of reference established

In addition to confirming that RE is a collaborative activity, our selective coding phase also identified certain characteristics of this collaboration. In particular, it revealed that the collaborative process underlying RE is not composed of a fixed temporal sequence of stages (such as the development stages identified in prior group literature), but that the collaborative process may be categorized into states based on a number of factors, which we discuss below. The states identified through the data analysis had some resemblance to McGrath's (1991) conceptualization of the different collaboration modes that groups engage in for task performance and goal achievement. Specifically we identified four distinct states (see Figure 2) – scoping, sense-making, dissension, and termination. These states differ in terms of the collaborative objective, nature of knowledge transfer, nature of trust, and the extent of shared mental model about the requirements amongst the participants. Below, we discuss in detail the nature of each of these collaborative states.

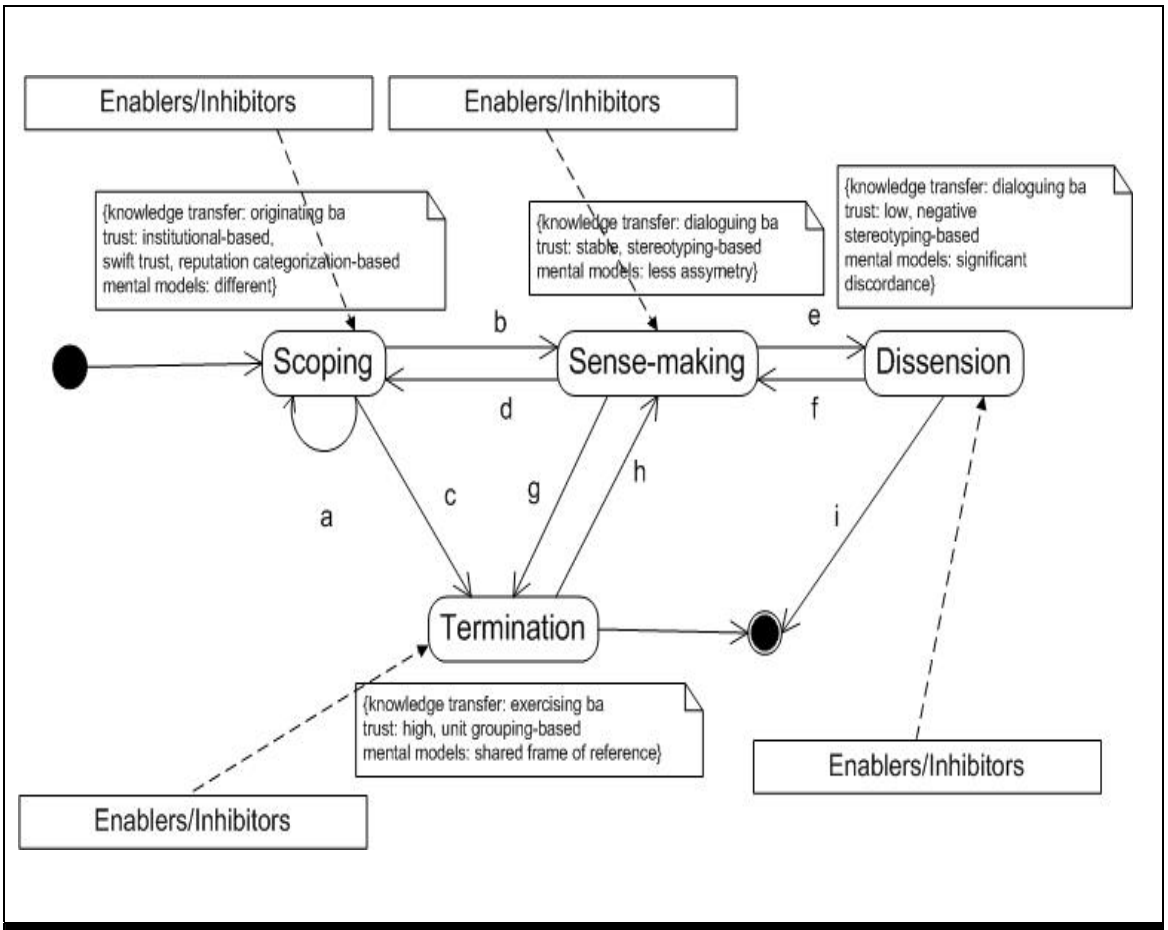

Figure 2: A Process Model of Requirements Elicitation in terms of States and Transitions

The Scoping State

Nature of knowledge transfer

This state is characterized by a predominantly unidirectional transfer of knowledge about business needs/goals as perceived by the user representatives *to* the analysts. Enthusiastic about the prospects of a new IS, the user representatives engage in a "push" strategy of knowledge transfer, where they voluntarily share their knowledge regarding the business problem to the analysts. A user representative from TechSource emphasized this unidirectional knowledge transfer in this state, noting that "… the business clearly says that these are [the] things I want to implement or this is my objective…"

Table 4: Triggers of the Transitions between the States

State Transitions	Description	Some Triggers Identified
a	Recursive transition to the scoping state.	• User reps' lack of clarity (or an incomplete understanding) regarding the broad needs of the proposed system • Perceptions of a lack of feasibility of the system • Lower levels (or lack) of "swift trust"
b	Logical progression from scoping to the sense-making state.	• Ground-rules and working relationship between user-reps and analysts established • Feasibility of the system requirements established • High level of congruence in understanding as a result of the transfer of broad system requirements
c	Transition from the scoping state to the termination state.	• The business need is a simple/trivial system enhancement such as changes to the interface or some basic functionality o Further deliberation for getting detailed understanding is thus not necessary
d	Reverse transition from the sense-making state to the scoping state to redefine their broad business objectives.	• Need to redefine overall business objectives • Need to develop more clarity on the definition of the problem boundaries • Impact analysis results that indicate the need to "broaden/condense" the problem definition.
e	Transition from the sense-making to the dissension state.	• Issue-based conflict o Disagreement about (or conflicting interests surrounding) the requirements specifications o Disagreement about the choice of technology platforms • Interpersonal conflict o Political issues within the group o Greatly reduced trust between participants due to formation of negative stereotypes
f	Transition from the dissension back to the sense-making state.	• Resolution of issue-based conflict has been reached, and group now needs to turn attention to the other "unfinished" business • Solution to political problems has led to the recognition of new requirements that need to be made sense of • Re-establishment of trust after periods trust-breakdown
g	Transition from the sense-making to the termination state with the goal of objectifying the requirements within the specification document and getting client sign-off.	• Shared frame of reference surrounding the requirements of the new system. • Requirements elicitation is perceived as complete by the participants
h	Transition from the termination state to the sense-making state with the goal of "filling in" the perceived gaps within the detailed business specifications.	• Complex business problems where by user representatives and analysts perceive gaps within the objectified requirements specification
i	Premature termination from the dissension state	• Failure to resolve conflicts • Complete break-down of trust • Project deemed unfeasible

The user-reps attempt to clarify their needs, while the analysts attempt to absorb and internalize the problem statement. A TechSource analyst highlighted the importance of meetings and involving multiple stakeholders.

> *… [the] first thing that happens is, it starts with a lot of meeting[s], … you involve different people [user representatives], from the different groups…*[2]

In addition, formal business case documents provided by the user representative, or even formal questionnaires submitted by the analysts are also used for knowledge transfer purposes during this state. In essence, the scoping state of RE characterizes a formal "breaking of the ice," a ceremonial start of the RE process where the user representatives engage in initial articulation of the problem domain (i.e., the user representatives articulating the system's business needs) for the analysts, and attempt to get to know each other in an effort to develop a working relationship.

In terms of knowledge transfer, this state may be viewed as reflecting originating ba, where the context is set, and an initial socialization between the stakeholders take place. The originating ba enables the sharing of all the core issues related to the systems requirements, and forms the foundation for the sharing of more complex and tacit knowledge, and the conversion of the different strands of knowledge into one unified whole later on. For example, user representatives sensitize the analysts to the business processes, compliance needs due to regulatory demands of the external world, and so on. A UnivTech analyst characterized the nature of information provided by the user-reps during this state:

> *.. What are the business functions that are involved here and what [is] the flow of data among these business functions...*

A TechSource analyst also made a similar point:

> *…you need subject matter expertise… what I call a process lead. They understand the business process. They tell our people how it is going to work.*

Trust

Our analysis of the data also suggests that trust[3] is an extremely important component of the RE process. It is viewed as the important ingredient that "glues" the interactions in this state (O'Hara-Devereaux and Johansen, 1994). An analyst highlights this issue:

> *I strongly believe that this entire business is running on trust… if the ...users [i.e., the user representatives] cannot trust the analysts … then we are going nowhere.*

During the scoping state in our study, trust between the two stakeholder groups (that is, user representatives and analysts) was primarily institutional-based. Apart from contexts where there had been a significant history of interaction between the user representative group and the analyst group, this state involved initial contacts between these two groups. Thus, there was insufficient information available to form any stereotypes regarding the others' trustworthiness. In the absence of such cues, trust develops due to a faith in the institution, and the security that one feels due to guarantees within an organization (Zucker, 1986). Similarly, McKnight et al. (1998) highlighted that structural assurances, defined as the belief that success is likely because such contextual conditions such as promises, contracts, regulations, and guarantees are in place also acts as a base for trust during this initial state. An analyst from TechSource stated:

> *[There is] official trust, in the sense that he is the business analyst, officially designated and the IT person [is also] officially designated... and that's why I trust him, because he is the official BA [business analyst]*

[2] The illustrative quotes have been edited for better readability.

[3] We would like to note that trust is not static but dynamic across and within each collaborative state. In general, the level of trust needs to remain high for the collaborative process to succeed. However there is an ebb and flow in the perceptions of trust within the collaborative states. Typically each collaborative state has behavioral mechanisms to restore levels of trust. However the dissension collaborative state is the particular state where the application of such mechanisms is most salient.

Further, prior reputation of the stakeholders (that is, reputation categorization) was also found to elevate the initial levels of trust in this state. For example, in some situations, analysts were known to have high levels of expertise, and/or the user representatives were known to be knowledgeable about their domain and to be participative and supportive, and this helped increase the trust of the other party.

