Achieving Solution Success: An Investigation of User Participation Approaches

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ACHIEVING SOLUTION SUCCESS: AN INVESTIGATION OF USER PARTICIPATION APPROACHES

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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<th>Definition</th>
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<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>ISD</td>
<td>Information System Development</td>
</tr>
<tr>
<td>UPA</td>
<td>User Participation Approach</td>
</tr>
<tr>
<td>COVA</td>
<td>Commonwealth of Virginia</td>
</tr>
<tr>
<td>SNA</td>
<td>Social Network Analysis</td>
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Abstract

ACHIEVING SOLUTION SUCCESS: AN INVESTIGATION OF USER PARTICIPATION APPROACHES

By Angela Marie Mattia, Ph.D.

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

Virginia Commonwealth University, 2009

Major Director: Dr. Heinz Roland Weistroffer
Associate Professor, Information Systems

User participation and its relationship to system success have been discussed in the information systems (IS) literature from many theoretical and practical perspectives. In reality, most of this discussion is grounded in empirical research that has yielded mixed results on the importance of user participation and its relationship to system success. The goal of this dissertation is to extend the line of inquiry into user participation during information system development by providing information systems researchers and IS practitioners with both a valid theoretical and practical investigation of a successful IS solution. This investigation organizes the study within a descriptive model that emerges from the different traditions of prior research and uncovers the approach to user participation in a successful IS solution. This user participation approach (UPA) model becomes the structure for the systematic arrangement of user participation
approaches into a four-fold typology according to criteria or extrinsic information attributed to them in the research literature. A case study analysis and social network analysis of a successful IS solution will be used to describe, map and measure the relationships, activities, processes, and flows between participants, thus providing a descriptive and visual analysis of the relational structure that emerges. Indeed, these methodological approaches conceptualize the attributes and the relations of user participation during information system development and give insightful perspectives on how a successful IS solution is developed and implemented. The resulting outcome is a description of a successful approach to user participation and some practical recommendations on how to increase the chance of success in a system solution.
CHAPTER 1: INTRODUCTION

1.1 PREamble

Today most people would consider user participation as a critical factor in successfully developing an information system (IS). Interestingly enough, empirical studies have had mixed results and cannot conclusively prove a link between user participation and system success. Indeed, attempts to organize and synthesize past empirical studies on user participation have resulted in conflicting results (Cavaye 1995; He & King 2008; Hwang & Thorn 1999; Olson & Ives 1981). One of the reasons for the conflicting results may be the approaches managers and analysts use when users participate. These approaches are both explicitly and implicitly imbedded in the views (Bostrom & Heinen 1977) of the analyst, who has traditionally guided the information system development (ISD) process. In reality, the view of an analyst, user, manager or stakeholder is like a pair of glasses through which they view the world. They all have views and they aren’t all the same. It is this varied frame of reference that seems to indicate that there is no one approach that guarantees that user participation leads to a successful information systems project (Orlikowski & Gash 1994). Therefore, a variety of user participation approaches may need to be available so that an approach can be chosen that is congruent with the goals and objectives that exist in an organization.

1.2 MOTIVATION FOR THE RESEARCH

meta-analysis that synthesized the research findings from 82 empirical studies on user participation in ISD. They classified various ISD outcomes into a scheme involving two broad categories: attitudinal/behavioral outcomes and productivity outcomes. The overall results indicate that user participation is minimally to moderately beneficial to ISD. The results of the He and King (2008) study compared there results to numerous other meta-analyses, some of which are taken from the broader management context of user participation. The results of these studies suggest that the effect of user participation is problematic and needs additional investigation. He and King (2008) suggest that organizations have their own specific goals and objectives for ISD projects, and therefore need different strategies to develop and implement them.

Furthermore, studies have shown that user participation is affected by social processes (Newman & Robey 1992; Robey & Newman 1996), political perspectives (Franz & Robey 1984) and cultural impact (Butler & Fitzgerald 1997; Iivari 2006). Still other research has examined how the backgrounds and perspectives of users and analysts affect their relationships, but these studies generally focused on specific aspects, such as conflict during the user-analyst interaction (Robey, et al. 1989; Robey, et al. 1993). There are various aspects to studying user participation, and one promising approach is looking at the context within which user participation can result in improved user satisfaction. This approach seeks to explain where and how user participation should occur and based on the results find strategies for the most appropriate involvement for users during system development (McKeen & Guimaraes 1997). Another interesting approach is to capture the institutional and development-related contexts that shape and influence the processes of user participation and the management of change (Butler & Fitzgerald 2001). The IS literature offers a large amount of useful and interesting user participation research on the
traditional approach to ISD, yet it is clear that little is known about the influence of alternative approaches that have emerged from different development contexts (Mao & Markus 2004). Therefore it remains to be seen how well they will work in today’s IS contexts.

Indeed, IS project context can vary in many ways (e.g., traditional systems development, Enterprise Resource Planning (ERP) systems installation, business process outsourcing, etc.). Markus and Mao (2004) state “We recommend single-context studies here, because we would expect systematic variations across contexts in stakeholders, participants, and change agents.” Likewise, the social composition (social network) of an organization is an emergent property of choices and decisions, made by interacting individuals through their work processes and communications. The IS research shows that one reason for failure in IS implementation is the lack of communication between users and developers (Bussen & Myers 1997; Hartwick & Barki 2001). Therefore, we would expect systematic variations across contexts in user participation processes, activities, communications, and the relationships of participants. This is a direction that needs further research in today’s world that embraces social networking.

1.3 RESEARCH PROBLEM STATEMENT

The following high level questions are based on the assumption that an approach to user participation is a strategy that is selected by a change agent with the expectation of achieving solution success.

We will use an exemplary case of IS solution success in an attempt to address the following questions:

- What is the approach to user participation in a successful IS solution?
- How does user participation contribute to a successful IS solution?
- What is the formal social network in a successful IS solution?
1.4 RESEARCH OBJECTIVES

Therefore, the objectives of this dissertation are to:

- Describe and extend the line of inquiry on user participation.
- Determine an exemplary approach to user participation in a successful IS solution.
- Develop guidelines that increase the chance of success in a specific IS solution.

This dissertation extends the inquiry on user participation by creating a research and practical model that recognizes four approaches to the user participation process in ISD that emerge from the different traditions of prior research. These four user participation approaches (UPAs) include a traditional approach and three alternative approaches based on descriptive and practical orientations derived from the IS literature. The proposed model will be used as a logical structure for classifying and organizing complex user participation information, so that a better understanding can occur.

A case study and social network analysis (SNA) will be used to explore, map and measure the activities, processes, relationships and information flows among participants, thus providing a conceptual and visual analysis of the relational structure that emerges in an exemplary case of system success. This dissertation identifies solution success by using a list of critical success factors and some preliminary benchmarks needed for success, as defined by the project implementers. A matrix of success factors (Chapter 4) is derived from the propositions and set against the various benchmarks.

A case study and SNA approach offer the potential to conceptualize the attributes and the relations of user participation during a successful case of ISD, but equally as important, this
dissertation contributes guidelines that increase the likelihood of bringing an ISD project closer to a successful outcome.

Specifically, this dissertation will:

- develop a four-fold typology that contains the traditional approach (analyst-led) to user participation in ISD, and compares the dominant alternative approaches to ISD.
- provides IS researchers and IS practitioners with a case study on the approach to user participation in a successful system solution.
- explore user participation (in ISD) as a social network through a case study by examining:
  - The emergence of formal social structures from the user participation approach (UPA) chosen.
  - Control over system design and design process within the social network.
  - The role of change agents and participants in a successful system solution.

1.5 Significance and Contributions of This Dissertation

Table 1.1 Dissertation Research Map

<table>
<thead>
<tr>
<th>ORGANIZE</th>
<th>A UPA model (Chapter 3) organizes user participation research.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCEPTUALIZE AND OPERATIONALIZE</td>
<td>The UPA Typology (Chapter 3) systematically arranges user participation approaches into categories according to criteria or extrinsic information attributed to them in order to help in the management of user participation during information systems development</td>
</tr>
<tr>
<td>ANALYZE</td>
<td>The case study (Chapter 5) supplies a critical investigation of a successful system solution organized by the UPA Model Social Network Analysis (Chapter 6) supplies a useful tool to visualize user participation in a successful system solution. SNA provides both a visual and a mathematical analysis of social networks</td>
</tr>
</tbody>
</table>
This dissertation is focused on extending the line of inquiry on user participation by broadening the descriptive model of user participation (Cavaye 1995) and the theoretical synthesis of Mao and Markus (2004). The reason for this focus is embedded in two broad, but very significant problems. First, the existing body of IS literature remains fragmented and continues to present inconsistent results (He & King 2008). This finding contrasts greatly with the common sense perception that has prevailed since the 1960s, that user participation in the ISD process increases the likelihood of project success (Barki & Hartwick 1994; Foster & Franz 1999). Actually, well-documented support exists for this position. One reason for failure in IS implementation is the lack of communication between users and developers (Bussen & Myers 1997; Hartwick & Barki 2001), therefore it is reasonable to infer that a need to communicate requires user participation.

A second reason for the focus of this dissertation is to keep extending the line of inquiry on user participation. This dissertation broadens the descriptive model of user participation (Cavaye 1995) and the theoretical synthesis of Mao and Markus (2004) because of the rapid change in IS development we face today. Change brings with it new tools that facilitate user participation in ways never seen before (Markus 2004). Therefore, this researcher agrees that we need to revisit user participation in ISD (He & King 2008; Mao & Markus 2004; McLeod, et al. 2007) and address the need to have a broader and more comprehensive description of user participation in ISD that fits the world we live in today.

Consequentially, a four-fold typology compares the traditional approach (Analyst-led) to user participation in ISD, to the dominant alternative approaches that aim to provide guidance to developers on how to develop successful systems. This is significant because the control over
system design and design process within the social network appears to offer theoretical and practical knowledge about user participation.

Next, this dissertation provides IS researchers and IS practitioners with an illustrative case study of ISD activities, project management activities and their relationship to user participation in a specific IS context. This case study strategy will illuminate the user participation approach and methodology: why a particular approach was chosen, how the approach and methodology was implemented, and with what result. As suggested by Markus and Mao (2004), a single-context study was chosen for this research because it can supply valuable insight into a specific contemporary IS project context. An extensive literature search identified few studies that addressed a contemporary IS project that had measurable system success. Thus, the case study is worth conducting because the descriptive information alone is informative.

Lastly, this dissertation investigates user participation (in ISD) as a social network. A social network of participants is defined as a set of participants and the relations (e.g., communication, work processes) that connect them together (Kilduff & Tsai 2003). This dissertation looks at the emergence of social structures from the user participation approach (UPA) chosen. This is relevant because the configuration of interactions that occur among the stakeholders, participants, and change agents introduce a new social network perspective to the study of user participation, such as embeddedness, structural holes, and centrality. These concepts orient the study towards specific aspects of organizational phenomena that might otherwise be overlooked.

- The concept of embeddedness argues that work-related transactions tend to overlap with social relations (Granovetter 1985). Thus, this dissertation uses a social network
perspective to suggest that an ISD project is embedded in a social network, and therefore patterns of activities and processes within and between participants and change agents may depart from what might be expected from a pure economic perspective.

- **Structural holes** are gaps in the information flow (social network); a liaison role can be used to bridge the gap (Burt 1992b). This is significant because a lack of communication between analyst and users is linked to system failure; therefore the importance of the liaison role and bridging ties in the information flow can be instrumental to a successful system.

- **Centrality** in information flows (social networks) is an important factor in an analysis of structural holes. Centrality is the extent to which a participant occupies a central position in the social network in one of the following ways: having many ties to other participants (degree centrality), being able to reach many other participants (closeness centrality), connecting other participants who have no direct connections (between centrality), or having connections to centrally located participants (eigenvector centrality).

Existing social networks supply persistent datasets on how users participate, and a social network analysis may present the cues and patterns that allow us to better understand the relationship of user participation in ISD to system outcomes. In addition, visual representations of social networks help us understand the dataset and convey the results of the analysis. Though people are quite adept at participating in ISD projects in new and ever-more detailed ways, they often lack the ability to see the relationship of user participation to the activities and processes that contribute to system success. It is clear that social networks can be an important source of
information and contribute to the practices and guidelines that can help increase the chance of success in a specific IS context

1.6 MAPPING THE CHAPTERS OF THE DISSERTATION

This dissertation proceeds as follows. Chapter 2 provides a short overview of the descriptive model of the user participation process (Cavaye 1995) and theoretical synthesis (Mao & Markus 2004) user participation. In addition, we review the user participation literature from a social network perspective.

Chapter 3 presents an updated theory of user participation elements (Markus & Mao 2004) based on the IS user participation and research model literature. An updated synthesized theoretical version of the descriptive model of Cavaye (1995) called the UPA model is developed. We synthesize the user participation approach model (UPA), theory, and the survey of the literature into a four-fold typology of user participation approaches. This conceptualization is used as a means to better understand some of the dominant approaches to the user participation process.

Chapter 4 introduces the research methodologies. A case study approach is introduced as one of the two research methods. The guidelines for conducting the case study of a successful system solution are provided. Next, social network analysis (SNA) is introduced as the second research method. The guidelines for conducting social network analysis are provided.

Chapter 5 presents evidence about the approach to the user participation process in a successful total procurement solution (eVA). In the initial section of this chapter, this dissertation will use a style and method similar to the Markus and Mao (2004) study to present theoretical support for using the UPA process model as a way to organize the numerous complex
variables, in a total e-procurement solution. Thereafter, this dissertation will use hypothetico-deductive logic to scientifically investigate the eVA case study. Results from the analysis contribute to the adaptation of the user participation approach (UPA) typology presented in Chapter 3.

Chapter 6 introduces a social network perspective, which is used to look at the emergence of a single directed binary social network that describes the flow of information among ten identified formal roles (eVA Team) taken from a successful system solution conducted in a public organization.

Chapter 7 concludes this dissertation and discusses the limitations of the eVA case study and the social network perspective. These methods explore (case study) and map the relationships and information flows (SNA) between participants, thus providing a descriptive analysis of the eVA collaborative approach that emerges. An adapted typology includes the eVA collaborative approach and supplies a foundation for future research.
CHAPTER 2 – LITERATURE REVIEW: IDENTIFYING THE ELEMENTS IN A UPA

Participation is the subject of research in many other disciplines; including organizational behavior, human relations, and psychology. Indeed, this dissertation makes important contributions and has inspired many contributions to the IS literature, but this extensive literature review will be a review of the IS literature that is meant to enlighten and enliven the conversation on current approaches used for user participation during ISD. As a point of departure, we will define some basic terminology. We will review four themes that dominate this dissertation’s agenda: ISD research models, UPA elements, goal-directed social networks and the application of social network analysis (SNA). To our knowledge, social network analysis has not been applied to user participation during ISD.

This chapter will lay a foundation to explicitly conceptualize the variables posited in the research literature in order to create a working model for this research. As noted in Chapter 1 of this dissertation, organizations have their own specific goals and objectives for ISD projects, and therefore need different strategies to develop and implement them (He & King 2008). However, little is known about the influence of alternative approaches to user participation that have emerged from different development contexts (Mao & Markus 2004). Therefore it remains to be seen how well they will work in today’s IS contexts.

2.1 USER PARTICIPATION IN INFORMATION SYSTEMS DEVELOPMENT

User participation has been discussed in the IS literature from many theoretical and practical perspectives. Attempts to organize and synthesize the literature have proven difficult.
In ISD the user participation process is described by numerous ambiguous terms that need to be defined. This will provide a frame of reference for the remainder of this dissertation. First, Barki and Hartwick (Barki & Hartwick 1989) suggest that the term user participation should be used “when referring to the set of operations and activities in the systems development process in which a user participates,” and the term user involvement “should be used to refer to a subjective psychological state which influences a user’s perceptions of the system.”

Many types of users exist, including different levels of management, and day-to-day users. During ISD users have different roles that are required at various times depending on the phase of ISD, therefore the IS literature frequently calls them participants. The word stakeholder has also become commonly used in the IS user participation literature and generally refers to “those who are likely to be affected by a solution, whose acceptance and use of that solution could be problematic, and who are therefore logical candidates for participating in solution development or implementation” (Markus & Mao 2004). Participants are the members of the subset of stakeholders who are actually given the chance to participate in the ISD activities.

The selection of good participants from among the stakeholders is often the job of the change agent. Change agents can be a subset of existing stakeholders (managers, IS professionals, HR professionals), or they can be external consultants and/or vendors. They are the “people who play important roles in designing and executing participation opportunities for stakeholders” (Markus & Mao 2004). They decide who the participants will be, how they will participate (via surveys, JAD sessions, or on ISD project teams), and what participation techniques and tools (e.g., CASE, discussion aids, wikis) are used. In addition, change agents are often the team leader or facilitator in the user participation process and may have the authority to resolve or remove other participants if conflict occurs (Sabherwal & Robey 1993). Therefore,
Information system development can also be used in numerous ways. In the past the process was described basically in the same way: the initial problem statement, system analysis, system design, building, and implementation (Cavaye 1995). In the present context, ISD refers to the whole process (including the management of the project), but the terminology has evolved to include alternative combinations and descriptions of the phases (Bødker, et al. 2004; Namioka & Schuler 1993; Slob & Verbeek 2006; Stahl & NetLibrary Inc. 2007; Verbeke & Stellingwerff 2004). In addition, it is important to note that many studies look only at particular phases, but still refer to the object of their study as ISD (Browne & Rogich 2001; Lu & Wang 1997; Wixom & Todd 2005).

Development-related activities performed by stakeholders during ISD include activities that may pertain to either the management of the ISD project or to the analysis, design, and implementation of the system itself (Cavaye 1995). Therefore, participation reflects what
specific behaviors are performed, how many of these behaviors are performed, and how often they are performed and can be measured by asking users to indicate the extent to which they have performed specific assignments, activities, and behaviors (Hartwick & Barki 2001). These activities may pertain either to the management of the IS project or to the analysis, design, and implementation of the system solution itself.

Describing the user participation process in terms of activities engaged in by the user focuses on only one facet of a complex process. Several attributes have been identified in the IS literature to describe user participation. Some of these attributes help us develop a clear picture of “participation” in this study and therefore need to be defined. The level of participation is an important attribute that recognizes that users may have different responsibilities (Ives & Olson 1984). Users can have a small part in the ISD process or may be given full responsibility (leadership) for the development of the system. The context of participation is an attribute that needs to be addressed because users may be involved in different aspects of system design (Hirschheim 1983). The formality of participation is recognized as an attribute because formal teams can be organized and/or informal participation may exist through relationships, discussion, and tasks (Barki & Hartwick 1994).

Due to the diverse use of the terms user participation and user involvement, user engagement has emerged as a term that refers to either user participation or user involvement or both (Hwang & Thorn 1999). In addition, recent research also looks at user attitude as a separate term and defines it as affective or evaluative judgment (e.g., good or bad) towards an object or behavior (Barki & Hartwick 1989). Simply said, it is a psychological state that reflects the user’s feelings about IS. This is important because recent research has suggested that user participation, user involvement, and user attitude exert different impacts on system outcomes.
Indeed, a circular relationship (figure 2.2) is suggested (Lin & Shao 2000), because when users perform participatory activities, it helps users tend to get more involved, which may improve their attitudes and make them feel more satisfied with the IS.

![Figure 2.2 User Participation](Adapted from Lin & Shao (2000))

There is an extensive amount of literature on user participation in information system development. Individual papers discuss separate components, terms and individual factors associated with participation issue. They contribute to the body of knowledge on user participation and system success, but the findings are not consistent or cumulative because the concept has many complex dimensions that have been understood and the participants’ behavior predicted within the defined scope of the research.

### 2.2 The Gap in Information Systems Development Research Models

Research models are attempts to capture and explain the complex, interdependent, and dynamic factors and processes that exist in our world. Different models address different aspects of ISD, thus they give us different insights and recommendations on how to achieve a successful outcome. A philosophical research model (figure 2.3) addresses the nature of
relationships (system thinking) in the social network (Churchman & Schainblatt 1965). An effective relationship is achieved through a dialectical process (represented by the arrows in the figure 2.3) that results in mutual understanding between the analyst (the scientist) and the user (the manager). The dialectical process (communication) is presented in the nature of the relationship. Prior research has established that communication plays an important part in a successful solution outcome (Hartwick & Barki 2001). This model is useful, but limited when used exclusively because it is isolated from the context of ISD.

**Figure 2.3 A Philosophical (Systems Thinking) Model of User Participation**

Next, factor research models emerged that capture the potential predictors of successful ISD and tests the empirical relationships between predictors and outcomes. Some categories of factors (variables) that affect ISD are identified in the literature as individual, organizational, situational, and technological (Lucas 1975). For example, earlier empirical studies on user participation have had mixed results on a link between user participation and system success (figure 2.4) (Cavaye 1995; Hwang & Thorn 1999; Ives & Olson 1984; Lin & Shao 2000). Variables are designed to be measured and therefore explain very little of the variance that naturally occurs when predicting an outcome (Ives & Olson 1984; Tait & Vessey 1988). Furthermore, factor research approaches do not explain how outcomes occur.
Process research models emerged as researchers began to understand that ISD is dynamic. These models hold the promise of providing new insight into old concepts by allowing researchers a view of the many theoretical perspectives and topic areas in a simplified, but more complete model. A process approach describes, explains, predicts, and can be used to alter behavior. It is dynamic and provides the story that explains the strengths of the relationships between predictors and system outcomes. Mackenzie (Mackenzie 2000) presents a process approach for the organization sciences that views organizational behavior as fundamentally a physical process; thus it is a sustained phenomenon or one marked by gradual changes through a series of states. This supports earlier conclusions that user participation is inherently a process (Cavaye 1995; Newman & Robey 1992). Indeed, it is part of a larger ISD process that is characterized by its dynamic nature (Newman & Robey 1992).

As we look at factor and process research it is important to note that variables are often a form of the outcomes (results) that come from a process and are inherently causal (Mackenzie 2000). However, a variable cannot capture the complexity of a process because a process represents a developmental sequence of events. Factor and process models do not produce the same causal arguments. Interestingly enough, factor research models are the most commonly used models in ISD (Newman & Robey 1992), and although they are useful to researchers, a gap exists in the study of the actual processes that produce the factors. Past research (Cavaye 1995;
Newman & Robey 1992) suggests that process and factor models complement each other, and when presented together, give a more informative and therefore more complete picture of what is being studied.

Briefly, there are a few basic ideas behind processes (Mackenzie 2000) and therefore behind the user participation process (figure 2.5). First, activities take place in all processes. Second, a time-dependent sequence of these activities occurs. Third, this sequence involves distinct components (e.g., people, the steps or phases of activities, relationships between steps, and links to other processes). Fourth, the outcome of a process is determined by the process itself.

Another model that is frequently discussed in the IS literature is the socio-technical model (Bostrom & Heinen 1977). This approach conceptualizes the interaction of people (change agents, participants, and stakeholders), tasks (operations and activities), technology, and (social) structure as a diamond shape. Each component can affect any of the other components. The focus is usually on one or more of the components in the organization. For example, risk management in IS advises managers to be aware of the limitations of different approaches and to combine them into a comprehensive and contextual risk management practice (Lyytinen, et al. 1996). Risk management can affect any of the other components (e.g., social structure, technology, etc.), thus it has a social technical impact on the organization.

Figure 2.5 A Process Model of User Participation
Socio-technical approaches helped to improve working practices and joint agreements between workers and management in the 1960s and 1970s, but the much harsher economic climate of the 1980s and 1990s forced information systems to support downsizing and cost cutting in a global economy (Mumford 2006). Information systems are designed to affect other components (e.g., social structure, participants, etc.). This model offers considerable progress in understanding ISD, but fails to address the political impact (Franz & Robey 1984) within organizations or frames (meanings and actions) (Orlikowski & Gash 1994) within organizations.

![A Socio-technical Model of User Participation](image)

**Figure 2.6 A Socio-technical Model of User Participation**

### 2.3 The User Participation Approach (UPA) Elements Emerge

Numerous research studies have synthesized the research findings and previous research models on user participation in ISD using a factor model that depicts a direct causal relationship between user involvement and system success (see figure 2.4). Olson and Ives (1981) reviewed 22 empirical studies (1959 - 1981) and concluded that only 36% of the sample supported the participation-system success link. In 1995, Cavaye reviewed 19 empirical studies (1982 – 1992) and concluded that 37% of the sample supported the participation-system success link. Of particular concern in both studies was the small sample size, but beyond this threat to validity,
the consistent reporting of conflicting findings suggests the need for more definitive investigation of user participation on system success.

Using a meta-analysis approach, numerous researchers synthesize and compared results from empirical studies. Wagner and Gooding (1987) suggested that users are poor estimators of aspects of their own behavior. They concluded that user participation had limited beneficial effects. This began a stream of research that raised questions on the practical significance of participatory design (Vredenburg, et al. 2002; Wagner 1994; Wagner & Gooding 1987) and led to the investigation of the effect of situational factors. The strength of the participation-system success link was statistically tested and the results indicated user participation was significantly beneficial to ISD (Pettingell, et al. 1988).

Of the two meta-analyses that bear directly on the proposed research questions, the first is Hwang and Thorn (1999), which used meta-analysis on 25 studies (1976-1996) to statistically test the strength of the participation - system success link. The results indicated user engagement had a direct relationship to system success and was significantly beneficial to ISD despite the differences among the individual studies. Second, He and King (2008) devised a classification scheme for ISD outcomes that consists of two broad categories: attitudinal/behavioral and productivity outcomes. Meta-analysis was used on 82 studies using the attitudinal/behavioral and productivity classification scheme. The results indicated user participation was minimally to moderately beneficial to ISD with stronger attitudinal/behavioral effects when compared to productivity outcomes. The study’s conclusion that user participation is just one of a number of things that make an ISD project more successful is one of the conceptual foundations for this dissertation. Although the most current empirical evidence (He & King 2008) seems to minimally to moderately support the hypothesized link, the Mao and Markus (2004) suggest that
the overall IS literature presents mixed results, and has numerous different explanations for how and why participation leads to a system outcome.

Cavaye (1995) is a seminal study that attempts to explain many of the inconsistencies in the empirical literature by highlighting a number of important attributes of participation and presenting a model (see figure 2.7) which is used to describe and synthesize existing research findings (through 1995) on user participation and its link to system success. The attributes of participation identified in the IS literature were given as type, degree, content, extent, formality, and influence. Contingencies (e.g., time for development, financial resources, top management commitment, degree of task structure, project complexity, initiator of the project, technology available, change management, willingness and ability of users to participate, and user characteristics and attitudes), are included to illustrate that system success may have variables that moderate the user participation effect (Cavaye 1995). It is important to recognize them, so that the user participation process is framed in the specific context. Factor and process research models were put forth as providing valid insights when presented together. Cavaye (1995), which is based on Newman and Robey (1992), contributes to the model extended in this dissertation.

Figure 2.7  User Participation in Systems Development  
Reproduced from (Cavaye 1995)
In 2004, Markus and Mao proposed an updated theory of user participation that is robust enough to accommodate changing IS practice. The updated theory of user participation is important to this study because we critically analyze it, along with the traditional IS participation theory, to show that it contains partial and conflicting explanations for the effect of user participation on solution success. These explanations have important conceptual implications, particularly when viewed in light of the constant change that occurs in our socio-technical networks (e.g., new business environments, technology, tools, development approaches, and so forth). To address these gaps, we apply the updated theory of user participation (figure 2.8) within our UPA process model (figure 3.3) using the key elements of both. The elements include a redefined concept of system success and an elaborated conceptualization of the social network of participants and participation activities in a specific IS context, content, and political environment.

![Figure 2.8. Updated IS Participation Theory](image)

Reproduced from (Markus & Mao 2004)
Markus and Mao (2004) suggest that “perhaps the most critical conceptual need found in the IS literature today is to disentangle participation’s effects on various types of outcomes that are currently lumped together under the heading of system success.” In addition, changes in the nature of IS project management due to the variety of ever-changing contexts that exist today and will exist tomorrow, also raise old and new issues about how the concepts of user participation are conceptualized. System success is actually a successful system “solution delivered by developers” (Markus & Mao 2004). Therefore, from this point forward, we will use the term system solution instead of system success wherever relevant, as the more inclusive term. This extension broadens the boundaries of the system to include all components (e.g., social structures, technology, etc.) in the solution, not just the technology that is implemented. This will help update and systematize existing research findings and continue the cumulative research tradition on user participation.

2.4 Detailed Discussion of the UPA Elements

This section describes the current research on user participation, including its current limitations and weaknesses. As a general rule, all existing literature that incorporates all the major elements or constructs that are present in this dissertation are introduced because they are background that is particularly relevant. Along this line of reasoning, Cavaye (1995) included contingencies in a descriptive model of ISD. Contingencies are defined as the context of system development that helps or hurts user participation. Numerous user participation researchers use a contingency approach (Cavaye 1995) to explain the mixed results of prior studies (Lin & Shao 2000; McKeen, et al. 1994; Morley 1993; Tait & Vessey 1988) and the set of circumstances or facts that surround user participation in a particular ISD project (Andres 2002; Franz 1985).
Some contingency variables in the IS literature are organizational issues, such as time for development (Hirschheim 1985; Mahmood 1987; Tait & Vessey 1988), the financial resources available (Doll 1987; Locke & Schweiger 1979), and top management commitment (Hirschheim 1985; Jarvenpaa & Ives 1991). Some project environment contingency variables identified are the degree of task structure (Schonberger 1980), project complexity (Beath 1987; Hirschheim 1985; Mann & Watson 1984; Tait & Vessey 1988), initiator of the project (Alter 1978; Kim & Lee 1986), technology available (Mann & Watson 1984), and the expected change brought about by the system (Anderson 1985; Markus 1981). Lastly, Cavaye (1995) included some user related contingency variables, such as user characteristics, attitude, willingness and ability to participate (Anderson 1985; Locke & Schweiger 1979; Zmud 1979).

This dissertation does not include user related factors as part of the initial context because recent research has suggested that user participation, user involvement, and user attitude have a circular relationship (Lin & Shao 2000) during the user participation process. For example, a circular relationship occurs when users perform participatory activities, which helps users get more involved, which may improve the user’s attitudes and make them feel more satisfied with the IS. This is a circular because “the feelings of the users for or against the systems are interrelated with the importance and personal relevance users perceive about the systems. User participation should have more efficacy if such behaviors originate from the underlying favorable attitudes and spontaneous involvement, instead of from manager’s forcible orders.” (Lin & Shao 2000)
Today, changing IS contexts make it essential to make careful distinctions among user participation, user involvement, and user attitude (Lin & Shao 2000), and among the types and politics of stakeholders, participants, and change agents (Markus & Mao 2004) in a system solution. Therefore, the benefits of these system solutions are only realized when organizations reorganize work in new ways (change) “to take advantage of the capabilities of IT” (Markus 2004). As a result, it is important to consider user participation in the context of an organizations change.

The theoretical and empirical organizational change literature contributes to our discussion by supplying four research themes or issues common to all change efforts: (a) content issues, which largely focus on the substance of contemporary organizational changes; (b) contextual issues, which principally focus on forces or conditions existing in an organization’s external and internal environments; (c) process issues, which address actions undertaken during the enactment of an intended change, and (d) criterion issues, which deal with outcomes commonly assessed in organizational change efforts (Armenakis & Bedeian 1999).

This dissertation has integrated the contingencies from Cavaye (1995) and the change literature themes into the UPA in an effort to accurately describe the user participation/solution success link. First, context is the project environment. It embodies the external (competitor strategies, government legislation, technological innovation, etc.) and internal (human resources, history and culture of an organization, etc.) contextual factors that shape change (Dawson 2003). Second, specific IS content may differ considerably in terms of operational issues. This would include scale and scope of the IS project, time for development, the financial resources available and top management commitment. Third, the political environment of stakeholders is important because outside and inside negotiation, consultation, conflicts, and resistance are known to
impact the reorganization of work (change) to take advantage of the capabilities of IT (Dawson 2003; Markus 2004). Moreover, many studies have supported the premise that user participation is influenced by political activities (Barki & Hartwick; Franz & Robey 1984; Robey, et al. 1989; Robey, et al. 1993).

Since the IS field’s early days, the concept of system success has inspired hundreds of studies that address user participation and involvement (He & King 2008) in a variety of contexts, such as enterprise resource planning (ERP) system installation, e-commerce, outsourcing, and decision support system (DSS) development (Markus & Mao 2004). Many of these studies began a discourse on user participation and have influenced our understanding of user participation during ISD, but a limitation of prior research is that some IS studies may have unintentionally taken user participation out of context due to a lack of theoretical and practical understanding of a very complex process.

**Strategies of Change Agents: User Participation Approaches**

Markus (2004) differentiates change management and project management issues in ISD due to the unique type of risk involved and calls it “technochange” (for technology-driven organizational change). “Deliberate technochange is the use of IT to drive improvements in organizational performance. As technochange involves both IT and organizational changes, it differs both from IT projects and from organizational change programs.” (Markus 2004) One unique risk is that people will not use information technology and related work practices. IT project management, which focuses on project cost, project schedule, and solution functionality and organizational change management approaches are generally not effective on their own, because they are not integrated with the IT "solutions" developed by a technical team. Consequently, a better strategy is to align the IT "solution" with important organizational
characteristics, such as stakeholder culture or incentives. Moreover this dissertation suggests that an iterative, incremental approach that includes user participation can be an even better strategy in many situations. The UPA approach involves both new IT functionality and change agents that can steer related organizational changes in each phase, such as redesigning business processes as needed, new performance metrics, and stakeholder training.

Moreover, change agents are the “people who play important roles in designing and executing participation opportunities for stakeholders” (Markus & Mao 2004). They control who participates, and how each participant will participate, and what participation techniques and tools are used. In addition, a change agents is often the team leader or facilitator for the user participation process and may have the authority to resolve or remove participants if conflict occurs (Sabherwal & Robey 1993). Indeed, a change agent chooses the UPA approach as part of the strategy for technochange (Markus 2004).

A social network of relationships within which we are embedded when we participate in a project may have important consequences for its success or failure. The user participation approach in which we embed ourselves forms a social network of relationships that influences the negotiation of relationships among stakeholders, change agents, and participants during the user participation process. The user participation process is therefore particularly affected by the agreed on (or lack of agreement) management in an IS project.

Four types of social relations that illustrate the established control are represented in this dissertation: analyst-led, joint ownership, developer-initiated (Mao & Markus 2004), and user-led development (Newman & Robey 1992). These relationships are not the only ones that exist, but are meant to represent a category of similar social relationships based on the type of control that is agreed upon. The importance is two-fold: first, these relationships emerge out of the
project management approach that is chosen and second, these relationships are one of the major influences on the management of change that is used in the process. Therefore, where user participation is led by analysts, this social relationship is likely to have emerged from a traditional approach and the methods that are used will typically share a number of common features that drive interpretations and actions in ISD (Iivari, et al. 2001).

In recent research and practice, alternatives to this traditional approach have emerged. Joint ownership in system development is a relationship in which change agents and participants are equal partners (Mao & Markus 2004; Newman & Robey 1992). User-led development is described as employing development tools that are user-friendly and therefore empower users to meet their own needs (Newman & Robey 1992). Developer-initiated is an attempt to foster mutual learning with customers (Mao & Markus 2004). Lastly, equivocation is presented in the model because of a lack of user participation is an approach to user participation. This uncommitted, "wait and see" stance postpones or eliminates participatory processes, and thus implies a much less certain future for a project. But it is important to note that sometimes it is possible for projects to be developed without using participatory processes that are excellent solutions ("killer apps") that appear to be "self-implementing" (Markus, et al. 2002).