Mental Models

In the scoping state, the user representatives and analysts bring their own cognitive processes into the requirements elicitation process. The user representatives bring their domain knowledge and their heuristics about how the system should work, while the analysts bring their domain knowledge about the applications and technology, and a very broad idea about the nature of the system. In other words, the nature of the technology frames held by the analysts is different, and in some cases, "inconsistent" with the frame of the user representatives (Kaiya, Shinbara, Kawano, and Saeki, 2005; Davidson, 2002). This is consistent with the connectionistic view of knowledge and knowledge transfer (the epistemology adopted in this study), which argues that individuals, owing to their affiliation to different organizational networks, have "different pictures" of the given world (Venzin et al., 2000, p. 41).

The following quote from a user representative at Techsource highlighted this issue:

> *IT does not always know… [they need to figure out] here's what the business needs to see, this is what the business user needs to see.*

Sense-making State

Knowledge transfer

The second distinct state of collaboration during RE is when the two parties (i.e., the analysts and the user-representatives) strive hard to understand the boundaries of the problem from their own perspectives, and attempt to gain better understandings by tapping into the knowledge base of the other party. This state may be viewed as being characterized by the dialoguing ba. In this state, the project goals are investigated and scrutinized at the micro-level through a series of interactions (or dialogues) between the two stakeholder groups, in order to develop an in-depth understanding of the problem domain and appropriately scope it. In the words of a TechSource analyst:

> *We basically sit down at a table…we organize a meeting… and it sometimes takes more than three or four meetings for this group, the initial group of people, just to figure out what they really want…*

Consistent with the concept of the dialoguing ba, attempts to develop a shared frame of reference are made through extensive interactions, conscious co-construction of requirements, and sharing of mental models (Nonaka et al., 2001). The dialoguing ba proceeds in a bi-directional nature with both stakeholders trying to share knowledge (i.e., push), and by tapping into the other's knowledge base (i.e., pull) in an attempt to make the learning process more efficient. Given the differences in the knowledge bases of the user representatives and the analysts, the understanding of the problem boundary is accomplished (or new knowledge regarding the requirements specification is created) only when there is a successful merging of these two knowledge bases and " mutual synchronizations" in their knowledge "rhythms" (McGrath, 1991, p. 164).

In certain situations, even the detailed requirements may not provide enough information to the analysts in order for them to develop a complete understanding of the problem. In such cases, the analysts may require concrete examples or more vivid symbols to achieve the shared understanding, as highlighted in the following quote by a user representative from TechSource regarding the queries put to user representatives by the analysts:

> *[The analysts ask:] Do you want this to happen first… do you want this to happen in all states, do you want this to happen for all customer ties? [etc.]*

Drawing on the additional information that such investigation provides, the analysts then attempt to "pull" more information regarding the requirements by posing more detailed queries to the user

representatives. The culmination of the interaction, if successful, leaves the analyst and the user representatives with a better understanding (and new knowledge about) the requirements.

Trust

The level of trust needs to remain high within this state as the analysts and user representatives continue their quest to understand the problem and make sense of the overall requirements. However, as discussed earlier, the bases of trust differ from those in the scoping state. Unlike the scoping state, the sense-making state witnesses a high degree of interaction between the two stakeholder groups. Through these interactions, stakeholders are able to gather cues from each other, which lead to the formation of stereotypes, and positive stereotypes tend to accentuate their trust in the other (Fiske and Taylor, 1991). An analyst from TechSource provided the following anecdote of how positive stereotypes help the RE process:

> *… if you know all the clients and if we are quite comfortable working with them, they understand what we are talking [about], we understand what they are talking [about]…[then] we can do a better requirement capturing in less time.*

On the other hand, the extended interaction during this collaborative state may also result in reducing their trust in each other. For example, given that the user-reps often hold the key to relevant information at this stage, if the cues received by analysts lead to negative stereotypes of user-reps, efforts must be made to "re-categorize" them by drawing upon alternate "stocks of knowledge." If this does not happen, the user-reps lose credibility and the analyst team may seek out alternate sources for information. An analyst from TechSource highlighted this issue in the following quote:

> *Sometimes you may not be really convinced…with the response…you may feel that it is being done differently, in such cases you may contact somebody else in the business…*

We would like to note that the level of trust during this state needs to remain high to ensure success of the RE phase. If trust goes below a certain level (perhaps due to negative stereotyping), a transition to the dissension state tends to occur.

Mental models

Consistent with the perspectives of the connectionists, our data analysis also suggests that this state witnesses the "sharing of a common stock of knowledge, both technical and organizational" (Kogut and Zander, 1992, p.389), which helps reduce the initial asymmetry that exists between the analysts and user-rep groups in terms of their mental models, and proceed toward the creation of a shared mental model.

This is an extremely challenging phase that is affected by several cognitive processes and biases. For example, user representatives may suffer from "overconfidence" regarding their knowledge of their business domain, or they may have "recall bias," which can hinder the elicitation of the requirements or the development of a shared mental model, as suggested by Browne and Ramesh (2002). Similarly, "deficient mental models" or "faulty reasoning" resulting from an incomplete understanding of the application and technologies concerned can also make the sense-making process challenging. The goal of the analysts during this state appears to be to collect as much information as possible by tapping (in detail) into the domain knowledge of the user representatives. The following quotes from different analysts are indicative of this view:

> *Analyst 1:*
> *We ask what exactly do you need done … we try to nail down you know, what are you really looking to get out of this. What is the benefit of this?*
>
> *Analyst 2:*
> *I know that in the system there could be other KW [Kilowatt] components also, not just this KW. There could be, "On KW," that is also [a] demand component, [and] there could be "Off KW," that is also [a] demand component, so* ***I went ahead and asked do you want this reporting also****... because I understand that they are talking about demand components...* ***Or, if they talk about KWh, then I can talk further.***

On the other hand, the analysts may have a tendency to "use heuristics and seek satisfactory rather than 'optimal' solutions to problems" (Browne and Ramesh, 2002, p. 628). Thus, the user representatives need to consciously "push" as much information as possible in an effort to ensure that analysts seek the most optimal solution, and are on track to developing a shared understanding of the problem. A user representative from TechSource described this as follows [emphasis added]:

> *I would guess that you …need to make sure that you are giving them a complete understanding of the business process.*

Another user representative at TechSource also echoed a similar sentiment:

> *We want to provide them [the] maximum amount of information that we can.*

In some cases, even during the process of developing a shared understanding, a participant may feel the need to *push* more information during the discussions/negotiations surrounding the system requirements. For example, analysts sometimes make the user representatives cognizant of some inherent problems with their (i.e., the user representatives') conceptualization of the system requirements, and re-direct them as necessary.

The Dissension State

Knowledge transfer

This state also reflects a dialoguing ba. However, rather than co-constructing new and shared knowledge, in this state, participants are focused on resolving differences/disagreements that may have emerged during the sense-making state. Prior research on requirements elicitation highlights that dissension between the stakeholders can originate due to "discordances in interpretation" or "discordances in evaluation" (Kaiya et al., 2005, p. 291). Discordances in interpretation refers to situations where the same requirement may be viewed or interpreted differently by the two stakeholders, while the discordances in evaluation refers to differences in preferences of the two stakeholder groups regarding a particular requirement. In the context of knowledge transfer, discordances in interpretation and evaluation are both extremely important, since such discordances are resolved only through the conveyance of knowledge between the different stakeholders (Kaiya et al., 2005). A TechSource Analyst recalled:

> *We keep talking, discussing but, parties don't agree, we don't think that it can be done and, business thinks that it has to be done, or, business thinks that it should be done differently and we see differently...*

With explicit sharing and transfer of knowledge between the two stakeholder groups, not only is the nature of the discordance discovered (Kaiya et al., 2005), but this explicit transfer of knowledge through continuous dialogue and interactions also helps in understanding the other's point of view. A UnivTech project lead noted:

> *Sometimes you ask the question several times. Or we come out at several different ways to get the answer till everyone is on the same page. Because really, at the end of this requirements process one of the goals that everyone is on the same page. Everybody has the same understanding of what we want out of this.*

Finally, through this dialogue process, the conflict that ensued during the sense-making state is resolved.

Trust

Often, participants may find themselves in the dissension state due to conflict over some aspects of the requirements or specifications that may have arisen during the sense-making state. As a result of this conflict, the level of trust between the two stakeholder groups in this state is very low. As discussed earlier, because the sense-making state usually allows for prolonged interactions between the two parties, it presents several opportunities to all RE participants to gather cues and form stereotypes about the other. An analyst from TechSource described a situation where negative stereotypes were formed due to behaviors exhibited by participants during the interaction:

> *..they were not taking us serious enough. That was one thing. Not willing to listen to what we have to say.*

Given these low levels of trust, an important focus of the dissension collaborative state is to restore high levels of trust between the participants. This, in most cases, needs significant re-categorization of mutual perceptions of trust by both the stakeholder groups to elevate intra-group trust levels. When all forms of interactional cues lead to negative stereotypes, re-categorization can be achieved sometimes by relying on the institution (organizational/departmental reputation) and on the contractual agreements binding the two parties. It can also be accomplished by the intervention of a powerful individual, with sufficient legitimate power (French and Raven, 1957), who is able to coerce the stakeholders to restore their prior levels of trust. Coutu (1998) refers to this trust as the deterrence-based trust, where members will trust simply because of fear, that if they do not trust, they will be punished.