**User Involvement and User Attitude**

Numerous studies have suggested that user involvement in design and implementation is related positively to users' perceptions of system usefulness in numerous studies (Franz & Robey 1986). However, Franz and Robey (1986) did not find organizational factors to be related significantly to user involvement, as they had originally hypothesized. Rather, organizational factors either had a direct relationship with perceived usefulness or moderated the relationship
between involvement and usefulness (Robey & Farrow 1982). Recent research has suggested that user participation, user involvement, and user attitude exert different impacts on system outcomes.

Barki and Hartwick (1989) suggest that the term user involvement should be used when referring to “a subjective psychological state in which users are involved when they consider a system to be both important and personally relevant.” User attitudes is a separate term and is defined as affective or evaluative judgment (e.g., good or bad) towards an object or behavior (Barki & Hartwick 1989). Simply said, it is a psychological state that reflects the user’s feelings about IS. Both definitions were derived from the psychology, organization behavior, marketing, and IS literature. Barki and Hartwick (1989) also suggest that as a starting point, user involvement should be “context-free” when developing a measure.

Barki and Hartwick (1994) developed a questionnaire that had 11 sections, consisting of a seven-point unipolar scale pertaining to how both important and personally relevant (e.g., critical/noncritical) the participants consider the system. The authors adapted an uni-dimensional involvement construct (Zaichkowsky 1985) into a multi-dimensional construct (sub-scale) because they felt that considering only one dimension hampers the understanding of involvement constructs and its behavioral consequences. Each dimension of involvement describes specific behaviors and all dimensions should be taken into account in understanding user participation. The sub-scales contain 5 and 4 items that assess the dimensions of importance and personal relevance. Attitude has a sub-scale containing 4 items. A stronger relationship exists between user involvement and user attitude. Thus, a highly involved participant tends to have more extreme or polarized (very positive or very negative) feelings about the issue. This should be expected, since both constructs are defined as psychological states and user participation is a
behavioral construct. A limitation of Barki and Hartwick (1994) is that no cross-validation in different contexts was supplied, nor was any nomological validity suggested by developing a theoretical richness of user participation, involvement, and attitude constructs. This study proposes to enrich the theoretical constructs of user participation, involvement, and attitude by adding a qualitative perspective that can be contrasted with studies that used only objective methods.

**User Participation, Processes, and Activities**

First, Barki and Hartwick (1989) suggest that the term user participation should be used when referring to “the set of operations and activities in the systems development process in which a user participates.” Therefore, user participation is conceptualized as a behavioral construct (the degree of participative behaviors of users during the development process) that has three dimensions (responsibility, user-IS relationship, and hands-on activity). Moreover, development-related activities performed by participants during ISD include activities that may pertain to either the management of the ISD project or to the analysis, design, and implementation of the system itself (Barki & Hartwick 1994; Cavaye 1995).

A large stream of research followed on user participation. This stream of research continues to define user participation as “what specific behaviors are performed, how many of these behaviors are performed, and how often they are performed and can be measured by asking users to indicate the extent to which they have performed specific assignments, activities, and behaviors” (Barki & Hartwick 1994; Baroudi, et al. 1986; Doll & Torkzadeh 1990; Franz & Robey 1986; Robey, et al. 1989). Hartwick and Barki (2001) extended the original three dimensions (responsibility, user-IS relationship, hands-on activity) and found strong evidence that supported including the fourth dimension of communication.
The four dimensions of user participation are:

1. **Responsibility** - the performance of activities and assignments reflecting overall leadership or accountability for the project

2. **User-IS Relationship** - the performance of development activities reflecting users’ formal review, evaluation, and approval of work done by the IS staff

3. **Hands-On Activity** - the performance of specific physical design and implementation tasks

4. **Communication Activity** - activities involving formal or informal exchanges of facts, needs, opinions, visions, and concerns regarding the project among the users and between users and other project stakeholders

These constructs will be adapted and synthesized with the concept of participation put forth in Markus and Mao (2004). The concept of participation activities is put forth by Markus and Mao (2004) as theoretically elaborated into different *types*—principally:

- solution design participation (user-IS relationship, hands-on) activities
- solution implementation (or change management) participation (hands-on) activities
- project management participation (responsibility, user-IS relationship, communication) activities

These types will be used in this study to measure user participation because this approach offers several advantages. First, a more complete and accurate description of users’ participation can be attained by assessing a wide variety of assignments, activities, and behaviors in a specific content, context, and political environment. Second, as a variety of archival documents are
analyzed concerning these user participation activities and behaviors, the authors of the documents are reporting whether or not events should have or not have taken place, not subjective assessments of an abstract concept. Since archival documents are more likely to show whether or not a participant should or did perform specific activities and behaviors, perceptual and reporting biases can be reduced. Third, measuring using this approach does not rely on participants’ self-assessments of the relative importance of different participation dimensions or different participation activities. This approach helps overcome the weaknesses inherent in such self-assessments that have been documented in the social cognition literature, (e.g., (Hawkins & Hastie 1990; Nisbett & Ross))..

**User Participation, User Involvement, and User Attitude**

The first of the two studies that bear most directly on how the variable of user participation, *involvement, and attitude* is presented in this study is Barki and Hartwick (1994), which has been discussed in detail in the previous sections. That was a useful starting point for this study to understand how best to operationalize the precise nature of the relationship among user participation, involvement, and attitude during systems implementation.

The second of the two studies that bear most directly on how the variables of user participation, *involvement, and attitude* are presented in this study is Lin and Shao (2000). This study found that much of the empirical research has been unable to demonstrate the benefit of user involvement. This study examines the participation-success relationship in a broader context, where the effects of user participation and two other factors user attitudes and user involvement, on system success occur simultaneously. Other contingency variables that were considered are system impact, system complexity, and development methodology. The
theoretical model and the associated hypotheses were empirically tested by a survey of 32 organizations.

Of particular concern in the Lin and Shao (2000) study was the fact that they presented the contingencies as outside the scope of the user participation, user attitudes and user involvement relationship. In addition, they excluded contingency factors which have been studied in previous research, such as system complexity (e.g., (McFarlan 1989)), stage development, resource constraints (e.g., (Ein-Dor & Segev 1978)), communication, user attitudes, degree of user involvement, management styles, top management support, system impact, etc. and justified this action by stating that “It would be unwieldy and imprudent to incorporate all of these factors into one model.” Their study considers three other important contingency factors: system impact, system complexity, and development methodology. Within these limitations to the model, the empirical findings corroborate the positive link between user participation and user satisfaction and provide evidence on the interplay between user attitudes and user involvement and therefore give additional validity to this study’ inclusion of user participation, user attitudes and user involvement as having the potential to simultaneously affect system success.

System Solution

Markus and Mao (2004) define system development success “as a high quality process of system development (methodologies used, interactions and conflicts, progress against schedules and budgets) and/or a high quality outcome of system development, namely a project, a system, or an IT artifact.” They define system implementation success as a “high quality process of preparing the target user community for use of the system (often called “change management”)

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and/or a high quality change outcome, namely that the intended users (regardless of whether they participated in development) adopt the system, use it as expected” (Markus & Mao 2004).

In many “IS” projects today (e.g., joint ownership projects), it is difficult to differentiate the information system and technology from the other aspects of a business project, such as business process re-engineering, job and compensation redesign, changes in the physical layout of the workplace, or IT infrastructure development (Markus & Mao 2004). Effective change management includes having “complementary changes” occur with the IT investment to achieve the greatest business value (Brynjolfsson & Hitt 2000; Markus & Mao 2004; Zhu 2004).

A limitation of this conceptualization is that it excludes solution development and implementation failures. In addition, it does not allow for the inclusion of both concepts together. Therefore, this study will replace the concepts of system development success and system implementation success with the concepts of solution development success and solution implementation success. Furthermore, in this study solution success refers to the entire development and implementation package (e.g., IT plus complementary changes), which addresses a limitation in the Markus and Mao (2004) study.

Consequentially, this study explores the approach to user participation in a specific case where it leads to a high quality outcome of system development and/or implementation (e.g., project, a system, or an IT artifact). Solution success could be operationalized in this study in two ways:

- The product point of view is an objective view of the outcomes. These types of outcomes can be measured as activities involving budget and schedule performance (Jiang, et al. 2002; Markus & Mao 2004; Saarinen 1996) or as perceived system quality (Butler & Fitzgerald 2001; Hwang & Thorn 1999; Kim & Peterson 2003; Lin & Shao 2000; Markus
Complementary changes measured as changes in the physical layout of the workplace, or IT infrastructure development are additional examples.

- The process point of view is a subjective view of how the project progresses. It can be measured as developer and/or user participant satisfaction with the process, perceived conflicts and conflict resolution (Hatzakis, et al. 2005; Jiang, et al. 2002; Kujala 2003; Lin & Shao 2000; Lynch & Gregor 2004; Mahmood, et al. 2001; Markus & Mao 2004; Wixom & Todd 2005). Complementary changes measured as business process re-engineering are an additional example.

### 2.5 User Participation: A Goal-Directed Social Network

In considering user participation and social networks, we must distinguish between two types of processes. Goal-directedness and serendipity are two processes that produce quite different system solutions over time.

Kilduff and Tsai (2003) “tackle the difficult issue of network change over time, introducing the twin processes of serendipity and goal directedness to understand how different organizational trajectories unfold. Whereas one process (goal-directedness) is teleological, subordinating actors’ interests and interactions to explicit goals, the other process (serendipity) involves no pre-existing goals, feathering growth through dyadic matching, with more decentralized structures and more diverse actors.”

In this study, goal-directedness is defined as processes that involve relationships that are formed to achieve, plan, coordinate, or decide on individual or collective activities. Serendipity is defined as processes that involve relationships between people who accidently meet and like one another (Kilduff & Tsai 2003; Salancik 1995). Although this study acknowledges the
existence of the process of serendipity in the social network literature, user participation is by
definition the type of network trajectory that would be dominated by a goal-directed process.

User participation in an IS project is an example of a network change driven primarily by
goal-directedness. Moreover, according to Kilduff and Tsai (2003), one of the key identifying
features for goal-directedness is the emergence of an administrative entity that acts as a broker to
plan and coordinate activities of the network as a whole. This entity can be a member of the
network itself or a separate actor with a specialized coordinating role. This concept bears
directly on this study, because the role of a change agent (broker role) is to help build the
network (select the participants), coordinate and manage the user participation activities, support
network goals (deliver a solution success that participants share), and provide a centralized
location (physical or virtual) for performing key activities of the network. For example, a user
participation network might be organized to help develop and implement a solution success. All
the relationships within the user participation network would be structured to achieve the goal.

Kilduff and Tsai (2003) put forth a description for social networks that are dominated by goal-
directed processes. The list that follows shows how this concept relates to this study:

- The underlying assumptions are teleological and instrumental.
- Participants share a goal.
- A social network is formed to achieve this goal.
- Solution success is measured against the project goals and objectives.
- The typical social network is fast to form around the shared goals.
- New goals can evolve that prolong the need for participants in an IS project.
- The survival of a group of participants can be threatened by both solution success and failure.
- A centralized structure around change agents: measured as core-periphery.
• The structure of the social network minimizes structural holes, has tight coupling, and shows clear boundaries.

• Sub-network formation is common.

• If conflict arises over goals, solution failure is more probable.

• A homogeneous group of participants make solution success more probable.

• The implications to individual participants are that they will be chosen because they share goals, a more predictable career path, and will have more mobility across similar organization.

• Having an emphasis on network wide trust is important to solution success.

This study (as well as others; e.g., (Markus & Mao 2004)) suggests the need to investigate the rapidly changing IS development issues and contexts that we face today. We have suggested that this issue may be continuing to cause inconsistencies in the empirical IS literature. Change brings with it new tools that facilitate user participation in ways never seen before (Markus 2004). Therefore, this dissertation agrees that now is the time to revisit user participation in ISD (He & King 2008; Mao & Markus 2004; McLeod, et al. 2007) and address the need to have a broader and more comprehensive description of user participation in ISD that fits the world we live in today.

A social network perspective can be used to look at user participation in a new way. The user participation processes were shown to be sensitive to differences in the initial condition (i.e., schedule, roles involved, etc.). These differences become amplified in terms of how the network organizes its members and interacts with the context, content, and political environment (Kilduff & Tsai 2003). Indeed, a social network perspective is valuable in providing a richer understanding of a complex process.
Exemplars of Existing Social Network Analysis Studies

This section provides a brief explanation of social network analysis and an exemplar of some of the relevant major research streams in social network scholarship. The study of social networks encompass theories, models, and applications that are expressed in terms of relational concepts or processes and is based on an assumption that relationships among interacting units are important (Wasserman & Faust 1994). Social network analysis is a method of analysis that has a set of distinct theoretical social network perspectives and is characterized by quantitative techniques for collecting data, statistical analysis, and visual representation. In the 1970s, mathematical tools and methods that belong to graph theory and computers caused the study of social networks to take off as an interdisciplinary specialty. Today, it is used in a variety of studies, which include management, information systems, marketing, and health care fields as well as social psychology, sociology, and anthropology.

Some of the characteristics of social network analysis studies are:

- a focus on relationships between actors rather than attributes of actors; the analysis depends on the availability of relational rather than attribute data
- a sense of interdependence: a group structure rather than individual view
- a social structure that affects system solution outcomes
- emergent effects

It is helpful to keep in mind that social network variables can and do serve as both dependent and independent variables. Also, it is important to note that different research streams differ in terms of which characteristic is dominant in the principal concept (e.g., in social capital research
the focus is on social network variables as explanatory, while in embeddedness research, the focus is typically on network ties as the system solution outcome).

The exemplars of prior SNA studies are organized by the dominant concept in that research stream: social capital, embeddedness, knowledge management, social cognition, and a miscellaneous research stream that this dissertation will label “relational processes” (see table 2.1). It is important to note that while the objective of this section is to find exemplars of current research (mostly the last ten years), this dissertation does include some older references in order to anchor a stream of work in a research tradition. A detailed review of the network paradigm in organizational research literature is available by Borgatti and Foster (2003).

The most popular stream of research is social capital. The notion of capital suggests that people can create and accumulate value for themselves and others. Resources that are productive are not just entities (e.g., things and people), but are also social relations among people (Coleman 1988; Putnam 1993). In information systems, social capital encompass a variety of research relating a person’s ties (or network position) to significant outcomes such as power, leadership, mobility, influence, and group performance (Burkhardt & Brass 1990; Chen 2007; Cohen & Prusak 2001; Huysman & Wulf 2004; Johnson 2007; Kianto & Kosonen 2007; Wasko & Faraj 2005; Widen-Wulff, et al. 2008; Ye & Agarwal 2003a, 2003b). The outcomes are an emergent side effect of previous activities and an enabler of future activities.

Social capital generally is characterized as ties to resource-filled others, but Burt (1992) redirected attention to the topology of a social network. He described structural holes as a lack of ties among an actor’s alters and argues that the spanning of structural holes provides the actual mechanism that can make weak ties have positive outcomes (Burt 1992a; Granovetter 1973). Burt’s topological view contrasts with the point of view (Coleman 1990) that suggests that a
dense social network allows everyone to coordinate with each other to create emergent outcomes. This argument is consistent with those who define a group’s social capital as interconnections among all group members (Putnam 2000).

Table 2.1 Social Network Streams of Research

<table>
<thead>
<tr>
<th>Social Network Streams of Research</th>
<th>SNA Concept and Exemplar</th>
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<tr>
<td><strong>Social Capital</strong></td>
<td>The value of connections. Exemplar: (Burt 2004b) The mechanism by which brokerage provides social capital is outlined.</td>
</tr>
<tr>
<td><strong>Embeddedness</strong></td>
<td>All relationships are necessarily embedded in a larger social context. Exemplar: (Yang &amp; Tang 2004) Sociogram analysis was conducted on teams exhibiting the highest and lowest performance to determine their differences. The study concluded that group characteristics, e.g., cohesion and conflict, fluctuated in different phases, but in later stages, much less cohesion occurred and the advice network seemed to be very important.</td>
</tr>
<tr>
<td><strong>Knowledge Management</strong></td>
<td>Fundamentally all social processes are derived from knowledge creation and utilization. Exemplar: (Chan &amp; Liebowitz 2006) A case study illustrates how to develop knowledge maps using social network analysis for a leading organization.</td>
</tr>
<tr>
<td><strong>Social Cognition</strong></td>
<td>The perception of networks. Exemplar: (Wasko &amp; Faraj 2005) Network centrality is argued to be an important indicator of why individuals choose to contribute knowledge. Centrality measures may also potentially be used to show that individuals have in fact contributed, how often they have contributed, and to whom.</td>
</tr>
<tr>
<td><strong>Relational Processes</strong></td>
<td>Concerned with how physical proximity, similarity of beliefs and attitudes, amount of interaction, and affective ties are interrelated. Exemplar: (Leenders, et al. 2003) Team creativity requires a moderate frequency of communication and a low level of communication centralization. Building on these results, the management of member proximity, communication modality, and team task structure is modeled.</td>
</tr>
</tbody>
</table>
Next, this dissertation examines embeddedness, which is basically the idea that all economic behavior is embedded in a larger social context. Specifically, Granovetter (1985) argued that economic exchanges are embedded in social networks. This explanation of economic action was a marriage of the over-socialized (role-based) and under-socialized (purely instrumental rational actor) approaches to explaining economic action. Following the same idea, knowledge management (defined as creation and utilization of knowledge) is fundamentally a human and above all social process. New practices and concepts (knowledge) emerge from the interaction of individuals. Because knowledge is social process that is distributed to other minds, individuals need to know who knows what (Rulke & Galaskiewicz 2000).

Next, the term “social cognition” is a research stream into the perception of networks. An example of this stream of research takes as premise that cognition of the network determines interaction, and interaction in turn changes the network (Carley & Krackhardt 1996). Lastly, “relational processes” is a well-established area of research, concerned with how physical proximity, similarity of beliefs and attitudes, amount of interaction, and affective ties are interrelated (Carley 1991; Friedkin & Johnsen 1990, 1999).