It is important to note that if none of the above-mentioned strategies can be (or are) implemented, then the RE process will suffer from a premature termination (which fortunately did not happen in the cases we encountered.). A user representative from UnivTech illustrated the importance of having individuals with hierarchical power resolve conflicts, and thereby help to restore trust:

> *If we get to the point where we discussed and discussed and everybody made their point but we are still at a standstill, the director [the individual in a position of power] would step in and say okay, I will have to make a decision*

An analyst from TechSource also echoed how higher authorities were invoked to try and resolve the situation:

> *We did act appropriately like we did tell our sponsors. We had sponsors in the client's position as well. We did get them involved and made sure they were present at all the meetings so that things didn't get out of hand and we kept giving them feedback on how things were going.*

Mental models

During the dissension state, there is a significant discordance or inconsistency in the mental models of the two stakeholder groups. We would like to note that such conflicts need not be hostile. There could be productive disagreement, which, depending on the context, ultimately results in resolution or reconciliation. The analysts and user-reps have their own isolated understanding of the issues, and, therefore, tend to perceive the problem from their respective lenses. Often such perspectives lead to divergent conceptualization of the requirements. As an analyst from TechSource noted:

> *I have seen the disagreements happening between different groups…some group comes up with a project or comes up with new kinds of requirements … there'll be disagreements with some other group…so there'll be [a] lot of arguments, and disagreement and all those things would happen.*

Such conflicts or dissensions are generally resolved through the use of several techniques (especially by the analysts) that help to mitigate the cognitive biases, and to reconcile mental models of the two sides. For example, a common technique used by analysts is to engage in "direct prompting techniques," especially the use of "directed questions" that are "context-dependent" (Browne and Ramesh, 2002, p. 634). In our study, analysts attempted to ask the same questions in a variety of ways in an effort to reduce their level of dissonance. The dissension can also be resolved through the use of "indirect prompting techniques" such as knowledge maps, flowcharts, etc., as suggested by an analyst from TechSource:

> *It is using a bunch of sticky notes and putting all these concepts together and say what are the different things you [that] want? … and arranging it, documenting it, rearranging it on a white board.*

The Termination State

Knowledge transfer

This state can be viewed as an exercising ba, where consensus has been achieved between the two parties with respect to the requirements, and this new knowledge is now put into action (Nonaka et al., 2001) through the creation of the requirements specification document, and then the detailed

knowledge regarding those specifications is transferred from the analysts to the user representatives for sign-off. An analyst at TechSource highlighted this issue:

> *So once when you come up with the final requirements document, you send it to them, walk through the entire document with them to see if they understand... and both the parties agree, then you sign off the document and freeze the requirement.*

During the exercising ba of the requirements elicitation, it is assumed that shared knowledge has been created. The knowledge transfer in this state reflects the sharing of explicit (though not usually new) knowledge about requirements specification through formal documentation by the analysts to the user representatives, and legitimized through the sign-off.

Trust

This state is a result of successful sense-making surrounding the requirements and ensues when consensus has been reached regarding the specifications of the system. Trust in this state is high and based on the unit-grouping component of cognitive trust. According to this form of trust, those who share common goals and values tend to perceive each other in a positive light (McKnight et al., 1998). Drawing upon this, it may be argued that in our context, there tended to be unit grouping among the analysts and the user representatives, with both groups of stakeholders sharing the common goal of a successful RE process. This perception of solidarity helped keep their levels of trust in each other high. For example, the project lead from UnivTech mentioned:

> *They know you are on their side, for their benefit and you are really a member, you are on this team with them…. It just changes the whole dynamic, because it's a positive [feeling]...*

Mental models

This state usually witnesses a shared frame of reference, where the technology frames of the two stakeholder groups have merged in a unified whole, such that (in a TechSource analyst's words) "...everyone is on the same page." A similar view was echoed by another TechSource analyst as well:

> *…at the end of requirement capturing process, we definitely come up with a document [which everybody agrees on and] says, "This is the final document, this is going to be built into the system."*

6.2. Triggers for Transitions between States

As discussed earlier, our process model not only includes states, but also incorporates triggers that lead to transition from one state to another. While we have tried to unearth relevant triggers from our data, naturally we cannot (and do not) claim to provide a comprehensive set based on our study of RE in two organizational settings – we invite future work in refining the definition of states and identifying other potential triggers.

Transition from Scoping-to-Scoping State

This is a recursive transition that is in evidence when a need is felt by the RE participants (i.e., analysts and user-representatives) to "restart" the scoping process.

Many different triggers can initiate this self-transition. Sometimes, there may be *a lack of clarity among the user-representatives themselves* regarding the broad business needs of the system. This lack of agreement can make the transmission of this information to the analysts very difficult, thereby initiating the transition back to the same state. On similar lines, a TechSource user representative said:

> *And so if it is something that is pretty specific, okay, and it is not something that I feel very comfortable [in terms of] representing the client totally, then I will pull in the client to make sure that they are in there [so] that I don't end up answering something for them that leads IT to the wrong path in looking at solutions.*

Such a transition can also occur when a general perception among scoping participants emerges that *the system requirements being articulated (during the scoping state) are simply not feasible,* and need to be re-examined afresh.

Relationships among the user representatives and analysts are initiated during the scoping state. Given that in many instances the two groups (i.e., analysts and user-reps) may not have had a history of working together, in an effort to get the collaboration started on the right track so that deadlines can be efficiently met, there needs to be a high level of "swift trust" formed within the team. This type of trust is not "developed," but "imported" by team members in an effort to expedite the "relationship building" process (Jarvenpaa and Leidner, 1999, p. 794). Swift[4] trust enables the collaboration to set the ground rules and the tone of the environment. Inadequate levels (or a lack) of swift trust during this state can also result in the collaboration reverting back to the scoping state instead of progressing to the sense-making state. On a related note, the return back to the scoping state can also reflect the emerging realization among participants that the assumptions underlying the project and the ground rules governing the relationships among user representatives, analysts and, other project stakeholders need to be revised or revisited. As an analyst from TechSource pointed out:

> *…they did talk back quite a bit, made snide remarks and all…we just let that slide. We did act appropriately, like, we did tell our sponsors. We had sponsors in the client's position as well. We did get them involved and made sure they were present at all the meetings so that things didn't get out of hand*

Transition from Scoping to Sense-making State

This is a state transition that captures the logical progression from scoping to sense-making. This transition reflects the fact that the *broad boundaries* of the information systems requirements have been understood and agreed upon by the user-reps and analysts, and this marks a shift to the initiation of efforts to get a *much more detailed understanding* and enumeration of the business specifications. This transition is triggered if it is perceived that: a) *the broad requirements are feasible given the time frame of the project and other macro considerations*; b) *the user-reps and analysts share a satisfactory set of ground rules* (and working relationship) to move forward, and c) there has been a *high level of congruence in understanding during the transfer of broad system requirement-related information* for both stakeholders to have reached an agreed shared understanding. A user representative from TechSource pointed out:

> *You know you have [an understanding at] a high level… [in terms of] what the business wants… you then have to break it down even further.*

Transition from Scoping to Termination State

In some cases, the systems development project may involve simple enhancements to existing systems in the form of changes to the interface, or some other basic functionality. In such contexts, more detailed information or negotiations regarding the requirements specifications are not required. Based on some initial interactions, the analysts can get to a point where they can inscribe the requirements in a specification document and get the user representatives' sign-off. In other words, *trivial requirements or simple enhancements* can result in a transition directly to the termination stage. An analyst from TechSource discussed a similar scenario:

> *When there is a report or change in the screen, or a change in a small way. There is not much involved actually, the user also understands that this is how it has to look and this is how it has work.*

Most RE processes (as indeed, most collaborative processes) would be expected to use this transition or "least effort" path if it were possible. However, since RE initiatives often do not deal with trivial enhancements; this transition is not a very common occurrence.

Transition from Sense-making to Scoping State

While trying to comprehend the specific nature of the business process and requirements of a system, in some cases, the collaborative team reverts to discussions surrounding the broad objectives of the system. This can be interpreted as a transition from sense-making to scoping. Such a transition can

[4] We must acknowledge here that, based on past (negative) experiences of the RE participants, swift trust may not form in some cases. In this case, the teams would need to rely on trust based on past reputations of the RE participants/groups or institutional-based trust in order to effectively proceed through this state.

be triggered if, while discussing the specific details of the requirements, the RE participants feel the necessity to revisit the fundamental premises and boundaries of the project and to redefine the business objectives of the proposed system (or features).

Transition from Sense-making-to-Dissension State

This transition from sense-making to dissension reflects the need for the RE participants to resolve conflicts that may have arisen during the sense-making state. This transition may be triggered by *the emergence of both issue-based conflict and interpersonal conflict amongst the group members* (e.g., Jehn and Mannix, 1991). For example, a user representative from TechSource described how disagreements arose during sense-making:

> *…everything is questioned, sometimes there is[sic] arguments, on [a] fairly regular basis there are arguments…and we go over things*

In terms of issues-based conflict, dissension amongst the group members can arise due to misaligned interests regarding the requirements of the system, choice of the technology platforms, etc. An analyst from TechSource explained:

> *…differences could be based on the implementation, how do you implement? What technology do you use? Disagreements would be there at that level.*

On the other hand, interpersonal conflict could arise due to political problems within the team. An analyst from UnivTech pointed out the following:

> *…you know, people may have their pet peeve that they want included and the group as a whole, the user committee as a whole [may disagree]… not so much the technical people kind of scope that out[exclude from requirements]… I think that is where you know conflicts arise.*

Similarly, an analyst again added:

> *One person who wanted control would not let go of that, did not want the project to go there, and kind of dug in her heels and so there was a potential conflict.*

At another level, the transition from sense-making to dissension state will also occur if problems during the interaction result in perceptions of diminished trust that cannot be restored easily. As an illustration, an analyst from TechSource said:

> *...them going behind our backs, you know in terms of work methodology we were following or escalating even minor incidents.... So basically everything we said or did, we knew that it was going to be misconstrued*

Transition from Dissension to Sense-making State

In this transition, having resolved their temporary dissension, the RE participants revert back to the sense-making state, with the objective of sharing, absorbing, and co-constructing the requirements. Such a transition can be triggered due to many reasons, for example: 1) the RE participants may have resolved their issue-based conflict, and need to get back to the unfinished aspects of their requirements definition, or 2) the negotiation and eventual resolution of conflict may have led to the recognition of new requirements (hidden behind political walls) that needed to be understood and clarified. A project lead from UnivTech illustrated this point:

> *…it is the group as a whole,[that] you come to [a] consensus… there can be tension but the group works through it and you get to the resolution that way.*

Transition will also occur from the dissension to the sense-making state if the initial transition (that is, from sense-making to dissension) resulted from low levels of trust, and the collaborative mechanisms within the dissension state resulted in the restoration of such trust.

Transition from Sense-making to Termination State

This transition occurs when the RE participants have developed a shared frame of reference regarding the nature and specific contents of the requirements. It reflects the fact that there is congruence among the analysts and user-reps about the requirements, and that the final set of

features/functionalities agreed upon is complete and can readily be objectified within a specifications document.