**Limitations of Social Network Analysis Research**

In a review and analysis of the emerging social network paradigm in organizational research, Borgatti and Foster (2003) discuss the most important limitations of social network analysis research. First, they suggest that social network analysis is criticized for having too little theory of its own. This argument evolved because social network studies are investigations into social phenomena, so they also tend to have a lot of behavioral content. This argument is invalid because social network theories only explain social network phenomena that have a lot of
network content. Social Network Analysis is a mixture of methods and theoretical perspective as discussed in the prior section.

Second, another criticism of social network analysis has been the challenges of testing hypotheses statistically (Borgatti & Foster 2003). Social network data violates the assumption of independence (random sampling), because the data is naturally autocorrelated. Statistical tests (permutation) performed using software packages have addressed this shortcoming. It is now less of a problem.

Lastly, another problem is the lack of sufficient computing resources to handle large datasets (Borgatti & Foster 2003). This is a problem when bounding a large social network, because if the social network dataset gets too large we cannot process the data. For example, if we are looking at participants among external stakeholders, we can artificially bind the network at some arbitrary boundary, such as stakeholders who participate between certain dates. This can distort the data if not carefully considered in the research design.

2.6 SUMMARY

Our goal in this chapter was to highlight topics relevant to this dissertation in order to provide a context for the study and show that user participation is important and timely. The literature review clarifies the relationship between this study and previous work conducted on user participation and highlights how this dissertation is different and distinctive from previous research. It does offer the reader an exhaustive literature review that articulates a clear picture of the areas from which we borrow principles and ideas that we synthesize to create the model for our research.
The literature review presented in this chapter builds support for our argument that the existing body of IS literature remains fragmented and continues to present inconsistent results. Next, we address the need to have a broader and more comprehensive description of user participation in ISD that fits the world we live in today. Lastly, we argue that there is a need to supply valuable insight into a specific contemporary IS project context and the emergence of
social structures from the user participation approach (UPA) chosen. The UPA model that emerges from the IS literature is the visual (figure 3.3) and conceptual representation of our argument. In addition it supplies the transition between the review of literature and the methods presented in the next chapter.
CHAPTER 3 – THEORY AND CONCEPTS RELEVANT TO THE UPA

3.1 INTRODUCTION

To continue with the theme of this dissertation, this chapter attempts to form a coherent research design between the organizing UPA process model that forms the foundation of this study and the existing updated theory of IS participation. Yin (1994) argues that a research design is composed of five key components: (1) the research questions, (2) the propositions, (3) the unit of analysis, (4) the logic used to link the data to the propositions, and (5) the criteria used to interpret the results of the case. It is “the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions” (Yin 1994).

In this chapter:

(1) We further develop these broad research questions

Q1. What is the approach to user participation in a successful IS solution?
Q2. How does user participation contribute to a successful IS solution?
Q3. What is the formal social network in a successful IS solution?

(2) “Predictions about the world are made using propositions, that is, conclusions that may be deduced logically from the theory. Propositions link the values of units” (Shanks 2002).

The following general propositions are presented (see table 3.2 for details)

**A successful user participation approach (UPA) suggests the need for:**

P1. different strategies when applied to different contents (operational issues)
P2. different strategies when used in different contexts (project environment)
P3. different strategies when used in different political environments

P4. to be led by a change agents that use different user participation approaches

P5. to have activities designed and executed by change agents

P6. different types of participation activities between participants, change agents, and stakeholders (behavioral construct)

P7. different strategies designed to consider that when participants that get more involved, it may improve the user’s attitude (psychological construct), which may influence the system solution

P8. decreased stakeholder resistance to change

A successful user participation approach (UPA) suggests a system solution that:

P9. improves quality

P10. increases user acceptance

P11. increases user satisfaction

P12. improves budget and schedule performance

P13. increases feelings of ownership

P14. has the presence of change agents in the formal social network of participants

(3) The unit of analysis is a web-based e-procurement solution, which is used by state agencies, colleges, universities and many local governments to announce bid opportunities, invite bidders, receive quotes, and place orders for goods and services;

(4) The logic used to link the data and conclusions to the propositions is based on behavioral and social science research, specifically the case study research strategy and a social network perspective;
(5) The criteria used to interpret the results of the case are based on case study and social network analysis methodologies. Both methods of interpretation will allow the data to be determined either consistent or not consistent with the UPA propositions. This logic is discussed in detail in the following sections of this chapter. The research map (table 3.1) outlines this study’s general research design.

**Table 3.1 Research Design Map**

| The research questions | (1) What is the approach to user participation in a successful IS solution?  
|                       | (2) How does user participation contribute to a successful IS solution?  
|                       | (3) What is the formal social network in a successful IS solution?  |
| The propositions       | User Participation Approach (UPA) General Propositions (See Table 3.2) |
| The unit of analysis   | A web based state e-procurement solution, used by state agencies, colleges, universities and many local governments to announce bid opportunities, invite bidders, receive quotes, and place orders for goods and services. |
| The logic used to link the data to the propositions | Based on behavioral and social science research, specifically a case study research strategy and a social network perspective. |
| Criteria used to interpret the results of the case | Case study and social network analysis methodologies |

This dissertation design builds in the triangulation approach “which gives a more detailed and balanced picture of the situation” (Altrichter, et al. 1993). The goal is to develop a “converging line of inquiry” by using several research methodologies to interpret the results and to use the process to achieve triangulation of evidence to make the results and conclusions “more convincing and accurate” (Yin 1994) in the study of the same phenomenon. This dissertation triangulates by using both a qualitative method (case study research strategy) for inquiry and quantitative method (social network analysis) for a different perspective. This adds credibility to the design and analysis and is a non-traditional approach to establishing reliability and validity of
the interpretation of the results. By combining theories, methods, and empirical materials (figure 3.1) this dissertation attempts to overcome the limitations or intrinsic biases and other problems that come from using a single theory and/or method. Figure 3.1 is an overview of the research design. The design begins with the research questions (Q1-Q3), which are generated from the academic literature (P1-P14). VQ1-VQ23 (presented in Table 4.3) are open-ended questions that are used by the researcher to guide the collection of evidence from the available data.

Figure 3.1 Overview of Research Design
3.2 APPLYING THE UPDATED THEORY OF USER PARTICIPATION

The new IS theory of participation (figure 3.2) postulated by Markus and Mao (2004) develops an argument that the theory must be robust enough to accommodate changing IS practice. This new IS theory of participation can address two kinds of gaps: (1) logical gaps and (2) gaps created by the current nature of IS practice, which has changed considerably since IS participation theory was first proposed.

![Figure 3.2 New IS Participation Theory](image)

Figure 3.2 New IS Participation Theory
Reproduced from (Markus & Mao 2004)

Propositions of the updated IS theory of participation (Markus & Mao 2004)

The new updated IS theory of participation separates solution success into solution development success and solution implementation success. It is based on the premise that solution development success does not mean that solution implementation success will occur. A simple example will clarify this premise. Zealous user participation (e.g., months of full-time participation on a system development team) could result in a misplaced loyalty to a solution of
poor quality (Markus & Mao 2004). Participants might judge their solution to be very successful, even though it fails later when implemented.

The following statements paraphrase the propositions put forth in Markus and Mao (2004). They provide relevant concepts and new insight into the IS theory of participation.

Solution development and implementation success is more likely to occur when:

- both socio-technical and functional quality exist.
- participants include representatives from most affected stakeholder groups (e.g., operational users, management personnel, and relevant external stakeholders).

Solution development and implementation success depend on the different abilities of different stakeholder groups. For example:

- Useful information about functional and other requirements can be given by managerial and operational employees and external stakeholders. This contributes to solution development success through their participation.
- The acceptance and use of the solution by others is more likely to be secured by managerial participants rather than operational participants (manager buy-in). This contributes to solution implementation success through their participation.

Solution development and implementation success depend on the quality of change agents’ efforts in designing and executing participation activities. For example, change agents of various types (e.g., IS professionals, HR specialists, managerial personnel, external consultants,
and vendors) can make greater contributions to solution development and implementation success when they:

- select participants effectively.
- focus, not just on developing solutions, but also on developing effective relationships with participants and other stakeholders.
- work effectively together to design participation opportunities, rather than if they work independently or competitively.

**Different types of participation activities** produce different outcomes. For example, a close relationship exists between:

- solution development participation and the outcome of solution quality.
- solution implementation participation and the outcome of solution acceptance and use.
  An increase solution acceptance and use occurs when the quality of the solution to be implemented is high. Solution implementation participation alone is unrelated to the outcome of solution quality. The relationship must include solution development participation.
- project management (solution development) participation and the outcome of project success.
- development, implementation, and project management participation and the outcomes of change agent-participant interactions (e.g., conflict or its resolution) or change agent credibility.
Participation richness is related to solution development and implementation success. For example, solution development and implementation success are more likely to result when all other things being equal:

- rich participation activities (e.g., being a full-time member of a project team or working iteratively with functional prototypes) are offered rather than thin participation activities (e.g., focus groups, one-time prototype demos, beta testing). For example, stakeholders doing hands-on work with functional prototypes during system development is more likely to promote a successful solution than “participation via responding to a requirements questionnaire” (Markus & Mao 2004).
- change agents provide thin participation opportunities for members of inaccessible stakeholder groups (e.g., external consumers or business partners) than when no participation opportunities are offered.
- change agents use approaches (e.g., anthropological methods, workplace observation) for certain stakeholder groups (internal or external) that provide them with a rich understanding of potential users’ needs without requiring an extensive commitment of the stakeholders’ time.

Change agents’ choice of participation methods is related to solution development and implementation success. For example, system quality and system implementation success are more likely when:

- developers choose analysis techniques that are less technical (e.g., business process modeling instead of data flow diagrams).
• developers choose analysis techniques that capture socio-technical requirements and functional requirements.
• developers use the cognitive elaboration approach.
• change agents use a “facilitation” approach rather than a “technical expert” approach to participation because neutral facilitation is more likely than technical expert leadership to elicit socio-technical requirements in addition to functional requirements.

**Change agents’ manipulation of the conditions of participation** is related to solution development and solution implementation success. For example, system development success is more likely when:

• full-time availability of employees is secured.
• participation activities are conducted in or near the intended users’ workplace.
• project schedule and budget resources for stakeholder participation are available.

The following are the key elements of the Markus and Mao (2004) propositions (see appendix B) involved in the updated IS theory of participation.

1) The traditional outcome concept of system success is separated into two concepts that have emergent reciprocal relations. These two concepts are called system or solution development success and system or solution implementation success.

2) Relevant actors are articulated. These actors are stakeholders, participants, and change agents.

3) The behavioral concept of participation activities is re-characterized in terms of type and richness, methods and conditions.
4) Emergent causal processes are hypothesized as neither necessary nor sufficient, but enabling and constraining.

In conclusion, more work should be done, we believe, to develop the user participation process. We see a plethora of research opportunities offered by this updated theoretical framework and its propositions, but we also see a need to adapt the framework in various ways, such as by incorporating the traditional user participation approach and alternatives approaches that include specific strategies, and by developing propositions specific to particular IS contexts. To do this, we argue that a UPA is a necessary activity, therefore item 4 of the IS theory of participation foundation (e.g., emergent causal processes are hypothesized as neither necessary nor sufficient, but enabling and constraining) needs to be adapted to recognize that even a lack of participation (equivocation) is an approach to user participation. The UPA is an adaptation to the IS theory of participation because it is a process model that posits necessary relationships (in a particular temporal order) between inputs and outputs; for example, a UPA is an initial input (approach) that change agents employ (implicitly or explicitly) when developing and implementing a system solution. In contrast, Markus and Mao (2004) argue that the relationships between user participation activities and outcomes are neither necessary nor sufficient, but merely influential; therefore it is not a rival theory to the UPA. The UPA process model is explicitly presented as a way to describe various participation strategies as a basis for providing guidance to change agents. It is a process theory of user participation approaches that emerges from the discussion of the UPA elements presented in the literature review.

Adapted from Cavaye (1995) and Markus and Mao (2004), user participation approaches are synthesized into a model that is predominantly descriptive, characterized by answering the first of four fundamental questions a researcher asks about a phenomenon, “what is it?” The
UPA model (figure 3.3) is an aid to presenting some of the important information about user participation approaches coherently. The model organizes a plethora of existing user participation research (table 3.2) into a descriptive model of user participation approaches. The proposed model is important because it presents the concepts in the user participation literature that we will map to our case study. Moreover, it places the user participation literature into a descriptive context for this study and for future research studies.

**Figure 3.3 User Participation Approach (UPA) Model**

The UPA model proposes that a system solution (dependent variable) can be causally linked to the approach to user participation (independent variable) and the user participation process (independent variable). However, the relationship between these two sets of variables is
not direct, but mediated by the context, content, politics, user attitude, and user involvement (variables).

The UPA model is the strategy employed in this dissertation for organizing the background material that needs to be acknowledged. As a general rule, all existing literature that incorporates all the major elements or constructs that are present in this dissertation is introduced because it is background that is particularly relevant. The model is designed to support the legitimacy of our assertions by providing sufficient logical and empirical support that descriptive information alone will be revelatory. In addition, the analysis of the literature provides hints about the variables involved when users participate in a successful system solution. The UPA model attempts to capture the concept that a set of interrelated conditions in which something exists or occurs is important.

**Identification of the User Participation Approach Propositions**

The Markus and Mao (2004) paper leads to the following conclusion and propositions. The UPA model’s relationships (similar to the updated user participation theory) are emergent in the sense that are they are “products of constant social negotiation and consensus building” (Truex, et al. 1999). We suggest that, by negotiating to manage change with a UPA (goal-directed consensus building approach), it is possible to promote solution development success and/or solution implementation success. This decision to have a particular approach to users participating makes user participation necessary from that point forward and as a result contributes to success. First, user participation contributes to success, because the “constant social negotiation and consensus building” (Truex, et al. 1999) keeps a project focused on the social-technical (2.6) aspects of the solution that can help get the hoped-for results. Second, the decision to have a UPA makes user participation a necessary condition for success. Participation
is a consideration that is included in the project design and although it is possible for developers to design and implement a solution that appears to be “self-implementing” (Markus, et al. 2002) without using participatory processes, not having users participate is still a participation choice.

Once the general propositions (table 3.2) of a theory are identified, qualitative and quantitative methods can be used to apply the propositions to a set of conditions in a specific case (state procurement agency) study. This will create empirically testable assumptions from the theory. The general UPA assumptions are formulated from the literature to guide the research process. As the research design is developed in detail, more specific assumptions are created and the evidence to be collected is identified. See the Research Design chapter for more details. The following table 3.2 contains the assumptions we have formulated thus far in this study.

<table>
<thead>
<tr>
<th>Table 3.2 User Participation Approach (UPA) General Propositions Suggested in the IS Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A successful user participation approach (UPA) suggests the need for…….</strong></td>
</tr>
<tr>
<td>P1 different strategies when applied to different contents (operational issues)</td>
</tr>
<tr>
<td>P2 different strategies when used in different contexts (project environment)</td>
</tr>
<tr>
<td>P4 change agents that use different user participation approaches</td>
</tr>
<tr>
<td>P6 different strategies designed to consider that when participants that get more involved, it may improve the user’s attitude (psychological construct), which may influence the system solution</td>
</tr>
</tbody>
</table>
A successful user participation approach (UPA) suggests …..

<table>
<thead>
<tr>
<th></th>
<th>a system solution</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>P9</td>
<td>that improves quality</td>
<td>(Butler &amp; Fitzgerald 2001; Hwang &amp; Thorn 1999; Kim &amp; Peterson 2003; Lin &amp; Shao 2000; McKeen, et al. 1994)</td>
</tr>
<tr>
<td>P11</td>
<td>that increases user satisfaction</td>
<td>(Kujala 2003; Lin &amp; Shao 2000; Lynch &amp; Gregor 2004; Mahmood, et al. 2001; Markus &amp; Mao 2004; Wixom &amp; Todd 2005)</td>
</tr>
<tr>
<td>P12</td>
<td>that improves budget and schedule performance</td>
<td>(Jiang, et al. 2002; Kujala 2003; Markus &amp; Mao 2004; Saarinen 1996)</td>
</tr>
<tr>
<td>P13</td>
<td>that increases feelings of ownership</td>
<td>(Barki &amp; Hartwick 1994; Markus &amp; Mao 2004)</td>
</tr>
<tr>
<td>P14</td>
<td>the presence of change agents (administrative roles) in the formal social network of participants</td>
<td>(Breiger, et al. 2003; Carroll 2002; Kilduff &amp; Tsai 2003; Knoke &amp; Yang 2008; Mumford 2006; Scott 1991; Wasserman &amp; Faust 1994)</td>
</tr>
</tbody>
</table>

In order to empirically investigate a successful system solution organized by the UPA process model (figure 3.3) using the key elements, we need to operationalize selected propositions set forth in this by formulating the main question such that it can be answered in a way that either confirms or refutes these assumptions. In this study, we will answer (in chapter 5) the questions outlined in Chapter 1 (and reiterated in this chapter). In addition, we discuss (in chapter 6) why these conclusions (i.e., answers to the questions) were reached.

This study will critically analyze traditional IS participation theory (based on causal structure of contingency theory) and the updated theory of user participation (similar structure as complex adaptive systems theory). Our initial analysis shows that both have valid explanations for the effect of user participation on solution success and they both have important conceptual implications, particularly when viewed in light of the constant change that occurs in our socio-technical networks (e.g., new business environments, technology, tools, development approaches, and so forth). The overriding issue that our analysis discerned is that the theory postulated by Markus and Mao (2004) does not consider that an initial approach to user participation is always implicitly or explicitly selected. To address this gap, we investigate a
successful system solution organized by the UPA process model (figure 3.3) using the key elements, which includes a redefined concept of system success and an elaborated conceptualization of the social network of participants and participation activities in a specific IS context, content, and political environment.