Transition from Termination-to-Sense-making State

In some cases where the problem being investigated is inherently complex, and when the group gets ready to document detailed requirements, the RE participants may need to transition back to the sense-making state. Such a transition is typically triggered when *the analysts or the user representatives perceive the need to "fill in" the gaps that exist within the specifications.* The following quote from an analyst from TechSource organization highlights the transition back to sense-making:

> *…if I have documented all the requirements, in many … cases.., what happens [is] that people tend to miss one or two clients… let us [say] that there are three people A, B and C, three clients and we've got the sign-off, and we have got the approval from these three people… Client D comes and says that actually the requirement should be [something] different; in that case, we might need to go through the [sense-making] process again…*

Premature Termination from Dissension State

This transition describes a premature termination of the requirements elicitation activity without reaching its logical culmination. This transition is triggered in situations where the participants are unable to reach an agreeable solution to the various disagreements about the requirements for the information system. The disagreement or conflict, therefore, gets escalated and leads to *premature termination* of this phase. In very extreme cases such disagreements could lead to situations of complete *breakdown of trust* that accelerates such a termination. While we did not actually come across a case during our interviews, there were indications that such situations were not uncommon, as pointed out by one of the analysts from TechSource:

> *so one dept. might say that, if you do this, [it] is going to break this thing of mine, I won't let you do it, or one dept. might say that I want to do [something else]… it's kind of [a] 'tug of war' situation, [as a result] in many cases requirement capturing might stop*

We would like to note that sometimes premature termination can be a positive outcome. In certain situations, a project might be terminated legitimately ahead of time to save costs and unnecessary usage of resources (and not owing to some "tug-of-war" between the stakeholders as our quote suggested). This especially is the case if the project was found to be heading toward failure (owing to environmental reasons) or if management deemed that an agreement between the stakeholders can never be reached.

6.1. Enablers/Inhibitors

As we discussed earlier, different enablers/inhibitors affect the progress within each state. Enablers refer to the "capabilities, forces, and resources" that contribute to the progress of an "entity, program, or project" in a desired direction (BusinessDictionary.com). Inhibitors, on the other hand, are viewed as the opposite of catalyst, factors that slow down the process (BusinessDictionary.com). Our data, examined in light of past literature, revealed four categories of enablers/inhibitors during RE: analyst-based, user representative-based, user representative-analyst relationship based, and ISD problem-based.[5] Within each of these categories, based on our interpretation of the data, we identify primary enablers, secondary enablers, primary inhibitors, and secondary inhibitors (we would like to note here that the labels primary and secondary represent relative prominence of the factors as enablers or inhibitors as suggested by our data). Further, we found that different sets of inhibitors/enablers affect the different states. We summarize these enablers/inhibitors, and the prominence of their roles in the different states (see Table 5). Of course, we recognize that the roles (and importance) of the identified enablers/inhibitors in the different states can be different in other contexts, and we invite future exploration of these issues. Below, we discuss the roles of the enablers/inhibitors in further detail.

[5] We would like to note here that we have not explicitly explored the inter-relationships between the various enabler/inhibitors identified in this study. We agree that there may be some relationships, for example, between the experience of an analyst and his/her domain knowledge. However, we believe that an extensive exploration of such inter-relationships is beyond the scope of this paper, and can be undertaken in future studies.

Table 5: Enablers/Inhibitors of the Four Collaborative States

Factors		Scoping	Sense-Making	Dissension	Termination
Key Analyst-based Factors	Application Domain Knowledge	PE	PE	PE	
	Systems Development Process Knowledge	PE			
	Technology Knowledge		PE	SE	
	IS Application Knowledge		PE	SE	
	Experience	PE	PE	SE	
	Absorptive Capacity	PE	PE		
	Communication and Negotiation Skills		SE (C)	PE (C and N)	PE (C)
Key User-Representative based Factors	Organizational Domain knowledge	PE	PE	PE	
	Application Domain Knowledge	PE	PE	PE	
	Hawthorne Effect	PI	PI		
	Communication Skills	PE	SE	SE	
	Absorptive Capacity		PE		PE
Key User Rep-Analyst Relationship based Factors	History of relationship	PE		PE	
	Mutuality of Communication		PE	PE	
	Lack of congruence in understanding	SI	PI		SI
Key Problem based Factors	Complexity	SI	PI	PI	
	Tacitness	SI	PI	PI	

LEGENDS: PE: Primary enablers of each state SE: Secondary enablers of each state
PI: Primary Inhibitors of each state SI: Secondary Inhibitors of each state
C: Communication Skills N: Negotiation Skills

Key Analyst-based Enablers/Inhibitors

One of the primary enablers affecting the scoping, sense-making, and dissension states is *domain knowledge*. Iivari, Hirschheim, and Klein (2004, p. 318-319) have identified five components of domain knowledge of RE participants, which might include both analysts and the user representatives participating in the requirements elicitation. The five components are: 1) technology knowledge (that is, knowledge of the types of hardware and software), 2) application domain knowledge ("knowledge of the application domain for which an information system is built"), 3) systems development process knowledge (that is, knowledge of the tools and techniques for systems development, development approaches, and methods), 4) organizational knowledge (that is, knowledge about the "work processes in the organizational context to be supported by the IS"), and 5) IS application knowledge (that is, knowledge of IT applications, their functionality, features, etc.). In the context of our study, the analysts brought knowledge types 1, 2, 3, and 5 into the process, while the user representatives were the source of knowledge types 2 and 4.

During the first three states (i.e., scoping, sense-making, and dissension), the analysts attempt to elicit and internalize broad knowledge about the system requirements from the user representatives, which requires them to have sufficient "application domain knowledge." Such knowledge not only

enables analysts to understand the business requirements better (and more efficiently) but also to assess the technical challenges involved. An analyst echoed this rationale:

> *If you are a person who has lot of expertise in this particular domain... requirements gathering would be much simpler.*

Further, during the scoping state, many of the housekeeping details such as the nature of the methodology to be followed for systems development and the types of tools or techniques to be used for design (e.g., prototyping) are also negotiated. Thus, analysts' *systems development process knowledge* appears to contribute to progress in this state.

On the other hand, during the sense-making state, analysts' *technical knowledge* and *IS application knowledge* enable them to better understand the system requirements provided by the user representatives and "visualize" the design and architecture of the new system. An analyst from TechSource explained:

> *…if you have to do a good RG [requirements gathering] about a project in a particular application or a domain, the person should have a good background about the system*

A user representative from UnivTech also highlighted the importance of the analyst's technical knowledge for the project:

> *Because he [analyst] was instrumental in ensuring that we did not get into a situation where we would get …many tech support issues…he had to make sure the content server solution was technically robust*

These factors are also important during the dissension state, as such knowledge could be brought to bear to resolve conflicts, but have slightly less salience than in the sense-making state. The primary reason is that conflict resolutions are essentially brought about through compromise and negotiations that depend a lot more upon the *perceptions of credibility* that the user-representative has of the analyst's knowledge than his/her actual knowledge in real terms.

Similarly, the prior *experience* of the analyst also acts as a primary enabler for the scoping and sense-making states, as it allows him/her to appreciate the subtle nuances of the business rules as well as the possible technological pitfalls, as an analyst from TechSource indicated:

> *I'll say if the person is more exposed to the system, if the person has actually worked along with Business, he will do a better job.*

Similarly, a user representative from TechSource stated:

> *Experience is a big one. I guess particularly for us as we have a lot of different systems that we use for different things and so experience is really important.*

Experience of the analyst is a secondary enabler for the dissension state, because it is likely to have an indirect impact by acting positively on how the user representative perceives the credibility of the analyst. The absorptive capacity of the analysts served as a primary enabler during scoping and sense-making, where the majority of the system requirements were communicated to the analysts by the user representatives. In the words of a TechSource analyst:

> *… if the person is quite intelligent, if he can learn it quickly …better appreciate the business needs…[then the understanding of the problem is successful]*

A *high absorptive capacity* allows the stakeholders to absorb the knowledge efficiently, gain a better understanding of the problem domain and the technological challenges involved. An analyst (in UnivTech) provided the following viewpoint:

> *I think the person who's doing requirements should be able to grasp many things and … easily understand…what the user is trying to say.*

The communication and negotiation capability of the analysts (as well as of the user representatives) can be critical during requirements elicitation (e.g., Urquhart, 1997). While communication is

important during the sense-making state, its salience increases in the dissension state, since it is through "communication and negotiation" that the collaborative members are able to co-construct the system requirements, and resolve their disagreements (Fisher and Ellis, 1990; Roloff, Putnam, and Anastasiou, 2003). A user representative from TechSource highlighted the importance of communication:

> *…you should be able to communicate properly to the user, [what] your understanding [is], at the same time you should be able to … clearly make out what the user is trying to say…*

Another user representative noted:

> *Communication is important…dialogue is important so we need to be able to communicate our thoughts and views and where we think something needs to go…*

Given that the primary goal of the termination state is to communicate the final agreed upon set of requirements specifications, the communication skills (in the words of an analyst "documentation and communication skills") that enable them (analysts) to capture and document the necessary details about the specifications with precision, is a primary enabler:

> *...if you are talking about the soft skills, documentation and communication are [skills that] very important…*

Key User-Representative based Enablers/Inhibitors

Our data indicated that the user representative's level of business knowledge is an important enabler of the RE process (particularly during the scoping, sense-making, and dissension states). However, we found that the user representative needed to be knowledgeable at both the organizational level and the specific application domain level for the particular information system. The former provides them with resources to understand the business logic in terms of the external interfaces and boundaries, while the latter gives them expertise about the business logic internal to the system.

Iivari et al. (2004) indicated that the *organizational domain knowledge* of the user representatives is critical, since it reflects their ability to articulate the intricacies of the business processes as it pertains to the system being developed. In addition, such knowledge equips the user-representatives with a broad vision that allows them to relate the proposed system to the overall business of the organization and identify important requirements related to dependencies and interactions with other application domains. Participants in our study also indicated that organizational domain knowledge is a primary enabler in three of the four states, and especially during the sense-making state when the requirements of the new systems are being specified and internalized by the analysts. In the words of a TechSource analyst:

> *…you need [user reps to be] a subject matter expert...They understand the business process. They tell our people how it is going to work.*

Our data indicated that the RE process was also significantly facilitated (in three of the four states) when the user representatives were very familiar with the specific business processes related to the application domain for which the information system was being built. This specific knowledge equips the user representatives with a detailed understanding of the domain -specific business processes and allows them to articulate clearly the business logic-based requirements as well as comprehend the validity of proposed system requirements. The importance of the user-representative's application domain knowledge was echoed by our respondents:

> *If [the] user is a person who has [a] lot of expertise in this particular domain…the requirements gathering would be much simpler*

Further, consistent with past literature on knowledge transfer (e.g., Joshi and Sarker, 2003; Szulanski, 1996), our data revealed that the process of knowledge transfer is severely inhibited if the analyst does not perceive the user representative to be *credible*, and is deemed to be affected by the so-called "*Hawthorne effect*" (Browne and Ramesh, 2002). Such an effect refers to the user representatives' (dysfunctional) inclination to articulate what is expected from him/her in the organization as opposed to the actual requirements of the system. Prior research has acknowledged

this issue to be an important inhibitor of requirements elicitation, since it tends to slow down the process significantly. As a remedy, the analysts may need to spend extra time accessing other individuals in an effort to corroborate what the user representative that articulated, contributing to an inefficient RE process, as explained by a TechSource analyst:

> *Sometimes you may not be really convinced with the response… in such cases you may contact somebody else in the business…*

This factor was noted to be a particular problem during the scoping and sense-making states.

Another important user representative-specific enabler is communication skills. As a user representative from UnivTech points out, "Communication skills are vital …"

The communication skills of the user representatives are particularly critical during the scoping state, where they have to articulate the broad details of the problem at hand. These skills remain important during the sense-making and dissension states, given the intensive interactions that characterize these states, but are of relatively less salience compared to the knowledge-based capabilities of the user.

The *absorptive capacity* of the user representatives is critical during the sense-making state, as they have to readily grasp the system based arguments provided by the analysts and map them to the business functionalities in order to comprehend what the detailed business requirements should be. As one user representative from TechSource pointed out:

> *I have to go in and figure out often times the business process side of it because I don't know all of them. So of course I learn more [by] digging through. [Often] I really have to learn what is being done to make the change so I know more about how our system is actually set up. Is it something that is a domain table change, or do we actually have to go in and change a cap or how many caps do we have to change?*

This factor remains important during the termination state. This state requires their sign-off on the requirements specification document, which cannot occur until the user representatives have been able to absorb the entire set of requirements described by the analysts. The criticality of absorptive capacity is evident from the fact that the user representatives have to again be able to map the detailed functional requirements to the original business needs to assess if the final requirements are indeed correct.

Key User Rep-Analyst relationship-based enablers/inhibitors

Several factors related to the relationships between user representatives and analysts also affect the different collaborative states. As one of our interviewees from UnivTech indicated, *a history of interaction/relationships* between the analysts and user representatives enables an efficient knowledge transfer during the scoping state, and can thus be viewed as a primary enabler:

> *...the capturing process should be faster, if you interact with the same person a number of times…*

Specifically, positive past interactions between the analysts and user representatives can potentially enable the knowledge transfer and collaboration in the following ways: First, the personal acquaintance resulting from such interactions minimizes the need for the initial socialization, thus, allowing both sets of actors to focus directly on the issue at hand (i.e., understanding the system requirements). Second, prior interactions provide user representatives and analysts knowledge about the working styles of the other; therefore, eliminating the need to discover each other's working styles (a key ingredient of a successful collaboration). An analyst from UnivTech stated:

> *…we took six months off the front of the project because they [the users and analysts] had worked together; they knew where I was headed with facilitating the requirements gathering.*

A history of interaction can also enable the resolution of dissension, since a prior (positive) relationship would increase the mutual trust parties have for each other, thus, enabling them to

comprehend or accept the other's point of view.

It has been widely acknowledged that the nature of the relationship between the user representatives and the analysts affects the process of requirements elicitation. The symbolic interaction theory, which addresses the issue of the social processes of relationships, refers to three types of communication (and responsiveness) that play an important role during collaboration (Couch, 1989; Sarker and Sahay, 2003). They are: unidirectional communication, where the different collaborative parties show a lack of reciprocity in their communication, bi-directional communication, where the parties talk "past" each other without respecting the other's goals or objectives; and mutuality of communication, which refers to unison amongst the different parties in terms of goals, objectives, and understanding. The extent to which there is mutuality of communication between the user representatives and analysts significantly affects progress in the sense-making and the dissension states. A user representative from TechSource emphasized the fact that the analysts and the user representatives have to draw from their respective knowledge bases about the system (technical and function) and achieve mutuality in their communication to get at the best solution:

> *We have to really take both perspectives and bring them together because of course neither one of us has the full solution, because.. [while we talk of a pertinent] process [to ensure] business requirements [are met], we also need to look at the system [underlying the process] and what is available and these have to come together…to find the best solution.*

One of the primary objectives of the requirements elicitation process is the development of the shared frame of reference, especially during the sense-making state. Thus, the extent of incongruence in understanding the requirements as articulated by the user representatives and as understood by the analysts (Davenport and Prusak, 1998) usually acts as a primary inhibitor for this state. This lack of congruence in understanding resulting from the ineffective knowledge transfer from user representatives →analysts during the scoping state, and from the analysts→user representatives during the termination state also tends to act as an inhibitor, albeit to a lesser degree.

Key Problem based enablers/inhibitors

We also found that two factors related to the problem context (underlying the RE effort) play a significant inhibiting role during the first three states of the process. One of them is the inherent complexity of the information system being developed. Such complexity can be conceived to operate at different levels. Iivari (1990) argued that there are three levels of complexity during ISD: the organizational level, infological/conceptual level, and datalogical/technical level (Iivari, 1990) .We feel that increased complexity at any one of these levels would adversely affect the collaborative process. An analyst from TechSource alluded to the three levels of complexity and echoed the negative effects of these complexities on the RE process:

> *… when the scale of the project is too big, there are [a] lot of components that are involved [that is, infological/conceptual level complexity], lot of interfaces, it would involve you know interfaces [that is, datalogical/technical level complexity], various people various groups from the higher level to field people who are actually going to use this [that is, organizational level complexity]… there are [a] lot of people that are involved, so you have to look at each stage when you do the requirements gathering, in that way you know you will be involved in lots of iterations, and you know you have to properly understand what each person is trying to get.*

We would like to note that complexity may play a role during the scoping phase as well; however, its salience is higher during the sense-making and dissension states, as it is during these states that the participants are focused exclusively on understanding the problem-domain, developing a vision for the system, and resolving conflicts surrounding the conception of the new system requirements. Complexity (as highlighted above by the analyst) makes these above activities more cumbersome and time consuming.

Finally, the tacitness of the knowledge, that "incorporates so much accrued and embedded learning that its rules may be impossible to separate from [the individual]," and cannot be "described in words"

(Davenport and Prusak, 1998, p. 70), significantly hinders the requirements elicitation process especially during the sense-making and dissensions states. To construct a superior system, it is important to acquire both the explicit knowledge that is "embedded in procedures or represented in documents and databases" as well as the tacit components of that knowledge (Davenport and Prusak, 1998, p. 95). An analyst from TechSource highlighted the impediments caused by the tacitness of the problem domain:

> *…when somebody is trying to automate the whole manual process into something else... We clearly do not know [i.e., have an adequate understanding], initially the business user is also not aware of how this is going to work out… his objective is to change the manual work into automatic [work], but how, what, what is going to be involved, how are they going to do that, what are the hardware structures they require, all those things are very unknown at the higher level.*

7. Contributions, Limitations, and Conclusion

In this manuscript, using a grounded approach and being sensitive to concepts from collaboration, knowledge transfer, shared mental models, and trust literature, we provide *a theoretically-informed*, *integrative,* and *process-based understanding of requirements elicitation (RE)*. Below, we discuss the specific research and practical contributions that this study attempts to make.

7.1. Research Contributions

The primary motivation of this research was to conduct an empirically grounded investigation that would provide insights into the collaborative dynamics of the RE process. Given that the reality of the RE process has been described in many different ways -- as non-deterministic, chaotic, non-linear, and socially constructed -- we examined existing process models that reflect such a nature of RE. These process models provided some interesting insights; particularly in terms of identifying certain core theoretical elements underlying the RE process (e.g., *collaboration, knowledge transfer, trust,* and *development of shared mental models*). However, these theoretical elements have thus far been examined in isolation, which we feel does not provide a holistic understanding of the RE process. We identified this as a gap in the literature and now propose that a key contribution of our work is that it complements and augments the existing literature by empirically *unearthing and presenting in an integrative manner the nuances of the dynamic behavioral/social process underlying RE*. We also contend that in addition to unifying the various theoretical strands identified in existing research, our process model incorporates a richer, more detailed description of each of the theoretical elements. In Table 6, we provide a comparison of the contribution of our process model and other process based models of RE, and in the following section, we expand on the elements of our contribution.