3.3 CLASSIFICATION OF USER PARTICIPATION APPROACHES

The purpose of this section is to conceptualize user participation approaches by capturing and visualizing the variation that exists between IS development approaches. This is important because of the proposition that an initial approach to user participation is a process that is selected. The UPA model captures the main differences, so that the context of participation can “yield important observations about the quality and nature of participation” and about “how to” achieve successful participation (Mao & Markus 2004). These careful descriptions yield important information about the control, context, objectives, modeling tools, and procedural guidance on how to foster user participation. In order to identify, describe, classify, and operationalize the UPA propositions set forth in this chapter, we suggest that an adapted and expanded view of the differences set forth in Mao and Markus (2004) between traditional IS development and alternative approaches is needed.

Classification is a process that is taken for granted. It is arguably the most utilized method employed in the research community. It is the foundation not only for conceptualization, reasoning, and language, but mathematics, and data analysis as well. Yet, as much as we use it, how to classify correctly is a poorly understood process. A simple definition of classification is the ordering of similar entities into groups or classes, while minimizing within-group variance
and maximizing between-group variance. In other words, the general goal of classification is to create groups that are as homogenous as possible and as distinct as possible.

Why is the method of classification important to this dissertation? It is important because the key to successful classification is the ability to ascertain the main elements on which the classification is to be based. This also applies to past user participation research. As a case in point, most people would consider user participation as a critical factor in successfully developing an information system (IS), but empirical studies have found mixed results and cannot conclusively prove a link between user participation and system success (Cavaye 1995; Hwang & Thorn 1999; Olson & Ives 1981). This suggests that the possibility in past attempts to organize and synthesize empirical studies on user participation resulted in conflicting results because they did not identify and/or agree on the key elements or concepts. Unfortunately, no formula for identifying key elements exists, so this is a common problem. This dissertation will address this basic problem by using prior knowledge and theoretical guidance to identify the key elements in a typology at the conceptual level of analysis (referred to in this dissertation as a categorical analysis). A typology is the end result of our analysis because it is multidimensional and conceptual in nature. Typologies are normally characterized by labels in their cells and will be measured by their deviation from a criteria type (defined by the researcher) or polar type (two extremes). In addition, this is a qualitative method of classification, because it can be performed without quantification or statistical analysis.

First, we classify and map the list of user participation items into different process model elements. In a similar manner we characterize the methodologies retrieved from the literature. Finally, the elements are put into the typology so that differences can be easily seen. In this study, this analysis technique helps clarify the story that the UPA tells us. In addition, we
suggest that an adapted and expanded view of the differences set forth in Mao and Markus (2004) between traditional IS development and alternative development approaches produces four generalized user participation approaches (see Table 3.3) during IS development and implementation. The UPAs are archetypes that represent highly simplified but paramount conceptions.

Elements of traditional IS development and alternative development approaches as related to the UPA Model:

- **Control over system design and design process** indicates the overarching role taken by the change agent explicitly defined in the approach.

- **Context in which approach originated** mainly indicates the project environment, i.e., external (competitor strategies, government legislation, technological innovation, etc.) and internal (human resources, history and culture of an organization, etc.) contextual factors that shape change (Dawson 2003).

- **Coordinating role in goal-directed social network** is an important element because according to Kilduff and Tsai (2003), one of the key identifying features for goal-directedness is the emergence of an administrative entity that acts as a broker to plan and coordinate activities of the network as a whole. This entity can be a member of the network itself or a separate actor with a specialized coordinating role. This concept bears directly on this study, because the role of a change agent (broker role) is to help build the network (select the participants), coordinate and manage the user participation activities, support network goals (deliver a solution success that participants share), and provide a centralized location (physical or virtual) for performing key activities of the network.
- Objectives of user participation define the different fundamental reasons that user participation occurs during system development and implementation.

- Requirement elicitation process is the process of discovering the requirements for a system by communication with change agents and participants who have a stake in the system development and implementation (Sommerville & Sawyer 1997).

- Where requirement elicitation occurs is the physical or virtual location where change agents and participants conduct the process of requirement elicitation.

- Use of modeling tools describes what tools are used to construct, visualize, and document a system solution. The goal is for change agents and participants to use tools that can create an understandable (by all stakeholders) formal model of the system solution.

- Communication style describes the various preferences for both communicating with others and interpreting the communications from others.

- Procedural guidance for change agents on how to foster user participation is the practical, procedural, and philosophical guidance presented in the literature for user participation during system design and implementation.

The UPA approaches are arranged in groups (categorized) according to the control over system design and the design process control identified in the UPA model (see Table 3.3). Equivocation is not included because it lacks having users participate in the solution development and/or solution implementation process. The analysis thereby provides us with a cognitive map that conceptualizes and operationalizes the differences in the user participation approaches. Note: Equivocation is not included because it lacks having users participate in the solution development and/or solution implementation process.
3.4 Benefits and Limitations of the UPA Typology

The following list of advantages and disadvantages is adapted from (Bailey 1994).

**UPA Typology Benefits:**

1. Description of the UPA. A good UPA typology is a tool. It provides a side-by-side format for a quick comparison and analysis of a particular UPA approach.

2. Reduction of complexity. A chief goal is to achieve parsimony in our understanding of user participation. It can simplify the complex UPA model sufficiently to allow us to understand it. Indeed, it condenses a huge amount of data into a small number of salient elements.

3. Identification of UPA similarities. The UPA typology allows us to recognize similarities and group them together for analysis.

4. Identification of UPA differences. The UPA typology allows us to recognize differences and group them together for analysis.

5. Presents a list of UPA approaches. A good UPA typology shows the variance in the set of elements, thus providing a comprehensive understanding of the possible relationships that can exist in the dimensions.

**UPA Typology Limitations:**

1. Classification is descriptive, not explanatory. The UPA classification is viewed as failing to meet the goal of explanation and predication.

2. The UPA typology is vulnerable to the possibility that the theoretical constructs that do not exist empirically will be treated as "real" empirical entities.

3. Unmanageability. Small classifications have limited value and large ones are too complex to be used efficiently.
<table>
<thead>
<tr>
<th>Control over system design &amp; design process:</th>
<th>I. Analyst-led</th>
<th>II. Joint Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinating Roles in goal-directed social network:</td>
<td>Analyst-led (change agent role); Participant role: anyone who uses the system and is affected by it including management; Participant is involved early in the process, but is largely passive</td>
<td>Change agent role and participant role are equal partners; Participant role: actual application users – no management</td>
</tr>
<tr>
<td>Context in which the approach originated:</td>
<td>Custom systems developed and used internally</td>
<td>Custom systems developed and used internally and sometimes externally</td>
</tr>
<tr>
<td>Objectives of User Participation:</td>
<td>Focuses on the system design and quality (requirement gathering) in a structured manner through meetings with participants (to obtain buy-in) and change agents.</td>
<td>Focuses on the work environment as a socio-technical fit that enhances the participants’ quality of work life.</td>
</tr>
<tr>
<td>Requirement elicitation process:</td>
<td>Traditional SDLC: collected early, usually through interviews, questionnaires, and iterative methods (i.e., prototyping and JAD)</td>
<td>An iterative collective process via prototyping and interactive experimentation</td>
</tr>
<tr>
<td>Where requirement elicitation occurs</td>
<td>Usually project team room; meetings are much like “focus group” settings</td>
<td>In or near participants’ workplace</td>
</tr>
<tr>
<td>Use of modeling tools</td>
<td>Apply formal data model descriptions using data modeling (IT) techniques such as data flow diagrams and modeling languages</td>
<td>Computers as tools and user-friendly discussion aids</td>
</tr>
<tr>
<td>Communication style</td>
<td>Communicate through documentation</td>
<td>Cooperative, hands-on (communicate by doing), Collective methods of communication</td>
</tr>
<tr>
<td>Project management guidance for change agents on how to foster user participation</td>
<td>Methodologies, such as JAD: Sample of procedural guidance: Conduct meetings run by skilled change agents Get executive sponsorship Get appropriate people to participate Set clear, well-defined goals Define deliverables in advance</td>
<td>Sample of procedural guidance: Select different types of participants Provide a more creative change agent Visualize current workplace work activities, skills, experience Visualize possible workplace problems What-if to Improve Work conditions Prototyping</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control over system design &amp; design process:</th>
<th>III. Developer-initiated</th>
<th>IV. User-led</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role in goal-directed social network:</td>
<td>Contextual Design Approach</td>
<td>End-User Development Approach</td>
</tr>
<tr>
<td>Context in which the approach originated:</td>
<td>Software solutions developed by vendors for external customers; optional adoption by customers, although once adopted it may become mandatory for stakeholders</td>
<td>Activities or techniques that allow people who are not professional developers to create or modify software artifacts.</td>
</tr>
<tr>
<td>Objectives of User Participation:</td>
<td>Enhanced usefulness and usability of system solution</td>
<td>Empowering end users to develop and adapt systems by themselves</td>
</tr>
<tr>
<td>Requirement elicitation process:</td>
<td>Collected in an iterative process via observation and interview/ prototyping and interactive experimentation</td>
<td>Flexibility to respond to new requirements; experimentation with system requirements</td>
</tr>
<tr>
<td>Where requirement elicitation occurs</td>
<td>Where the work takes place</td>
<td>Where the work takes place</td>
</tr>
<tr>
<td>Use of modeling tools:</td>
<td>Participants are solicited to describe and diagram their work</td>
<td>Participants describe and diagram their work with powerful, user-friendly software tools</td>
</tr>
<tr>
<td>Communication Style:</td>
<td>Communicate through documentation</td>
<td>Hands-on informal methods of communication</td>
</tr>
<tr>
<td>Procedural guidance for change agents on how to foster user participation</td>
<td>Literature provides principles; Sample of procedural guidance; Extensive ISO documentation</td>
<td>Literature provides principles; Sample of procedural guidance; Parameterization -&gt; the user guides a computer program by indicating how to handle data in a different way Annotations -&gt; users write comments next to data and results in order to remember what they did.</td>
</tr>
</tbody>
</table>
3.5 **Summary**

Chapter 3 presents an updated theory of user participation (Markus & Mao 2004) as a theoretical starting point. Based on the IS user participation and research model literature, an updated synthesized theoretical version of the descriptive model of Cavaye (1995), called the UPA model, is introduced as a way to organize this research.

Second, we establish this model in terms of existing theoretical work on the approach to user participation. We synthesize the user participation approach model (UPA), theory, and the survey of the literature into a four-fold typology of user participation approaches. This conceptualization is used as a means to better understand some of the dominant approaches to the user participation process. This chapter is focused on organizing the approaches to user participation. Though people are quite adept in participating in a system solution, they often lack the ability to see the approach to user participation in intelligible, useful, and business oriented ways. The UPA typology presents guidelines for the approach to user participation that are intelligible, useful, and business oriented.
CHAPTER 4 – RESEARCH DESIGN

A web-based purchasing system (an e-procurement solution called eVA) is studied to analyze the approaches to user participation in a successful IS solution. Virginia government, state agencies, colleges, universities and many local governments use eVA to announce bid opportunities, invite bidders, receive quotes, and place orders for goods and services.

In this study we focus on the following questions using a case study research approach:

- What is the approach to user participation in a successful IS solution?
- How does user participation contribute to a successful IS solution?

4.1 DESCRIPTION OF A SUCCESSFUL PROCUREMENT CASE

Markus and Mao (2004) define system development success “as a high quality process of system development (methodologies used, interactions and conflicts, progress against schedules and budgets) and/or a high quality outcome of system development, namely a project, a system, or an IT artifact” and they define system implementation success as a “high quality process of preparing the target user community for use of the system (often called change management) and/or a high quality change outcome, namely that the intended users (regardless of whether they participated in development) adopt the system, and use it as expected.

This dissertation will study participation in a contemporary IS procurement context. The concepts of system development success and system implementation success will be replaced with the concepts of solution development success and solution implementation success. Furthermore, in this dissertation solution success will continue to refer to the entire development
and implementation package (e.g., IT plus complementary changes), which addresses a limitation in the Markus and Mao (2004) study.

We identified five areas for measuring success, with the intention of identifying a successful procurement case study. The idea was to identify a list of critical success factors in a procurement case and the benchmarks for success, as defined by the project implementers. The anticipated goal was to develop a matrix of these success factors set against the various dissertation research objectives. Sarker and Lee (2003) note that the concept of success is complex; no universally defined criteria exist and criteria vary with the phase of solution development or implementation. Therefore this dissertation will use predictions and they will be made using propositions, that is, conclusions that may be deduced logically from the theory. Propositions link the critical success factors to the UPA.

Propositions in the UPA theoretical framework will therefore link specific critical success factors with specific critical benchmarks for success. The following subset of the general propositions presented (see table 3.2 for details) are directly related to the benchmarks for success.

A successful user participation approach (UPA) suggests a system solution that:

P9. improves quality
P10. increases user acceptance
P11. increases user satisfaction
P12. improves budget and schedule performance
P13. increases feelings of ownership

A deductive investigation of each proposition will be reported in Chapter 5 and Chapter 6 by interpreting evidence from relevant empirical data and forming a conclusion. In order to empirically investigate the successful system solution organized by the UPA process model...
(figure 3.3) using the key elements, we need to operationalize selected propositions set forth in this by formulating the main question such that it can be answered in a way that either confirms or rejects these assumptions.

Consequentially, this study explores the approach to user participation in a specific case where it leads to a successful outcome of system development and/or implementation (e.g., project, a system, or an IT artifact). Solution success is operationalized in this study:

- **Objectively-- the “product” point of view**
  
  - Activities measured as budget and schedule performance (Jiang, et al. 2002; Markus & Mao 2004; Saarinen 1996)
  
  
  - Changes in the physical layout of the workplace.

- **Subjectively- the “process” point of view**

  
  - Measured as re-engineered business processes.

**Selection of a Single Case**

This dissertation identifies a list of critical success factors needed in a procurement solution and some preliminary benchmarks that show success, as defined by the project implementers. The following matrix of success factors (table 4.1) are derived from the
propositions and set against the various benchmarks. The preliminary evidence supports the selection of eVA as the single unique case to be studied.

“eVA’s effectiveness has little to do with the technology and more to do with the methodology the Virginia brain trust employed. It is when technology (nee software) is seen as the primary vehicle to drive results that it becomes ineffectual and mostly irrelevant. The 75 to 85% e-procurement initiative failure rate gives testimony to this fact” (Hansen 2007b).

Table 4.1. Matrix of Success Factors, Benchmarks, and Evidence Found

<table>
<thead>
<tr>
<th>SUCCESS FACTORS</th>
<th>BENCHMARKS</th>
<th>EVIDENCE FOUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of improved quality</td>
<td>The Coalition For Government Procurement, (CGP)</td>
<td>eVA awarded the &quot;Excellence In Partnership Award – increased accuracy and saving data entry time</td>
</tr>
<tr>
<td>Evidence of increased user acceptance</td>
<td>Achievement of Excellence In Procurement Award&quot; (AEP) at the National Association of State Procurement Officials Conference</td>
<td>Excellence in innovation, professionalism, productivity, e-procurement and leadership attributes</td>
</tr>
<tr>
<td>Evidence of increased user satisfaction</td>
<td>Participant Interview</td>
<td>City of Lynchburg uses eVA -- You Tube Interview</td>
</tr>
<tr>
<td>Evidence of improved budget and/or schedule performance</td>
<td>PEW Center <a href="http://www.pewcenteronthestate.org">http://www.pewcenteronthestate.org</a></td>
<td>Virginia Ranked #1 in 50-State Report --Cites eVA For Cost Savings</td>
</tr>
<tr>
<td>Evidence of increased feelings of ownership</td>
<td>Recognized leading authority on the evolution of the globalized supply chain practice.</td>
<td>Hansen Consulting and Seminar’s Jon Hansen has been showcasing eVA’s success throughout a multi-city speaking tour during 2008.</td>
</tr>
</tbody>
</table>

The case studied is eVA, which is a web-based purchasing system (e-procurement solution) used by Virginia governmental entities. State agencies, colleges, universities and many local governments use eVA to announce bid opportunities, invite bidders, receive quotes, and place orders for goods and services (see Appendix A). This is a single context case study, which Yin (1994) describes as analogous to a single experiment. Therefore, a single case study can be
conducted for many of the same reasons as a single experiment. Yin (1994) presents two rationales to support this statement. One rationale is when it represents the critical case in testing a well-formulated theory. A second rationale is when the case represents an extreme or unique case.

The rationale for choosing a single context case (eVA) is that it represents an unique case by being the first total e-procurement solution to be deemed successful by using numerous benchmarks (see table 4.1). It is also a follow-up case that investigates an extension of the updated theory of user participation. The UPA theory (figure 3.3) has specified a clear set of propositions (table 3.2) that are believed to be true. eVA is a suitable single-context case that can be used to determine whether the propositions are correct or whether some alternate set of explanations might be more relevant. The eVA case study does include more than one unit of analysis. Within the eVA case study, attention is given to two of the subunits (e.g., development phase and implementation phase as defined by Markus and Mao (2004)). This design is called an embedded case study design because the unit of analysis is the development phase and implementation phase of a single case. In other words, by using the subunits, the propositions will be investigated twice in a single case.

4.2 USING A CASE STUDY RESEARCH STRATEGY

The purpose of this section is to introduce one of the scientific methods that form the basis of this study. A case study is "an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" and it "relies on multiple sources of evidence" (Yin, 1994, p. 13). Furthermore, “a case study research strategy investigates pre-defined entities, phenomena,
or relationships which are not publicly observable or which cannot be seen directly” (Lee 1989a).

It is important to note that this type of research does not involve explicit control or manipulation of variables; the focus is on the in-depth understanding of the “entities, phenomena, or relationships” and their context (Cavaye 1996; Lee 1989a). Case studies typically use data collection techniques such as interviews, observation, questionnaires, and document and text analysis and can be a mix of both qualitative data collection and analysis methods (analysis of words and meanings) and quantitative methods (analysis with numbers and measurement) (Yin, 1994, p. 14).

The research strategy for this dissertation includes a case study design within the positivist case research tradition. The positivist case research tradition falls within the natural science model of social science research (Lee 1989a, 1989b). In fact, a case study can be used to perform research within two predominant scientific philosophies: positivism and interpretivism (Cavaye 1996; Lee 1989a). The positivist research tradition involves three sets of logic that are fundamentally related: formal logic, logic of experimental and quasi-experimental design, and hypothetico-deductive logic.

First, formal logic can be used on qualitative concepts to manage non-mathematical propositions (Cavaye 1996; Lee 1989a). Next, the logic of experimental and quasi-experimental design attempts to control the study of a relationship (e.g., X causes Z) as much as possible by restricting the focus of attention to a few or often a single variable (Cook & Campbell 1979). Experimental designs include laboratory experiments, statistical experiments, and natural experiments. In natural experiments it is important to note that the study occurs in a setting in which the variables cannot be manipulated; therefore the scientist must identify naturally
occurring controls (Lee 1989a). Lastly, the most notable logic for this study is the set of rules for hypothetico-deductive logic.

In the natural science model, the rules for hypothetico-deductive logic are used to test theories in a deductive sequence (Lee 1989a). Hypothetico-deductive logic is used to indirectly test the propositions by managing and manipulating the theoretical propositions. These propositions are “entities, phenomena, or relationships which are not publicly observable or which cannot be seen directly” (Lee 1989a) and therefore are referred to as theoretical. Examples of this concept can be seen in research fields such as biology, chemistry, and physics (e.g., the force of gravity and the existence of atoms in physics).

The rules of hypothetico-deductive logic can be used to verify the propositions, which contain the unseen entities, phenomena, or relationships that are theorized. Using the rules of hypothetico-deductive logic, the researcher applies the propositions of the study to the initial conditions of the case study in order to deduce the conclusions and verify if the theory is valid. In this case design, specific predictions are compared against actual observations and if the predictions agree with the observations, then the theory is confirmed or corroborated (not proven) in that case. On the other hand, if the actual observation is not consistent with the theory’s propositions, the theory is refuted in this instance. At that time a researcher should refine or discard the theory (Lee 1989b).
Using a Case Study to Test a User Participation Theory

This dissertation must meet four methodological requirements when testing a theory using the natural science model.

The theory must:

1. Be falsifiable. In effect, the theory must be formulated and stated in a way that it is open to being refuted by observation.
2. Be logically consistent. In effect, when deducing different predictions from the theory, they cannot be contradictory.
3. Display superior relative predictive power. In effect, it must be more explanatory than any rival theory.
4. Survive any attempts (thus far) to falsify it.

Lee (1989a, 1989b) argues successfully that qualitative case studies can be used to test theories in a controlled or logical deductive sequence that meet the natural science model of scientific research standards.

To test a theory in this manner, this dissertation must address four methodological concerns:

1. Making controlled or logical deductions
2. Making controlled observations
3. Allowing for replicability,
4. Generalizability

When conducting a qualitative study, a researcher can use the rules of formal logic to manage verbal propositions by making controlled or logical deductions. An excellent example of how to
address these methodological issues is used by Lee (1989a). He uses one of the most cited empirical examples of case study research in Information Systems (Markus 1983) as the exemplar. As Lee (1989a) noted, Markus (1983) uses three different theories of IS implementation to deduce “verbal propositions from the verbally expressed theories that are applied to the facts of the case she studied.”

This study applies hypothetico-deductive logic to a case study by:

1. Applying the propositions of the alternative theories to the conditions of the case.
2. Creating predictions of expected findings if each theory was correct.
3. Testing the predictions against the data of the case.
4. Eliminating the theories that did not predict correctly.

The researcher must apply controlled observations to test theories by taking advantage of naturally occurring “controls.” In fact, observing the relationships theorized between factors, while other potentially confounding factors are controlled, is the process of making controlled observations (Lee 1989a).

In a similar manner, this study applies controlled observations to a case study by:

- Identifying a factor (theory postulate) to analyze that is constant
- Observing the relationships (variations) theorized between factors
- Controlling potentially confounding factors

Replicability and generalizability are issues that hinge on the fact that a case study usually involves studying conditions that will never occur again. First, we need to acknowledge that anything that prevents another researcher from duplicating the same study becomes an issue that
needs to be addressed. The issue of replication is addressed by replicating the findings in another set of conditions (i.e., a different case)(Lee 1989a, 1989b). Simply said, the new researcher could apply the theory’s propositions to another case study. This would create a new, unique set of predictions of what one would expect to observe if the theory is valid in the new case.

The issue of generalizability is addressed by testing and confirming a theory in a range of conditions, not in one set of circumstances. Generalizability “is a quality describing a theory that has been tested and confirmed in a variety of situations” (Lee 1989a). The concepts of replication and generalizability (Yin (1994) calls this replication logic) are closely related in case study research because replicating a study (testing) in a different set of conditions extends the range of conditions; thus generalizability is extended.

Table 4.2 is used to demonstrate how to recognize the quality of social science research in a case study design (Sarker & Lee 2003), and specifically how it is applied to the unique aspects of this study. The guidelines are drawn from Yin’s (1994) classic book (Case study research: design and methods) and include the important methodological concerns put forth by Lee (1989a, 1989b). The four common tests of quality of a research design are construct validity, internal validity, external validity, and reliability (Yin 1994).
Table 4.2 Quality Social Science Research Design Guidelines

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Guidelines from the literature (Lee 1989a, 1989b; Yin 1994)</th>
<th>Whether/how the guidelines are followed in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct Validity</td>
<td>Use multiple sources of evidence</td>
<td>188 project management documents in a variety of formats, transcripts of interviews with change agents, and 83 presentations. Deduce specific predictions from the literature and test these predictions by comparing them to the actual state of a specific case. A change agent, participant, and stakeholder review a draft of the case study.</td>
</tr>
<tr>
<td>Construct Validity</td>
<td>Maintain a chain of evidence</td>
<td></td>
</tr>
<tr>
<td>Construct Validity</td>
<td>Having key informants review the case study report</td>
<td></td>
</tr>
<tr>
<td>Internal Validity</td>
<td>Pattern matching</td>
<td>Empirical patterns were matched with predictions deduced from falsifiable propositions. “Natural controls” were used wherever feasible.</td>
</tr>
<tr>
<td>External Validity</td>
<td>Increasing degrees of freedom</td>
<td>Multiple observations for each prediction Multiple (two) embedded cases Competing theory investigated but not tested Same propositions investigated (tested) in the development and implementation phases; each phase can be seen as a separate study where we investigated (tested) different instances of the same proposition</td>
</tr>
<tr>
<td>External Validity</td>
<td>Applying replication logic</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>Creating/maintaining a case study database</td>
<td>Case study notes (annotated documents) Case study documents (newsletters, brochures, agendas, proposals, documented interviews, reports) Tabular materials (archival data) Case question-and-answer format literature review; case introduction; table shells, etc.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Developing a case study protocol</td>
<td></td>
</tr>
</tbody>
</table>

Construct validity’s goal: Establish operational measures that capture the data in a manner that reflects the theoretical concepts in the study. To address methodological concerns, theoretical propositions are applied to a set of conditions, so that specific predictions can be operationally tested (Lee 1989a).

Internal validity’s goal: Establish and demonstrate a causal relationship among variables of interest to demonstrate that potentially confounding factors are controlled. Indirect
observations are of particular concern when inferences are being made and are addressed with pattern matching and case surveys (Yin 1994). The methodological concerns are addressed by Lee (1989a) with his discussion on controlled observations. Case studies have naturally occurring controls that can be observed under certain identifiable conditions. For example, an entity (e.g., an event or person) varies on some dimension that can be attributed to the change in the dependent variable.

External validity’s goal: “Establish the domain to which a study’s findings can be generalized” (Yin 1994) (considered by most synonymous with generalizibility (Lee & Baskerville 2003)). This is an analytical generalization based on the fact that this study is striving to generalize a set of results (from investigating (testing) the propositions) to the broader theory of user participation.

Reliability’s goal: Establish procedures that can be followed in the exact same manner, in the exact same case, and get the same exact results. In this study, Yin (1994) will be used as the guideline to establish reliability, but is adapted from a real-time case study focus to this study’s focus on archival evidence. This adaption will be discussed in the next section of this chapter.

**Procedures for Data Collection and Analysis**

The purpose of this section is to outline the procedures that will be used to collect the evidence needed to investigate (test) user participation in the eVA case, using the standards of quality for case study research described in this chapter. A case study protocol (Yin 1994) is considered an important first step in increasing the reliability (see the previous section for details) of the study. It includes the instruments, procedures and general rules. This study adapts some key ideas presented in Yin (1994) on doing field research. One of these ideas is “table shells” (Yin 1994).
Table shells used for specific arrays of data are especially helpful in reminding the researcher of what data needs to be collected and why. It is set up to answer the questions that are posed to the researcher, not a respondent. The purpose of the questions is to keep the researcher on task as the data collection and analysis proceeds. In addition, a list of probable sources for each question posed to the researcher should be included in the table shell. The following table shell has been designed to guide the collection of the data. This table shell will be used twice to guide my data collection and analysis, once in the development phase and once in the implementation phase.

The table shell (table 4.3) is filled as the researcher reviews the sources of evidence. The completed shell becomes part of the case study database (a strategy used to enhance reliability). The potential data and its relationship to the quality of the case research design presented in Table 4.4. Some potential sources that can contribute to the analysis are presented in Table 3.2. The sources of evidence for this case study can be categorized as follows: documents, archival records, transcripts of interviews, participant-observation, and physical artifacts.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Brief eVA Examples</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <em>User Participation Approach</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What role has control over the system design &amp; implementation process?</td>
<td>Roles of change agents, participants, stakeholders</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td>What roles are in the goal-directed social network?</td>
<td>Roles of change agents, participants, stakeholders</td>
<td></td>
</tr>
<tr>
<td>In what context does the approach originate?</td>
<td>eVa State total e-procurement solution</td>
<td></td>
</tr>
<tr>
<td>What are the objectives of user participation in the project?</td>
<td>eVA will streamline and automate government purchasing</td>
<td></td>
</tr>
<tr>
<td>What is the requirement elicitation process?</td>
<td>Go Live in 30 Days process plan.</td>
<td></td>
</tr>
<tr>
<td>How did the requirement elicitation occur?</td>
<td>Worked with the eVA Agency Adoption Team</td>
<td></td>
</tr>
<tr>
<td>What are the modeling tools?</td>
<td>Whiteboard, Visio, Worksheets, Spreadsheets, PowerPoint.</td>
<td></td>
</tr>
<tr>
<td>What is the communication style?</td>
<td>Collaborative, JAD, FAST, Technical communicator role, etc.</td>
<td></td>
</tr>
<tr>
<td>What project management guidance is evident on how to foster user participation?</td>
<td>eVA Guides, Team Worksheets, training documents, Microsoft Project documents</td>
<td></td>
</tr>
<tr>
<td>- <em>User Participation</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What are the different types of participation activities involving participants, change agents, and stakeholders?</td>
<td>Prepare project plans, data collection activities, contact your vendors, etc.</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td>How has becoming involved affected the user’s attitude?</td>
<td>Successful eVA vendors --You Tube Interview</td>
<td></td>
</tr>
<tr>
<td>How has the user’s attitude affected involvement?</td>
<td>Comment from Buyer, Fluvanna Correctional Center</td>
<td></td>
</tr>
<tr>
<td><strong>Mediating Variables:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <em>Environmental Issues</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the content (operational issues)?</td>
<td>Scale and scope of the IS project, time for development, financial resources available and top management commitment</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Chapter(s)</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>What is the context (project environment)?</td>
<td>Embodies the external (competitors strategies, government legislator, technological innovation, etc.) and internal (human resources, history and culture of an organization, etc.)</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td>What is the political environment?</td>
<td>Outside and inside negotiation, consultation, conflicts, and resistance are known to impact change</td>
<td></td>
</tr>
<tr>
<td><strong>Strategies for Change Agents</strong></td>
<td><strong>How do the change agents use different approaches in the project?</strong> Use a phased development and implementation solution.</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td><strong>What are some of the strategies designed and executed by change agents?</strong></td>
<td>Train initial users, acceptance testing of agency data and configuration, distribute any new policies/procedures, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>How do stakeholders resist change?</strong></td>
<td>Refuse to use the system, complain to co workers, people in authority, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>Dependent Variables:</strong></td>
<td><strong>- A Successful System Solution</strong></td>
<td></td>
</tr>
<tr>
<td>What is the evidence of improved quality in the system solution?</td>
<td>eVA awarded the &quot;Excellence In Partnership Award – increased accuracy and saving data entry time</td>
<td>Answered In chapter 5</td>
</tr>
<tr>
<td>What is the evidence of user acceptance in the system solution?</td>
<td>Excellence in innovation, professionalism, productivity, e-procurement and leadership attributes</td>
<td></td>
</tr>
<tr>
<td>What is the evidence of user satisfaction in the system solution?</td>
<td>City of Lynchburg uses eVA -- You Tube Interview</td>
<td></td>
</tr>
<tr>
<td>What is the evidence of improved budget and schedule performance in the system solution?</td>
<td>Virginia Ranked #1 in 50-State Report -- Cites eVA For Cost Savings</td>
<td></td>
</tr>
<tr>
<td>What is the evidence of increased feelings of ownership in the system solution?</td>
<td>Hansen Consulting and Seminar’s Jon Hansen has been showcasing eVA’s success throughout a multi-city speaking tour during 2008.</td>
<td></td>
</tr>
<tr>
<td><strong>A Different Perspective</strong></td>
<td><strong>What is the formal social network of a successful IS solution (using social network analysis)?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Goal directed social networks with mathematical (matrices) and graphical (sociograms) representations.</strong></td>
<td>Answered In chapter 6</td>
<td></td>
</tr>
</tbody>
</table>
Documents, such as industry and academic articles, are the primary source of evidence. Archival records include items such as state government memos, official plans, newsletters, requests for information, and other industry data are used as sources for evidence. Statistics for e-procurement activities are available that will help establish this status (successful/unsuccessful) of the development and implementation solutions. Note that while Yin (1994) distinguished between documents and archival records, this dissertation will merge the two categories into one category called archival evidence.

Transcripts of interviews are available that will allow for some documented perspectives to be analyzed and supply multiple sources of data (data triangulation). A case study report is developed that was reviewed by two people (change agent and participant) in the e-procurement industry. Feedback was obtained from the change agent and the participant to confirm the accuracy of the case context and the dissertation committee reviewed and supplied feedback on from a research perspective. This supplied multiple perspectives of the same data (theory triangulation).

Participant-observation enriches the research by supplying a better understanding of the processes and technical skills that were being developed and implemented. The researcher will use the e-procurement website (eVA) in the role of buyer and vendor and review the physical artifacts, such as printouts from eVA website.

A formal case study database is available (an UPA custom database) and will be maintained as the data is collected and analyzed. This will be a way of organizing and documenting the data collected for the study. It will also contain the questions, answers, and sources that are documented in the table shell (table 4.3). This will help facilitate another researcher’s effort to replicate this study, thus enhancing reliability (see table 4.2). Yin (1994)
suggests a second form of documentation “a report” that could be used to replicate the study. This dissertation serves as that report, because it is meant for external publication. In addition, this study will include a separate bibliography just for the data. This will make most, if not all, of my data available to other researchers.

Lastly, this dissertation will maintain a chain of evidence. The goal is to “allow an external observer …to follow the derivation of any evidence from the initial research questions to the ultimate case study conclusions” (Yin 1994, p. 98).

Research Questions 1 & 2  Case Study Database  Dissertation Conclusions

4.3 Why Use Social Network Analysis on eVA?

The general form of this analysis views the user participation process as a social network. Participants, stakeholders and change agents (nodes) participate in social systems; therefore social network analysis is used to make the relationships between participants explicit.

In this dissertation we focus on the following question, using a social network approach:

Q3. What is the formal social network in a successful IS solution?

The theoretical and methodological focus of social network analysis is identifying, measuring, testing hypotheses, and/or investigating the structural forms and relations among actors, making this type of analysis well suited for use with the eVA case study, in contrast to factor research which has an individualistic and variable-centric focus (Knoke & Yang 2008) (see figure 3.3). Basic units of analysis are relations (ties). Some other measures of social network structure
include range, density, centrality, groups, and positions (for a review, see (Wasserman & Faust 1994)).

**Software for Social Network Analysis**

In this dissertation the following software will be used to analyze how the approach to user participation helps inform the social network of a successful IS solution.

**Ucinet**  
License: shareware

Ucinet maybe the most famous and utilized software (Borgatti, et al. 2008) for analyzing a social network, and one of the most comprehensive ones. It can read and write a multitude of differently formatted text files, as well as Excel files. It can handle a maximum of 32,767 nodes (with some exceptions), although practically speaking many procedures get too slow around 5,000 - 10,000 nodes. Social network analysis methods include centrality measures, subgroup identification, role analysis, elementary graph theory, and permutation-based statistical analysis. In addition, the package has strong matrix analysis routines, such as matrix algebra and multivariate statistics. It has not been designed to draw networks, but it is well integrated with dedicated packages like Mage and NetDraw.

**NetDraw**  
License: Free

NetDraw has been built with the intent of visualizing social networks, but it also contains some routines specifically designed to analyze networks datasets. NetDraw is a free program written by Steve Borgatti for visualizing both 1-mode and 2-mode social network data. It can handle multiple relations at the same time, and can use node attributes to set colors, shapes, and sizes of nodes. Pictures can be saved in metafile, jpg, gif and bitmap formats. The program reads
UCINET system files, UCINET DL files, Pajek files, and its own VNA format (which allows saving network and attributes data together, along with layout information like spatial coordinates, colors, etc.). Netdraw is fully integrated in Ucinet.

**An example of how SNA can be applied to the eVA Case Study**

As an example of how SNA can be applied, consider the following research question:

Can an approach to user participation define the initial social structure of the group? A traditional approach to this question has been to focus on the analysts and their ability to manage the process of user participation. This is because analysts have traditionally played a change agent role in designing and coordinating collective actions.