The RE process has been identified by past research to be a contextually situated process that evolves dynamically as a function of the collaborative interaction of the participants with diverse view points (e.g., Gasson, 2006; Davidson, 2002; Urquhart, 1997; Pohl, 1993; 1994; Jarke and Pohl, 1993). Our process model reaffirms the collaborative, multi-faceted perspective of the RE process, and provides a rich description of how such collaboration unfolds. Specifically, our data indicate that the RE process is *composed of four distinct collaborative states – scoping, sense making, dissension, and termination*. These collaborative states differ in terms of 1) their objectives, 2) the nature of the knowledge transfer and trust among the primary stakeholders (i.e., the analysts and the user representatives), and the level of congruence in their mental models, and 3) the primary and secondary enablers/inhibitors. The collaborative states embody a particular snapshot of the entire collaboration process as a configurative function of its components – objective, nature of knowledge transfer, nature of trust, and extent of congruence of mental models. The evolution of the RE process is modeled as transitions between these collaborative states. Such transitions are inherently dynamic and contextually situated. In other words the exact sequence of transitions and iterations depends on the context of a particular project. The transitions are triggered by changes in the objectives of collaborative activities within RE, in the pattern of knowledge transfer, the level and bases of trust, and extent of symmetry attained in the mental models of the participants. Our model provides

Table 6 – Mapping collaborative states to existing RE processes

Articles	Process Description		Collaboration Themes					
	Non-deterministic process evolution	Collaboration centric process description	Multiple Stakeholders/ perspectives	Description of the subtle nuances of *knowledge transfer* during process evolution	Description of the subtle nuances of *trust* during process evolution	Description of the development of shared mental models during process evolution	The *triggers* causing the transition between the process components leading to process evolution	Key *enablers/inhibitors* and their differing salience during process evolution
Rolland (1993)	X		X					
Pohl (1993; 1994)	X		X					
Jarke and Pohl (1993)	X		X					
Potts, Takahashi, Anton (1994)	X	X	X					
Urquhart (1997)	X	X	X		X	X		
Davidson (2002)	X	X	X				X	
Nguyen and Swatman (2003)	X							
Thanasankit (2004)	X		X					
Gasson (2006)	X	X	X			X	X	
Our Study	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

extensive details of such possible transitions between the different collaborative states and has documented the triggers that cause such transitions (see Table 4). While the evolution of the process model is inherently situated within the context of a particular ISD project team, certain generic conclusions can be derived from it. For example, a successfully collaborating ISD project team would demonstrate a swift transition from *scoping state* to *sense-making state,* minimal iterative transitions between sense-making and dissension states, and a final (decisive) transition from *sense-making* to *termination*. On the other hand, a project team that finds itself unable to collaborate fruitfully would struggle to transition out from the *scoping state* or demonstrate a collaborative pattern where repeated and extended transitions are made to the *dissension state* or even result in a complete breakdown of collaboration by never achieving a transition to the *termination state* The transition patterns identified in our model also enable us to distinguish between situations of trivial complexities (transition from *scoping* to *termination*) and high complexities (repeated and extended transitions to and from the *sense-making* and *dissensions states*; possible transitions from the *sense-making* to the *scoping state*). Therefore, our process model combines the capabilities of a rich description of the dynamic and unpredictable nature of the RE process with some prescriptions of possible evolution patterns given different situational contexts.

Previous research has demonstrated that the collaborative interaction within the RE process is greatly facilitated by elements such as knowledge transfer, trust, and the development of a shared mental model. However, such research has typically focused on these elements in isolation while investigating the collaboration process. For example, Urquhart (1997) examined how evolution of mental models and building of trust was facilitated by different interaction tactics, Gasson (2006) focused on how the sense-making within the RE process is affected by the different perspectives (mental models) of participants, and Davidson (2002) examined the evolution of RE explicitly in terms of technology frames (mental models) and their shifting salience. To the best of our knowledge, our process model represents one of the first attempts to examine these different elements within a single integrative framework. In addition, we believe that our process model provides a more detailed description of the subtle nuances of these theoretical elements, and how they evolve during the progress of the RE process. We use theoretical sensitization derived from the work of Nonaka et al. (2001) to characterize the pattern of knowledge transfer and sense-making in terms of ba or shared context. Our empirical investigation further uncovers distinctions in the nature of ba in the different collaborative states as *originating (*scoping state), *dialoguing* (sense-making and dissension states) and *exercising* (termination state). As this process of knowledge transfer and sense-making unfolds, participants develop a shared mental model regarding the system requirements. In our process model, we characterize how the initial asymmetry of the mental model is reduced as the participants transition through different collaborative states until an agreed upon shared mental model is achieved in the termination state. Previous literature (e.g., Urquhart, 1997) has characterized trust as an important factor that enables s*eamless collaboration* within the RE process. Our process model re-affirms the importance of trust by acknowledging it as an important property of the collaborative states. Additionally, we identify the differing bases of trust in the different collaborative states and also document how changing levels of trust trigger transition from one collaborative state to another. We feel that by integrating familiar elements of the RE process identified by previous research and unifying them in a single framework as described above, we contribute to the discipline by providing a more holistic view of how the process unfolds. This we feel allows us to take an important step forward in the discipline's cumulative effort to open up the "black box" of the RE process.

In addition to integrating theoretical threads from previous research, this study also contributes to the literature by explicating *factors that act as primary and secondary enablers/inhibitors in each of the states*. Previous literature (e.g., Szulanski, 1996; Szulanski, Cappetta, and Jensen, 2004) has indicated that various personnel, process, and knowledge-related factors inhibit or enable the knowledge transfer process in general, and specifically during ISD. Similarly, prior literature on collaboration has also highlighted different stakeholders' interaction-related variables that may affect the nature of the collaboration (e.g., McGrath, 1984). This study explicitly identifies a wide range of enablers/inhibitors that can potentially affect the different states of RE. Through this, the study demonstrates that the influence of these factors gain or lose salience as the RE participants transition through the different states.

Apart from the substantive contribution, we believe that we have been able to illustrate a new lens (and a related strategy) for representing social processes, using state transition diagrams typically used to model the behaviors of finite state machines or to depict aspects of systems design in prior literature (e.g., Budgen, 2003). We are not aware of the use of such *formal techniques for depicting a social/behavioral process.* While there is a lot of interest in process theory building in the IS discipline (Markus and Robey, 1988), the strategies used currently have been found to be only partially effective (e.g., Sarker and Lee, 2003). Moreover, in the context of grounded theory methodology, where the research communities (whether Glaserian or Straussian) have invited *alternatives* (e.g., Kelle, 2007) to the so-called *"paradigm model"* (Strauss and Corbin, 1990), we are hopeful that our approach will resonate with future researchers who seek ways to more effectively model processes.

7.2. Practical Contributions

Our study aspires to make a number of practical contributions. It highlights the idea that RE unfolds through several states, identifies the different triggers that cause the transitions between the states, and maps out the different paths (and the most efficient path) that RE collaborative groups might take. The detailed descriptions of states and triggers provide the analysts, user representatives, and other stakeholders with the understanding to discern the state they are in, or the state they are about to enter, and thereby take the necessary actions to ensure that the objectives of the state are effectively accomplished.

The other practical contribution of this study is identification of the skill sets of the analysts and the user representatives. Specifically, the set of inhibitors and enablers of the knowledge transfer process identified in this study can provide insights into the capabilities that the analysts need to possess in order to ensure that the collaborative states terminate successfully. For example, an analyst with higher application domain knowledge and systems development process knowledge would need to take a leadership role during the scoping state, while the dissension state would require an analyst who has high communication and negotiation skills, such that he/she is able to resolve the differences that may have emerged between the stakeholder groups during the sense-making state. On the other hand, our study also highlights that user representatives can be influenced by the so-called "Hawthorne effect" while articulating the system requirements. This implies that analysts need to be on guard and avoid taking everything at face value, and when possible, attempt to triangulate the information received from one set of user representatives with other sources.

Finally, we believe that our conceptualization of RE as a dynamic model, which includes transition between states depending on certain conditions, as opposed to a conceptualization consisting of *normative* phases (e.g., Sommerville 2007), provides a level of flexibility such that the model can remain applicable to a wide range of software development methodological contexts. In other words, we believe that our model can capture the RE processes associated not only with traditional waterfall approaches, but also with the more current methodological approaches, such as those that highlight agility. Many agile methodologies (e.g., SCRUM) proceed in short cycles or "sprints." RE in an agile methodology is seen to be different from those followed in traditional methodologies, where "intensive interaction" and collaboration between the customer and developers is the essence, and it has been specifically argued that "consensus" and "trust between customers and developers" is key to effectiveness (Cao and Ramesh 2008, p. 63). Given the criticality of a successful collaboration for an agile methodology-based software project to succeed, we believe that our process model, highlighting collaboration, knowledge transfer, and trust, can help practitioners a) by enabling them to clearly see the nature of the RE process they are engaged in and b) by guiding them effectively as they transition from one state to another.

While the study makes a number of contributions, like any other study, it also has some limitations. We discuss them in further detail below.

7.3. Limitations and Conclusion

While the focus of our study was both the analysts and the user representatives, the proportion of analysts in our interview sample turned out to be greater than the proportion of the user

representatives. In this respect, it could be argued that our study reflects a slight bias toward the systems analysts in terms of our data collection efforts. However, because our objective is not to examine whose role is more critical to the RE process (in which case a more strict balance in the number of user representatives to analysts interviewed would have been necessary), and our model incorporates an almost equal number of user representative- and analyst-based factors, we believe that the imbalance (user reps versus analysts) does not significantly taint the results.

Another limitation arises from the fact that this study examines the interaction between *analysts* and *user representatives* only, and thus, the results may not be generalized to other situations with interactions between other types of stakeholders in the RE process. While we believe that our study is representative of a large number of RE processes (which often involve user representatives and analysts), prior research suggests that the RE process could also involve other stakeholders such as the end users themselves. Given the difference in the knowledge bases between end users and user representatives/domain experts (i.e., unlike the users, domain experts not only have an intricate knowledge about the users' business processes, but are also somewhat familiar with systems analysis techniques (e.g., Iivari et al. 2004; Tuunanen 2003)), involvement of the end users in the RE process can give rise to different kinds of dynamics in terms of collaboration, knowledge transfer, and development of a shared mental model with the systems analysts. Future research involving analysts and end users needs to be undertaken to get a more in-depth understanding of the RE process.

In this study, we have made an implicit assumption of homogeneity with regards to user representatives. In other words, we have assumed that there is a high level of shared understanding amongst the user representatives. Such an assumption was made primarily because of the empirical context of our study, where the user representatives were found to be quite homogenous. Also, the assumption seemed appropriate given that we were interested in modeling the collaborative interactions between analysts and user representatives. However, we would like to note that in many contexts, the user representative group may actually be quite heterogeneous (e.g., representing different departments) with respect to their views surrounding the requirements (Iivari and Hirschheim, 1996). Future research should examine the diversity within the user group itself and study how the heterogeneity affects their views of the overall RE process.

Further, in this study, we have focused on examining the RE process through the lens of knowledge transfer, collaboration, trust, and development of shared mental models only. While prior literature has suggested these to be the salient components of the RE process, it can be argued that given the complicated nature of RE, viewing it through just four components may provide only a limited understanding. However, adding more components would also make the conceptualization less manageable, and thus, we sought to achieve a balance between complexity and parsimony.

Finally, our study describes a "grounded" process model for Requirements Elicitation (RE), relying on induction, and to some degree, abduction. Thus, there may be some concerns surrounding its external validity. As Lee and Baskerville (2003) point out, the only way to assess the generality of a theory, whether developed through induction or imagination, is through the use of deduction. Noting that a deductive validation is outside the scope of the current paper, we invite future researchers to validate, refute, or further refine the model offered. In our view, interesting empirical approaches may include action research or role-play simulation.

Requirements elicitation has been, and still is, a key topic of interest for ISD researchers. Using data from two different organizations, and applying the grounded theory methodology, we have formulated a process-based understanding of this phenomenon. We are hopeful that as demand for ISD continues to grow in organizations, and undertaking RE effectively becomes increasingly critical, a conceptual representation of the complex social process within RE is likely to provide a useful device for understanding, reflection, and guidance. We hope that we have been able to offer a meaningful contribution in the journey toward such a conceptualization.

References

Agarwal, R., A. P. Sinha, and M. Tanniru (1996) "Cognitive Fit in Requirements Modeling: A Study of Object and Process Methodologies," *Journal of Management Information Systems* (13) 2, pp. 137 - 162.

Armour, P. G. (2007). "The Business of Software," *Communications of the ACM*, (50) 6, pp. 21-23.

Baldwin, M. W. (1992) "Relational Schemas and Processing of Social Information," *Psychological Bulletin* (112) pp. 416 - 484.

Barki, H. and J. Hartwick (1989) "Rethinking the Concept of User Involvement," *MIS Quarterly* (13) 1, pp. 53 - 63.

Berger, P. L., B. Berger, and H. Kellner (1973) *The Homeless Mind: Modernization and Consciousness*. New York: Random House.

Bryant, A. and K. Charmaz (2007) "Grounded Theory in Historical Perspective: An Epistemological Account," in A. Bryant and K. Charmaz (Eds.) *The Sage Handbook of Grounded Theory*, London: SAGE, pp. 31 - 57.

Boisot, M. (2002) "Changing Organizations: Business Networks in the New Political Economy," *Administrative Science Quarterly* (47) 1, pp. 196 - 198.

Booth, T. (1967) *Sequential Machines and Automata Theory*, John Wiley and Sons, New York.

Bostrom, R. P. (1989) "Successful Application of Communication Techniques to Improve the Systems Development Process," *Information & Management* (16) 5, pp. 279 - 295.

Bowlby, J. (1982) *Attachment and Loss. Volume 1: Attachment*. New York: Basic Books

Browne, G. J. and M. B. Rogich (2001) "An Empirical Investigation of User Requirements Elicitation: Comparing the Effectiveness of Prompting Techniques," *Journal of Management Information Systems* (17) 4, pp. 223 - 249.

Browne, G. J. and V. Ramesh (2002) "Improving Information Requirements Determination: A Cognitive Perspective," *Information & Management* (39)pp. 625 - 645.

Budgen, D. (2003) *Software Design*: Addison-Wesley

BusinessDictionary.com, "http://www.businessdictionary.com/definition/enablers.html"

BusinesDictionary.com, http://www.businessdictionary.com/definition/inhibitors.html"

Byrd, T. A., K. L. Cossick, and R. W. Zmud (1992) "A Synthesis of Research on Requirements Analysis and Knowledge Acquisition Techniques," *MIS Quarterly* (16) 1, pp. 117 -128.

Cao, L. and B. Ramesh (2008) "Agile Requirements Engineering Practices: An Empirical Study," *IEEE Software* (25) 1.

Couch, C. J. (1989) *Social Processes and Relationships*. Dix Hills, NY: General Hall.

Coutu, D. L. (1998) "Organization: Trust in Virtual Teams," *Harvard Business Review* (76) 3, pp. 20 - 21.

Curtis, B., H. Krasner, and N. Iscoe (1988) "A Field Study of Software Design Processes for Large Systems," *Communications of ACM* (31pp. 1268 - 1287.

Davenport, T. H. and L. Prusak (1998) *Working Knowledge*. Boston, MA: Harvard Business School Press.

Davidson, E. J. (2002) "Technology Frames and Framing: A Socio-Cognitive Investigation of Requirements Determination," *MIS Quarterly* (26) 4, pp. 329 - 358.

Davis, G. B. and M. C. Monroe (1987) "The Problem of Information Requirements for Computer Applications," *Accounting Horizons* (1) 4, pp. 105 -109.

Deifel, B. (1999) A Process Model For Requirements Engineering of CCOTS. *10th International Workshop on Database and Expert System Applications, 1999*.

Fayard, P. (2003) "Strategic communities for knowledge creation: a western proposal for the japanese concept of Ba," *Journal of Knowledgement* (7) 5, pp. 31.

Feldman, J. M. (1981) "Beyond Attribution Theory: Cognitive Processes in Performance Appraisal," *Journal of Applied Psychology* (66)pp. 127 - 144.

Fisher, B. A. and D. G. Ellis (1990) *Small Group Decision Making: Communication and the Group Process*, 3rd edition. New York, NY: McGraw-Hill Publishing Company.

Fiske, S. T. and S. E. Taylor (1991) *Social Cognition*. San Francisco, CA: Mcgraw-Hill.

Fraser, M. D., K. Kumar, and V. K. Vaishnavi (1991) "Informal and Formal Requirements Specification Languages: Bridging the Gap," *IEEE Transactions on Software Engineering* (17) 5, pp. 454 - 466.

French, J. R. and B. H. Raven (1959) “The Bases Social Power,” in D. Cartwright (Ed.) *Studies in Social Power*, Ann Arbor, MI: Institute of Social Research, pp. 150 -167.

Gasson, S. (2006) "A Genealogical Study of Boundary-Spannning Is Design," *European Journal of Information Systems* (15)pp. 26 - 41.

Glaser, B. G. and A. L. Strauss (1967) *The Discovery of Grounded Theory*. Chicago, IL: Aldine.

Guinan, P. J., J. G. Cooprider, and S. Faraj (1998) "Enabling Software Development Team Performance During Requirements Definition: A Behavioral Versus Technical Approach," *Information Systems Research* (9) 2, pp. 101 - 125.

Hickey, A. M. and A. M. Davis (2004) "A Unified Model of Requirements Elicitation," *Journal of Management Information Systems* (20) 4, pp. 65 - 84.

Hirschheim, R. A. (1985) "User Experience with and Assessment of Participative Systems Design," *MIS Quarterly* (9) 4, pp. 295 - 304.

Holton, J. A. (2007) “The Coding Process and Its Challenge,” in A. Bryant and K. Charmaz (Eds.) *The Sage Handbook of Grounded Theory*, London: SAGE, pp. 265 - 290.

Hunter, M. G. and S. C. Palvia (1996) "Ideal, Advertised and Actual Systems Analyst Skills: The Singapore Context," *Information Technology & People* (9) 1, pp. 63.

Iivari, J, (1990) “Implementation of in-house developed vs application package based information systems”, *ACM SIGMIS Database*, (21) 1, pp 1-10

Iivari, J., R. Hirschheim, and H. K. Klein (2004) "Towards a Distinctive Body of Knowledge for Information Systems Experts: Coding ISD Process Knowledge in Two Is Journals," *Information Systems Journal* (14) 4, pp. 313 - 342.

Iivari, J., R. Hirschheim, and H. K. Klein (1998) "A Paradigmatic Analysis Contrasting Information Systems Development Approaches and Methodologies," *Information Systems Research* (9) 2, pp. 164 -193.

Iivari, J. and R. A. Hirschheim (1996) "Analyzing Information Systems Development:A Comparison and Analysis of Eight IS Development Approaches," *Information Systems* (21) 7, pp. 551-575.

Jarke, M. and K. Pohl. (1993) “Establishing Visions in Context: Towards a Model of Requirements Processes.” *12th International Conference of Information Systems, Orlando, Florida, 1993*.

Jarvenpaa, S. L. and D. E. Leidner (1999) "Communication and Trust in Global Virtual Teams," *Organization Science* (10) 6, pp. 791 - 815.

Jehn, K. A. and E. A. Mannix (2001) "The Dynamic Nature of Conflict: A Longitudinal Study of Intragroup Conflict and Group Performance," *Academy of Management Journal* (44) 2, pp. 238 - 251.

Joshi, K. D. and S. Sarker (2003) “A Framework to Study Knowledge Transfer During Information Systems Development (ISD) Process,” in E. Cloakes (Ed.) *Knowledge Management: Current Issues and Challenges*, Herschey: IRM Press, pp. 25-37.

Kaiya, H., D. Shinbara, J. Kawano, and M. Saeki (2005) "Improving the Detection of Requiremetns Discordances among Stakeholders," *Requirements Engineering* (10)pp. 289 - 303.

Kelle, U. (2007) “The Development of Categories: Different Approaches in Grounded Theory,” in A. Bryant and K. Charmaz (Eds.) *The Sage Handbook of Grounded Theory*, London: SAGE, pp. 191 - 213.

Kirs, P. J., K. Pflughoeft, and G. Kroeck (2001) "A Process Model Cognitive Biasing Effects in Information Systems Development and Usage," *Information & Management* (38)pp. 153 - 165

Kramer, R. M., M. B. Brewer, and B. A. Hannah (1996) “Collective Trust and Collective Action: The Decision to Trust as a Social Decision,” in R. M. K. a. T. R. Tyler (Ed.) *Trust in Organizations: Frontiers of Theory and Research*, Thousand Oaks, CA: Sage, pp. 357-389

Kogut, B. and U. Zander (1992) "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology " *Organization Science* (3) 3, pp. 383 - 397.

Lee, A. S. and R. L. Baskerville (2003) "Generalizing Generalizability in Information Systems Research," *Information Systems Research* (14) 3, pp. 221 -223.

Lewis, J. D. and A. J. Weigert (1985) "Trust as a Social Reality," *Social Forces* (63) pp. 967 – 985

Liou, Y. I. and M. Chen (1993) "Using Group Support Systems and Joint Application Development for Requirements Specification," *Journal of Management Information Systems* (10) 3, pp. 25 - 41.

Lynch, T. and S. Gregor (2004) " User Participation in Decision Support Systems Development: Influencing System Outcomes," *European Journal of Information Systems* (13) 4, pp. 286 - 301.

Marakas, G. M. and J. J. Elam (1998) "Semantic Structuring in Analyst Acquisition and Representation of Facts in Requirements Analysis," *Information Systems Research* (9) 1, pp. 37 - 63.