This traditional approach is leader-centered. It has provided valuable insights into the relationship between leadership and group performance. Today, user-led approaches exist that are also consistent with a leader-centered approach. Both of these leader-centered approaches have only one change agent in a group, and view leadership as an exclusively top-down process between one change agent and the other participants (figure 4.1).

A newer approach to managing the user participation process is to have multiple change agents. This approach has proven effective because groups often have more than one change agent. Even when there is a formally assigned analyst and/or participant in the change agent role, other, informal, change agents can emerge quickly due to the characteristics of the approach.

Moreover, users often choose informal change agents of their own, change agents who are separate from the analyst designated into the role of change agent by the organization. The multiple change agent approach assumes that there is a need for more than one change agent in a group and that the organizational context, content, and political environment allows it. Indeed,
The user participation process is an emergent process between change agents and the other participants (figure 4.1).

![Leader-centered social networks](image1.png) ![Emergent-leader social networks](image2.png)

**Figure 4.1 Example Sociograms**

Basic units of analysis here are relations (ties) measured by visualizing formal social structures of the type “reports to.”

The purpose of this section was to give a brief explanation and a corresponding visualization of the social relations identified in the categorical analysis. This section has given an example and briefly outlined how social network analysis can enhance the research agenda set forth in the UPA model. User Participation during ISD until now has remained mostly untouched by social network analysis.

In all four approaches identified in the UPA model, we argue that the network perspective combined with the categorical analysis has the potential to supply a cross-level analysis, generally incorporating more macro-level constructs (such as solution success) into micro-level research (such as a specific user participation approach). As this dissertation continues to analyze user participation during ISD using the UPA model and categorical
analysis, social network analysis supplies is used to supply many more interesting explanations about the user participation process.

4.4 **Social Network Analysis Research Design Elements**

**SNA Sampling Units for eVA**

The first step in designing this social network study was to choose the social setting and to decide which entities in that settings are the network actors. The setting this dissertation is interested in is an embedded research design that involves a higher level system (complex formal organization) within which lower-level entities (formal group of users participating in an e-procurement solution) comprise the actors. The participants in the group are the actors whose relations comprise the social networks that are under investigation. An e-procurement solution has considerable advantages in determining the boundaries and getting access to them from top authority.

**SNA Relational Form and Content of eVA**

The next step is to decide on the specific relations and collect the data in the eVA total e-procurement solution. Forms are the modes of interaction through which specific contents attain social reality. Contents are the operational issues in the form of interests, purposes, drives, or motives of participants in an interaction. A relational form is a property of participant relations that exist independently of any specific contents. Two fundamental forms this dissertation will use are: (1) the intensity, frequency, or strength of interaction between actors and (2) the direction of relations. Relational content (type of tie) refers to the reason for occurring. An example is when you identify a close friend; you are measuring friendship. This requires that
you conceptualize and operationalize your interactions. This is a subjective content which is an analytic construct that is meant to capture the meanings from the participants’ subjective viewpoints.

The UPA typology supplies a conceptual map of the structural connections among the relational content domains. This will allow this dissertation to efficiently and accurately select specific contents that are the best theoretical and substantive fit. We offer a small list of generic relational contents that will be used in this dissertation, but it is important to note that the capacity to conceptualize and operationalize distinctions among relational contents is unlimited (Knoke & Yang 2008). For example, some conceptualized form and content are:

- eVA Transaction relations: Actors exchange control over physical (frequency of communication and when they will occur) or symbolic media (purpose).
- eVA Communication relations: Linkage between actors are channels (reports, meetings, presentations, etc.) through which messages may be transmitted.
- eVA Authority/control relations: These types of ties, in a complex formal organization, indicate the rights and obligations of change agents to issue commands in the context of an IS project (e.g., who conducts/initiates the meetings, discussions, and presentations).

**SNA Level of Data Analysis for eVA**

The level of analysis of this dissertation is the dyadic network. This is a network consisting of pairs of actors (i.e. change agent, participant). When the direction of the relation matters, as in concerns of project control, then the sample contains \( (N^2 - N) \) ordered dyads.
SNA Data Collection

Boundary specification must be set before any data is collected because when studying social relations no obvious limit may exist. Numerous strategies exist, but this dissertation will use an event-based strategy. This method draws network boundaries by including actors who participate in a defined set of activities occurring at specific times and places (Scott 1991). For example, an event-based strategy relies on users participating in formal ISD activities or events to locate a network’s boundaries, categorizing such activities appropriately is critical.

A limitation of this approach is the possibility of missing or incomplete data caused by overlooking significant activities or actors. This dissertation’s UPA typology identifies the elements, activities, and events that are important, thus supplying a crucial step and helping to overcome having missing or incomplete data. Another way to overcome this limitation is to analyze multiple events (requirement gathering and system testing) to achieve a more comprehensive and inclusive social network.

Data Collection Procedures

Archival document data supplies information for social network analysis, although it was not originally collected for social network studies. It offers the opportunity to supply high-quality longitudinal information when the data is kept over time. The archival data will come from various forms, organizational WebPages, newsletters, internal project documents, and proposals (see appendix 1 for examples). Analyzing these data sources provides useful social network data about user participation.

An advantage of using archival documents is that information bias is reduced. Information bias is the discrepancy between self-reported and actual behaviors. Another source
of data is objective observer records. This will complement the archival data and, if a consensus is found, supply greater opportunity for information validity. A test and retest method will be used to evaluate information reliability. For example, an archival document is analyzed for frequency and timing of communications. The retest can occur if another archival document can be analyzed that yields the same information. A perfect correlation between the two indicates complete information reliability.

**Basic Methods for Analyzing a UPA as a Social Network**

This section discusses the basic measures that this dissertation anticipates using to analyze the relational UPA data. Density, centrality, cohesiveness, and structural equivalence are important measures, but because representing social network data always comes before analyzing it, we start with graphs and matrices. Graphs present visualizations of social networks and matrices give us the ability to manipulate mathematical algebraic representation of relational data. Both of these can be considered tools that conceptualize and measure relational data.

In particular, two-dimensional diagrams called sociograms will be used to display the relationships (a socio-metric technique) among users, managers, analyst, and stakeholders in ISD (a bounded social system). This sociometric technique represents actors as a set of \( N \) nodes. Nodes were in the past called vertices, and labeled for identification purposes. The lines (also called arc or edge) between the nodes represent the relations or ties and if no line exists then it indicates that no relationship exists. Constructing insightful and meaningful sociograms is an art as well as a scientific activity.

Lines without an arrowhead (—) are considered non-directed or mutual (e.g., colleague) relationships. If a direction exists in a relationship being represented, then a directed graph or
digraph exists. The definition of a digraph is “a finite set of nodes and a set of ordered pairs \((a, b)\), where node \(a\) is the initial node of the line and \(b\) is the terminal node” (Knoke & Yang 2008). A single-headed arrow \((\rightarrow)\) indicates a directed tie (e.g., conducts/initiates the meetings, discussions, and presentations). A line with arrows at both ends \((\leftrightarrow)\) or \((\Rightarrow)\) indicates a two directed tie, which suggests reciprocity or mutuality (e.g., each actor chooses the other as having the authority to conduct/initiate the meetings, discussions, and presentations).

Sometimes the thickness of the line or using dashes can be a visual display of the strength, intensity, or frequency of the relationships. Some basic concepts can be illustrated with a hypothetical nine-actor digraph (figure 4.2) which represents an ISD equivocation sociogram. Equivocation is described as a state where either node adopts an uncommitted “wait and see” stance and postpones or eliminates any particular type of leadership from occurring during an ISD activity. This allows either party to influence the activities (e.g., conducts/initiates the meetings, discussions, and presentations). The main advantage is that it can accommodate continuous change.

Figure 4.2 Example of a Nine-Node Directed Social Network
Within a graph, a subgraph can exist. The triad (User1, User2, Analyst, figure 4.2) is a subgraph. A walk is the sequence of nodes and lines and the walk length is measured by counting the number of lines it contains. For example, the walk length of User1-User2-Analyst-User3-User4 has a length of 4. A path is defined as “a walk with entirely distinct nodes and lines (no node can be included more than once)” (Knoke & Yang 2008). In digraph “paths” all arrows must point in the same direction. Thus, (User2-User3-Analyst) is not a path. A path is the sequence of nodes and lines and the path distance is measured by counting the number of lines in the path. The shortest path is called the geodesic.

Figure 4.2 is a disconnected graph because at least one pair of nodes has no path between them, whereas a connected graph would have paths between every pair of nodes. Indeed, figure 4.2 would be strongly connected if User8 was removed, because it has every pair of nodes connected in both directions. User8 has no lines connecting it to any other node so it is called an isolate.

Unilaterally connected pairs of nodes are joined by a path in one direction, but not the other. In a connected graph, a cutpoint describes a node that if removed would disconnect the graph. For example, if User4 is removed it would disconnect the graph and two components would be created. Likewise, if a line is removed and the graph is disconnected into two components, that line is called a bridge.

Social networks with cutpoints and/or bridges can be more easily disrupted than networks with redundant paths. For example, if User4 is removed from the ISD project (figure 4.3 shows the result). This means that when a user from group A conducts/initiates meetings, discussions, and presentations, then group B would not have a relationship to group A, thus the flow of
communication and/or ideas to group B will be disrupted if the only method of communication was through the lines shown.

![Diagram of a social network](image)

**Figure 4.3 Example of the Results of Removing a Cutpoint in a Social Network**

Matrices are mathematical algebraic representations of relational data. The basic form is a sociomatrix (also called adjacency matrix, e.g., table 4.4). It is a tabular display, typically a square array of numerical elements arranged in rows and columns. Social network data is stored in an adjacency matrix. Commonly, the \([i, j]\) element of the adjacency matrix corresponds to the communication behavior of actor \(i'\) to actor \(j'\). The rows of the array are the cases, or subjects, or observations. The columns of the array are -- and note the key difference from conventional data -- the same set of cases, subjects, or observations. Each cell of the array describes a relationship between the actors. A simple example is shown as table 4.4, which describes the communication network among five people.

**Table 4.4 Example of Sociomatrix (also called adjacency matrix)**

<table>
<thead>
<tr>
<th></th>
<th>Analyst</th>
<th>User1</th>
<th>User2</th>
<th>User3</th>
<th>User4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>______</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>User1</td>
<td>1</td>
<td>______</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>User2</td>
<td>0</td>
<td>0</td>
<td>______</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>User3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>______</td>
<td>1</td>
</tr>
<tr>
<td>User4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>______</td>
</tr>
</tbody>
</table>
Table 4.5 is used to demonstrate how this dissertation meets the social network design guidelines (Scott 1991). In this dissertation, SNA provides both a visual and a mathematical analysis of complex e-procurement solutions. The measures along which social network studies vary, including the sources of evidence used, the sampling units, the level of analysis, the relational form and content, and other SNA measures.

Table 4.5 Social Network Research Design Guidelines

<table>
<thead>
<tr>
<th>Measures and Guidelines from the literature (Scott 1991)</th>
<th>Whether/how the guidelines are followed in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use multiple sources of evidence</td>
<td>188 project management documents in a variety of formats, transcripts of interviews with change agents, and 83 presentations. A nested two-stage research design that involves a higher level system (complex formal organization) within which lower-level entities (formal group of users participating in an ISD project) comprises the actors.</td>
</tr>
<tr>
<td>Sampling Units</td>
<td></td>
</tr>
<tr>
<td>Relational Form and Content</td>
<td>Transaction relations: Actors exchange control over physical (frequency of communication and when they will occur) or symbolic media (purpose). Communication relations: Linkage between actors are channels (reports, meetings, presentations, etc.) through which messages may be transmitted. Authority/control relations: These types of ties, in a complex formal organization, indicate the rights and obligations of change agents to issue commands in the context of an IS project (e.g., who conducts/initiates the meetings, discussions, and presentations).</td>
</tr>
<tr>
<td>Level of Data Analysis</td>
<td>Dyadic network. This is a network consisting of pairs of actors (i.e. change agent, participant).</td>
</tr>
<tr>
<td>Density, Centrality, Cohesiveness, and Structural Equivalence</td>
<td>Graphs for the visualizations of the UP social networks and UP matrices. This gives us the ability to manipulate mathematical algebraic representation of relational data and construct insightful and meaningful sociograms</td>
</tr>
</tbody>
</table>
This dissertation will maintain a chain of SNA evidence. The goal is to “allow an external observer … to follow the derivation of any evidence from the initial research questions to the ultimate social network perspective conclusions” (adapted from Yin 1994, p. 98).

**Research Question 3 → SNA Database → Dissertation Conclusions**

### 4.5 SUMMARY

The purpose of this Chapter 4 is to introduce the research design and the two scientific methods that form the basis of this study.

![Figure 4.4 Overview of Research Design](image)
**Table 4.6 Research Questions, Propositions, Variables, and Research Strategy**

<table>
<thead>
<tr>
<th>Research Questions (Q1-Q3)</th>
<th>Propositions</th>
<th>Variables (VQ1-VQ23)</th>
<th>Research Strategy/Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Investigatory Themes</strong></td>
<td>Literature Review, UPA Model, UPA Typology</td>
<td>Open-Ended Questions</td>
<td>Case Study, (SNA)</td>
</tr>
</tbody>
</table>
| **Q1.** What is the approach to user participation in a successful IS solution? | **A successful user participation approach (UPA) suggests the need for:**
  - P1. different strategies when applied to different contents (operational issues)
  - P2. different strategies when used in different contexts (project environment)
  - P3. different strategies when used in different political environments
  - P4. to be led by a change agents that use different user participation approaches
  - P5. to have activities designed and executed by change agents
  - P6. different types of participation activities between participants, change agents, and stakeholders (behavioral construct)
  - P7. different strategies designed to consider that when participants that get more involved, it may improve the user’s attitude (psychological construct), which may influence the system solution | **Independent Variables:**
  - **User Participation Approach**
    - VQ1. What role has control over the system design & implementation process?
    - VQ2. What roles are in the goal-directed social network?
    - VQ3. In what context does the approach originate?
    - VQ4. What is the requirement elicitation process?
    - VQ5. How did the requirement elicitation occur?
    - VQ6. What are the modeling tools?
    - VQ7. What is the communication style?
    - VQ8. What project management guidance is evident on how to foster user participation?
    - VQ9. What are the different types of participation activities involving participants, change agents, and stakeholders?
    - VQ10. How has becoming involved affected the user’s attitude?
    - VQ11. How has the user’s attitude affected involvement?
  - **Mediating Variables:**
    - **Environmental Issues**
      - VQ12. What is the content (operational issues)?
      - VQ13. What is the context (project environment)?
      - VQ14. What is the political environment?
    - **Strategies for Change Agents**
      - VQ15. How do the change agents use different approaches in the project?
      - VQ16. What are some of the strategies | Case Study |
Table 4.6 Research Questions, Propositions, Variables, which contains the research questions, propositions, variables, and research strategy is shown graphically (figure 4.4) to give any reader of this dissertation an overview of the research design. The design begins with the research questions (Q1-Q3), which are generated from the academic literature (P1-P14). VQ1-VQ23 (presented in table 4.3) are open-ended questions that are used by the researcher to guide the collection of evidence from the available data.

This dissertation uses a case study approach, which is "an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" and it "relies on multiple
sources of evidence" (Yin, 1994, p. 13). Furthermore, a case study research strategy investigates pre-defined entities, phenomena, or relationships which are not publicly observable or which cannot be seen directly” (Lee 1989a). The guidelines for conducting the case study of a successful system solution are provided.

The case study is worth conducting because investigating a successful system solution (eVA) supplies useful methodological clues on how to achieve system solution success. In addition, this case represents the critical investigation of the successful system solution organized by the UPA model.

This dissertation uses SNA to map and measure the relationships and flows between stakeholders, change agents, and participants in an ISD project. In particular, two-dimensional diagrams called sociograms, will be used to display the relationships among change agents, participants, and stakeholders in ISD (a bounded social system). The guidelines for conducting social network analysis are provided.

Triangulation is used to indicate that more than one method is used to explore user participation approaches. In SNA studies this is called "cross-level” analysis (Wasserman & Faust 1994). The basic idea being that we are mapping out and explaining more fully, the richness and complexity of human behavior (Cohen & Manion 1989) during user participation by studying it from more than one standpoint. In addition, it allows us to be more confident with a result if different methods lead us to the same result.
CHAPTER 5 – CASE STUDY APPROACH TO AN E-PROCUREMENT SOLUTION

5.1 INTRODUCTION

The purpose of this chapter is to present evidence supporting the approach to the user participation process in a successful total procurement solution (eVA) and draw conclusions that will contribute to the user participation approach (UPA) typology. Within the eVA case study, attention is given to the subunits (e.g., development and implementation phases as defined by Markus and Mao (2004)). This is an embedded case study design because the unit of analysis concerns the development and implementation phases of a single case. In other words, by using the subunits, the propositions will be investigated twice in a single case.

In the initial section of this chapter, this dissertation will use a style and method similar to the Markus and Mao (2004) study to present theoretical support for using the UPA process model as the way to organize the numerous complex variables in a total e-procurement solution. Thereafter, this dissertation will use hypothetico-deductive logic and the successful system solution (eVA) to scientifically investigate the propositions (see Table 3.2) organized by the UPA model. The use of the UPA propositions offers this case study of eVA a methodological way to include valid descriptive data while ignoring other descriptive data.

Theoretical Support for the UPA Process Model Applied to a Total e-Procurement Solution

In a theory building user participation study, Markus and Mao (2004) provided an updated model of user participation (Figure 3.2) as a way to revitalize IS theorizing and research on participation. In addition, it built the foundations for an updated theory that is robust enough
to accommodate changing IS practices and the foundation for updating the approach to user participation (Figure 5.1).