Markus, M. L. and D. Robey (1988) "Informational Technology and Organizational Change: Causal Structure in Theory and Research," *Management Science* (34) 5, pp. 583 - 598.

Marttiin, P., K. Lyytinen, M. Rossi, V. Tahvanainen et al. (1995) "Modeling Requirements for Future Case: Modeling Issues and Architectural Consideration," *Information Resources Management Journal* (8) 1, pp. 15.

Mathiassen, L., T. Tuunanen, T. Saarinen, and M. Rossi (2007) "A Contingency Model for Requirements Development," *Journal of the Assoication for Information Systems* (8) 11, pp. 569 - 597

McGrath, J. (1991) "Time, Interaction, and Performance (Tip): A Theory of Groups," *Small Groups Research* (22pp. 147 - 174.

McGrath, J. E. (1984) *Groups: Interaction and Performance*. Englewood Cliffs, NJ: Prentice-Hall.

McKnight, D. H., L.L. Cummins, and N. L. Chervany (1998) "Initial Trust Formation in New Organizational Relationships," *Academy of Management. The Academy of Management Review* (23) 3, pp. 473 - 480.

Misic, M. M. and D. Graf (2004) "Systems analyst activities and skills in the new millennium," *The Journal of Systems and Software* (71) 1-2, pp. 31 -36.

Moody, J. W., J. E. Blanton, and P. H. Cheney (1998) "A Theoretically Grounded Approach to Assist Memory Recall During Information Requirements Determination," *Journal of Management Information Systems* (15) 1, pp. 79 - 98.

Nonaka, I., R. Toyama, and N. Konno (2001) “Seci, Ba, and Leadership: A Unified Model of Dynamic Knowledge Creation,” in I. Nonaka and D. Teece (Eds.) *Managing Industrial Knowledge: Creation, Transfer, and Utilization*, Thousand Oaks, CA: Sage Publications, pp. 13 - 43.

Nguyen, L. and P. A. Swatman (2003) "Managing the Requirements Engineering Process," *Requirements Engineering* (8) pp. 55-68.

O'Hara-Devereaux, M. and R. Johansen (1994) *Globalwork: Bridging Distance, Culture, and Time*. San Francisco: Joey-Bass.

Ocker, R., J. Fjermestad, S. R. Hiltz, and K. Johnson (1998) "Effects of Four Modes of Group Communication on the Outcomes of Software Requirements Determination," *Journal of Management Information Systems* (15) 1, pp. 99 -118.

Orlikowski, W. and D. Gash (1994) "Technology Frames: Making Sense of Information Technology in Organizations," *ACM Transactions on Information Systems* (12) 2, pp. 174 - 207

Perez, V. L. and R. Schueler (1982) "The Delphi Method as a Tool for Information Requirements Specification," *Information & Management* (5) 3, pp. 157 - 167.

Pitts, M. G. and G. J. Browne (2004) "Stopping Behavior of Systems Analysts During Information Requirements Elicitation," *Journal of Management Information Systems* (21) 1, pp. 203 - 226.

Pohl, K. (1994) “The Three Dimensions of Requirements Engineering: A Framework and its Applications, *Information Systems* (19) 3, pp. 243-258

Pohl, K. (1993) “The Three Dimensions of Requirements Engineering.” *CAiSE, Paris, 1993*.

Potts, C., K. Takahashi, and A. I. Anton (1994) "Inquiry-Based Requirements Analysis," *IEEE Software* (March).

Reichertz, J. (2007) “Abduction: The Logic of Discovery of Grounded Theory,” in A. Bryant and K. Charmaz (Eds.) *The Sage Handbook of Grounded Theory*, London: SAGE, pp. 214 - 228.

Rolland, C. (1993) Modelling the Requirments Engineering Process. *3rd European-Japanese Seminar on Information Modelling and Knowledge Bases, Budapest, Hungary, 1993*.

Roloff, M. E., L. L. Putnam, and L. Anastasiou (2003) “Negotiations Skills,” in J. O. Green and B. R. Burleson (Eds.) *Handbook of Communication and Social Interaction Skills*: Laurence Erlbaum associates, pp. 801 -833.

Rotter, J. B. (1967) "A New Scale for the Measurement of Interpersonal Trust," *Journal of Personality* (35)pp. 651-665.Sambamurthy, V. and L. J. Kirsch (2000) "An Integrative Framework of the Information Systems Development Process," *Decision Sciences* (31) 2, pp. 391 - 410.

Sambamurthy, V. and L. J. Kirsch (2000) "An integrative framework of the information systems development process," *Decision Sciences* (31) 2, pp. 391 - 410.

Sarker, S. and S. Sahay (2003) "Understanding Virtual Team Development: An Interpretive Study," *Journal of the AIS* (4) 1, pp. 1 - 38.

Sarker, S., J. S. Valacich, and S. Sarker (2003) "Virtual Team Trust: Instrument Development and Validation in an Is Educational Environment," *Information Resources Management Journal* (16) 2, pp. 35 - 55.
Sarker, S., F. Lau, and S. Sahay (2001) "Using an Adapted Grounded Theory Approach for Inductive Theory Building About Virtual Team Development," *Database for Advances in Information Systems* (32) 1, pp. 38 - 56.
Sarker, S., and Lee, A. S. (2003) "Using a Case Study to Test The Role of Three Key Social Enablers in ERP Implementation," *Information & Management*, (40) 8, pp. 813-829.
Schenk, K. D., N. P. Vitalari, and K. S. Davis (1998) "Differences between Novice and Expert Systems Analysts: What Do We Know and What Do We Do?," *Journal of Management Information Systems* (15) 1, pp. 9 - 50.
Scott, W. R. (1992) *Organizations: Rational, Natural, and Open Systems*. Englewood Cliffs, NJ: Prentice Hall.
Siau, K. and X. Tan (2006) "Using Cognitive Mapping Technique to Supplement UML and up in Information Requirements Determination," *The Journal of Computer Information Systems* (46) 5, pp. 59 - 66
Sommerville, I. (2007) *Software Engineering*: Addison Wesley.
Strauss, A. L. and J. M. Corbin (1990) *Basics of Qualitative Research* Newbury Park, CA: Sage.
Suddaby, R. (2006). “From the Editors: What Grounded Theory is Not,” *Academy of Management Journal* (49) 4, pp. 633-642.
Sutcliffe, A. (2006) Trust: From Cognition to Conceptual Models and Design in E. Dubois and K. Pohl (Eds.) *CAiSE 2006*, Berlin: Springer-Verlag, pp. 3 - 17.
Szulanski, G., R. Cappetta, and R. J. Jensen (2004) "When and How Trustworthiness Matters: Knowledge Transfer and the Moderating Effect of Causal Ambiguity," *Organization Science* (15) 5, pp. 600 - 613.
Szulanski, G. (2000) "The Process of Knowledge Transfer: A Diachronic Analysis of Stickiness," *Organizational Behavior and Human Decision Processes* (82) 2000, pp. 9 - 27.
Szulanski, G. (1996) "Exploring Internal Stickiness: Impediments to the Transfer of Best Practices within the Firm," *Strategic Management Journal (1986-1998)* (17) Winter Special Issue, pp. 27.
Thanasankit, T. (2002) "Requirements engineering - exploring the influence of power and Thai values," *European Journal of Information Systems* (11) 2, pp. 128.
Tuunanen, T. (2003) "A new perpective on requirements elicitation methods," *Journal of Information Technology Theory and Applications* (5) 3, pp. 45 - 62.
Urquhart, c. (2007) “The Evolving Nature of the Grounded Theory Method: The Case of the Information Systems Discipline,” in A. Bryant and K. Charmaz (Eds.) *The Sage Handbook of Grounded Theory*, London: SAGE, pp. 339 - 360.
Urquhart, C. (2001) “An Encounter with Grounded Theory,” in E. M. Trauth (Ed.) *Qualitative Research in IS: Issues and Trends*, Hershey, PA: Idea Group Publishing, pp. 104 -140.
Urquhart, C. (1997) “Exploring Analyst-Client Communication: Using Grounded Theory Techniques to Investigate Interaction in Informal Requirements Gathering,” in A.S. Lee, J. Liebenau, and J. DeGross (Eds.) *Information Systems and Qualitative Research*, London, UK: Chapman and Hall, pp. 149 - 181.
Van De Ven, A. H. (2007) *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford: Oxford University Press.
Venzin, M., G. von Krogh, and J. Roos (2000) “Future Research into Knowledge Management,” in G. von Krogh, J. Roos, and D. Kleine (Eds.) *Knowing in Firms: Understanding Managing and Measuring Knowledge*, Thousand Oaks, CA: Sage Publications.
Wand, Y. and R. Weber (2002) "Research Commentary: Information Systems and Conceptual Modeling--a Research Agenda," *Information Systems Research* (13) 4, pp. 363 - 377.
Westfall, L. (2005) “The What, Why , Who, When and How of Software Requirements.” *ASQ World Conference on Quality and Improvement Proceedings, 2005*, pp. 97 - 104 59.
Wynekoop, J. L. and D. B. Walz (2000) "Investigating Traits of Top Performing Software Developers," *Information Technology & People* (13) 3, pp. 186.
Zucker, l. G. (1986) “Production of Trust: Institutional Sources of Economic Structure, 1840 -1920,” in, vol. 8 B. M. S. a. L. L. Cummings (Ed.) *Research in Organization Behaviour*, Greenwich: JAI Press, pp. 53 - 111.

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Saonee Sarker is currently an Associate Professor in the Department of Information Systems at Washington State University. Professor Sarker received her Ph.D. in Management Information Systems from Washington State University, her M.B.A. from the University of Cincinnati, and her BA (Honours) from Calcutta University. Her research focuses on globally distributed software development teams and other types of computer-mediated groups, technology adoption by groups, technology-mediated learning, and information technology capability of global organizations, and her publications have appeared in (or are forthcoming in) outlets such as *MIS Quarterly, Information Systems Research*, *Journal of Management Information Systems*, *Journal of the Association of Information Systems*, *European Journal of Information Systems*, *Decision Support Systems, Information Systems Journal*, *IEEE Transactions*, *Journal of Computer-Mediated Communication*, and *ICIS Proceedings.* She is also the PI of an NSF grant that was awarded to study work-life balance in globally-distributed software development teams.

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