In hindsight, it appears that the updated theory of user participation envisioned by Markus and Mao (2004) was perhaps too general for a model of “how to” approach user participation in the development and/or implementation phases of an e-procurement system solution, especially when you analyze the main types of approaches to user participation from the goal-directed social network perspective. In other words, it is not a very practical model, and therefore may be limited in its usefulness to practitioners. Furthermore, not apparent in the model of the updated theory of user participation is in what way a lack of participation can impact development and implementation success. Yet, the study (Markus and Mao, 2004) does mention that some system solutions are successful without user participation. Therefore, in the spirit of a follow-up study, this dissertation introduces the UPA model, one that this dissertation suggests is a better tool to base decisions and build business processes. In this dissertation it is used to organize the case study variables.

Figure 5.1 Theoretical Support for the User Participation Approach (UPA) Model
As this dissertation will discuss in more detail below; the eVA case is organized and compared to the user participation approach process model (see Figure 3.3) in order to draw conclusions about the approach taken to user participation in a successful total e-procurement solution. This strategy presents a visual perspective of potential user participation approaches (see Table 3.3) to readers so that they can better develop a mental model of how a specific user participation approach might appear in the e-procurement industry.

**State of the Procurement Industry in the Development Phase of eVA**

In order to appreciate the significance of a successful solution in the procurement industry, the reader must understand that trying to standardize government electronic catalogs or broader reaching e-procurement solutions containing bid submission, auctions, etc. is a barrier to supplier development and implementation. Therefore it is helpful in the analysis of the data to consider the content, context and political environment of U.S. public entities and private enterprises at a macro level at the time eVA was in the development phase. The need to understand the project environment, operational issues and the political environment is part of the UPA model and serves as a foundation for a better case study and social network analysis of a successful total e-procurement solution (eVA).

**Barriers to Solution Development - Organizations vested in legacy processes and systems**

Automating manual processes led public entities and private sector enterprises to invest organizationally and monetarily in technology. Mainframe-based, function-specific, internal applications were developed by early adopters of technology and, over time, organizations learned saw the value of developing interfaces between such applications to further streamline
processes. Further, organizations began to recognize that maintaining numerous interfaces caused its own set of difficulties and, therefore, the value of integrating (versus interfacing) systems evolved over time. The most ambitious organizations began conducting business process reengineering (BPR) and enterprise resource planning (ERP).

Technology development and implementation typically reflected the size of the organization with most large and small organizations developing and implementing much of what this dissertation describes. Development and implementation of a functional and commercial technological architecture has typically happened over years and come with a significant investment. From the largest to the smallest businesses and government entities, some significant level of expense was required to automate and streamline processes just to keep up with constituents, customers and suppliers.

**The Dot.com Revolution has an Impact**

Cheap processing power, bandwidth and a standard programming language (HTML) fueled the dot.com revolution. This ignited the need for new or revised business and service models. The most ambitious organizations began conducting BPR and ERP, to such an expansive breath that re-engineering and planning tools formed the center of the revolution. The general public accepted the World Wide Web (WWW) with frequently reported "unprecedented speed" compared to earlier technological advances. In July of 2000, Nielsen/Net Ratings, reporting 52% of U.S. homes, 144 million people, with access to the Internet (Rainie & Bell 2004), predicted that such access would greatly help fuel internet spending over time.

The growth of the Internet created significant pressure on public and private organizations entities to expand online information, goods and services. At this time, major
analysts (Forrester Research, Gartner Group, and others) predicted growth (reaching the trillions of dollars) of business-to-business (B2B) and business-to-government (B2G) e-commerce would explode, suggesting that those not participating would cause an organization to be left in the financial dust. Indeed, business literature at this time reinforced the message that increased product-pricing transparency would reduce producer-pricing power in the new electronic markets. A key issue for suppliers remained centered around connections between business conditions and technology development and implementation.

The rise of the dot.com’s motivated organizations to capitalize on the use of the Internet by re-engineering business processes, but the eventual fall of the dot.com's was a serious wake up call for organizations and made them question simple assumptions like:

- Self service on the Internet will reduce your service costs.
- Internet solutions decrease workload and costs while increasing customer satisfaction and loyalty.

Use of the Internet yielded mixed results, reinforcing the need for continuous scrutiny of technological solutions beyond promises or expectations to actual results.

**Procurement Pre-eVA**

Like many state governments in the late 1990s, the Commonwealth followed a decentralized procurement model which greatly hampered the commonwealth’s ability to purchase goods and services efficiently. Before the development and implementation of eVA, selling to and buying on behalf of state government was overflowing with bureaucratic red tape. This made it a very time-consuming process. For example, what life was like before eVA as articulated by Governor Warner:
Like many governments, the ability of the Commonwealth to efficiently purchase goods and services was hampered by a decentralized procurement model. Before the Commonwealth built and deployed eVA, selling to and buying on behalf of government was a daunting task.

Suppose you were a supplier who wanted to sell office supplies to the Commonwealth. In order to market your goods to possible buyers, you had to first figure out where the purchasing offices were of 170+ agency and university locations. You had to travel in person to these offices to register as a vendor and to find what business opportunities were available. If you could afford the $75 annual subscription, you could subscribe to a periodic paper publication of solicitations—but it listed only the opportunities valued at over $30,000, so the smaller opportunities that could help you build your business weren’t apparent. The mail delivery of the paper publication often lagged, so that you could be late in responding to solicitations in any case.

If you were able to timely respond to a solicitation, you again had to travel to the purchasing office to find out whether your bid was accepted. If you were able to win the contract for office supplies, for example, then sending out your paper catalog to the possible buyers was another expensive proposition. And if your prices on a particular good dropped, you had to send out price sheet updates to these 170+ offices and your sales reps had to perpetually make sure that buyers used the right price sheets so that you were complying with contract terms.

When you received purchase orders, the format and information always varied among purchasing offices, so it was easy to make mistakes in trying to figure out what an agency was ordering. There were frequent returns and corrections on orders. Because the whole process was conducted on paper, you couldn’t automate your supply chain for delivery. All of the rework and back-and-forth communication had the potential for phenomenal delays in supplying agencies with what they needed—and in finally getting payment for the goods.

If you were a buyer in a state agency just trying to purchase supplies for your unit, you had the same experience from the other side. You faced a multitude of price lists, returns for errors in product or pricing and time-consuming paper-based processes. Plus, you knew that every agency had its own purchasing office, and you had a sneaking suspicion that others were buying what you were and that a better price could be obtained if you could combine your purchases.

Overall, buying patterns were characterized by a lack of knowledge: not knowing all of the items available on the multitude of paper contracts and catalogs, not knowing whether the vendor next door was the best supplier for something you needed, not knowing if some other agency had found a better way to make purchases or had gotten a better price.

What this situation produced was a dependence on the personal relationship for suppliers—they sold only to offices that they knew, slowing the growth of their businesses, and small businesses had limited access to the market if they couldn’t
have the resources to build a broad set of these types of personal relationships. And each purchasing office operated as its own business, even down to the different satellite offices of a single agency—so that little of the buying power or best practices of these organizations could be leveraged. The inefficiencies and missed opportunities embedded in this old way of doing business simply cost the Commonwealth too much. The situation had to change, and a new way of doing business through a single electronic procurement system for the state was envisioned as the means to change it. (Lake 2006)

Inefficiencies and ineffectiveness embedded in the pre-eVA way of doing business cost the Commonwealth and suppliers unacceptable amount of time and money. A new way of doing business was needed. The rise of the dot.com’s motivated the Commonwealth to capitalize use of the Internet by re-engineering business processes; the eventual fall of the dot.com's, however, made them realize that use of the Internet was only part of the solution. eVA was envisioned as a “government-to-business network that streamlines the Commonwealth’s purchasing processes and creates a virtual enterprise-wide procurement system” (Before and After eVA 2008) solution.

5.2 Embedded Case 1: The Development Phase of eVA

The Honorable James S. Gilmore III, Governor of Virginia, issued an executive order on May 24, 2000. This order outlined an e-government initiative designed to make the Commonwealth a leader in electronic government. Following Governor Gilmore’s lead, the new governor, Mark R. Warner, immediately recognized the business value of the eVA e-procurement solution and continued to provide strong support for its development and implementation. The eVA development project is reported to be the first of its kind to integrate all aspects of e-procurement into a single system. This included integration of (1) online catalogs of suppliers, (2) bid handling, (3) payment facilitation and (4) contract data access. The
eVA project was designed and developed to meet suppliers' needs as well as those of state and local government buyers.

It is important to note that from the beginning, the Commonwealth collaborated with buyers and suppliers to obtain their input. As a result of their unique approach to development and implementation, eVA was launched in less than 9 months, beginning with issuance of the executive order, through award of a contract by the department of purchase and supply (within the department of General Services) for a technological solution and concluding with a go-live production system solution. The initial eVA rollout included 6 agencies, 600 users and 400 registered suppliers (the early adopters) and 70 posted catalogs. This earned eVA its first successful system solution milestone. It was the fastest successful e-procurement system rollout ever achieved in the nation.

Empirical Investigation

This dissertation acknowledges that the approach to user participation is a complex process that can be researched in many ways, but the UPA propositions (Table 3.2) have helped this dissertation focus attention on certain data and to ignore other data. The empirical investigations (tests) are organized by the UPA model, which is designed to be a broad (not deep) analysis of the eVA case study. The eVA case study tables are based on the table shell (Table 4.3) presented in chapter 4. The evidence presented was identified and referenced from the eVA data. This information completes the table shell requirements, and the results form the basis for an eVA UPA.

Data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of this study. The case study propositions supply a theoretical orientation for the open-ended questions within each embedded case study analysis.
Each open-ended question presents a descriptive response and the corresponding evidence that supports the descriptive response. The evidence follows the embedded case and is numbered so that it can be linked to the descriptive response. For example, E1 represents Evidence 1 presented in the evidence section that follows the embedded case that supports the descriptive response.

**Empirical Test #1: Results of Testing the UPA Propositions on eVA in the Development Phase**

System development officially began in May 2000. eVA was released with limited functionality in March 2001. Full implementation was in January 2003.

This dissertation presents the UPA (independent variable) as a necessary initial input that change agents employ (implicitly or explicitly) in the development phase of an information system solution. It is an element in the UPA model, the descriptive framework used to organize the case study analysis of eVA.

**Table 5.2 eVA Case Study Independent Variable (IV) & Results in the Development Phase**

<table>
<thead>
<tr>
<th>Independent Variable - User Participation Approach (UPA)</th>
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<tbody>
<tr>
<td>• What role has control over the system design process?</td>
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<tr>
<td>o RFP called for “structured systems development and implementation methodologies.” (E1)</td>
</tr>
<tr>
<td>o Overall fit is a blended approach of traditional methods with the Participatory Design Approach (i.e., Multiple Change Agents (Vendor Lead (AMS), IT Lead and a Functional Lead (COVA)) jointly in control of the project). (E1, E4, E15, E53)</td>
</tr>
<tr>
<td>• What roles comprise the goal-directed social network?</td>
</tr>
<tr>
<td>o All change agent roles and all participant roles are joint partners; participant role: actual application users, may include management application users. Based on the activities assigned in the eVA project (AMS, COVA, Agencies and Suppliers), all fall into the three (i.e., stakeholders, change agents, participant). Stakeholders may or may not be directly involved in eVA activities, but if stakeholders become change agents and/or participants in the development phase of the eVA, they are</td>
</tr>
</tbody>
</table>
grouped into teams that perform development activities. (E1, E4, E35)

- In what context does the approach originate?
  - A system developed for internal (buyers) and external (suppliers). The approach, contextually appropriate due to technological and cultural impact of the “dot.com” revolution (Rainie & Bell 2004), emphasized use of the Internet to streamline and automate government purchasing activities. (E5, E37, E44)

- What are the objectives of user participation in the project?
  - A consistent collaborative process, across all project phases and with all key stakeholders. The process focuses on the system design and quality (requirements gathering) in a structured manner designed by change agents through interactive meetings with participants (to obtain buy-in). (E1, E42, E53, E54)

- What is the requirement elicitation process?
  - One year prior to issuing a request for proposals (RFP), DGS formed an interdisciplinary design team to develop preliminary solution requirements. The design team consisted of the technology secretariat and representatives from state agencies, universities and local government. (E2)
  - Preliminary requirements were refined (flexible) at a statewide end-user forum, which was followed by end-user and software company teleconferences and an Internet forum to further refine the requirements. (E2, E3)
  - Consistent and collective processes, i.e., available research review regarding e-procurement, direct contact with public and private sector organizations, conferences, public forums, brainstorming sessions, focus groups, a proof-of-concept tour, prototyping, interactive team meetings and experimentation (i.e., user acceptance testing (UAT)). (E2, E38, E56)

- How did the requirement elicitation occur?
  - Meetings with buyers, vendors, and suppliers, focus groups, dedicated project room was setup at DPS headquarters for eVA project activities and eVA Agency Adoption Teams were established so that early adopters could be assisted at their work site. (E2, E37, E56)

- What are the formal modeling tools?
  - DRAW (low tech graphical tools): whiteboard, chalkboard, and whatever works was encouraged. (E36, E52)

- What is the communication style?
  - Interactive exchange of information and mutual respect by every stakeholder for the insights of the other stakeholders (E12, E13, E14)
  - A large amount of communication through documentation (E12, E33 E40)

- What project management guidance is evident on how to foster user participation?
  - Conducted public forums, business modeling workshops, brainstorming sessions, proof-of-concept tour, and team meetings run by skilled and creative change agents (cross-governmental design team). (E38, E40)
Executive Sponsorship (E39, E41, E58)
- Governor support is given by promulgating an executive order in May 2000 and increasing visibility within state government, which include cabinet secretaries, executive oversight committee, and agency heads.

Appropriate People to Participate (stakeholder collaboration) (E38, E47)
- Set Clear, Well-Defined Goals & Defined Deliverables in Advance (cross-governmental design team took the initial concepts and the group session results and turned these into a detailed RFP.” (E40, E57)
- Visualized Current Workplace Work Activities, Skills, Experience  (E35, E43)
  - Official Solicitation Documents RFP No. 194:0-12RPB

User Participation
- What are some of the different types of participation activities involving participants, change agents, and stakeholders?  (E16-E21, E23-E33)
  - Project Management
  - ESC Meetings
  - QA/Risk Management
  - Contract Administration
  - Vendor Registration
  - Agency Enablement and Adoption
  - Supplier Adoption and Rollout
  - Marketing and Communications
  - Security
  - User Acceptance Test (UAT)
  - QA/Risk Management
  - Agency Adoption and Rollout
  - Technical Analysis, Design, and Development
  - Training

- How has becoming involved, affected the user’s attitude?
  - Some stakeholders have become personal and public eVA advocates. E58
    - Suppliers resisted the payment of transaction fees, which decreased support for the project among private sector entities. (E9)

- How has the user’s attitude affected involvement?
  - Line agencies have been reluctant to use the system because of their substantial investments in existing systems. (E6)
  - Line agencies have been unwilling to voluntarily commit their own resources to untested systems. (E7)
**Basic Description Derived From the Evidence**

User participation contributes to a successful IS solution because it helps create an environment that is user-focused and stakeholder-driven. This environment puts the needs of the end users first as long as they meet budget and performance schedules. It also establishes an effective arrangement of co-ownership, where everyone shares equally in success or failure of the system solution. User participation focuses on enhanced quality, usefulness and usability of the system solution, as well as empowering end users to develop and adapt the solution by themselves.

In summary, the preceding results (Table 5.2) contribute to the following description of the eVA UPA.

**Requirement elicitation process:**
A design team was formed to do an iterative and flexible collective process through research and via conferences, forums, focus groups, proof-of-concept tour, prototyping, interactive meetings and experimentation (i.e., user acceptance testing (UAT)).

**Requirement elicitation methods and locations:**
Traditional and innovative methods (i.e., teleconferences, Internet forums, on-site visits) were used to gather requirements in or near participant workplaces and in a designated project team room.

**Objectives of user participation:**
Change agents focus on the solution design and quality (requirements gathering) via an adaptive approach during meetings with participants (to obtain buy-in and facilitate change) which includes a focus on enhanced usefulness and usability of the system solution, as well as empowering end users to develop and adapt the solution by themselves.
Use of formal modeling tools:

Participants describe and draw workflows with “low tech” graphical tools. Change agents encourage participants to use whiteboards, chalkboards or “whatever works.”

User participation procedural guidance:

1. Establish a strong, innovative and flexible core team that is multi-disciplined and multi-skilled.
2. Obtain executive sponsorship.
3. Listen to all stakeholders.
4. Empower users.

Main communication style:

1. Interactive exchange of information.
2. Mutual respect by stakeholders regarding insights of other stakeholders.
3. Extensive communication via documentation (website, PowerPoint presentations, etc.).

<table>
<thead>
<tr>
<th>Mediating Variable – Environmental Issues</th>
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<tbody>
<tr>
<td>• What is the content (operational issues)? For example, scale and scope of the IS project, time for development, the financial resources available and top management commitment are major operational issues.</td>
</tr>
<tr>
<td>o Governor Jim Gilmore promulgated an executive order in May 2000 that laid the groundwork for building eVA as a prime element of a broad e-government vision. (E41)</td>
</tr>
<tr>
<td>o In January 2002, Mark Warner ‘quickly recognized that with more visibility and use, the eVA solution had the potential to serve as a symbol for “government done right”—a businesslike approach that utilizes technology for better government performance.” Some cabinet secretaries and agency heads became advocates and an executive oversight committee was established to offer guidance and support as</td>
</tr>
</tbody>
</table>
needed. (E42, E58)

- The scope promotes process and workflow efficiencies, integrity, impartiality, and openness of the Commonwealth of Virginia’s (COVA) procurement activities (E59)
- eVA is owned by an application service provider (ASP), American Management Services (AMS). (E15, E46)
- A self-funded financial model (E9, E10)
- Contract modification and an additional assessment to line agencies. (E45)

- Project Schedule (Seivert 2007):
  - June 15, 2000 RFP Issue Date
  - October 13, 2000 Contract Award
  - February 15, 2001 Implementation of Phase I Functionality & Services

- What is the context (project environment)? For example, external (competitors, strategies, government legislator, technological innovation, etc.) and internal (human resources, history and culture of an organization, etc.) factors are major project environment issues.
  - The rise of the dot.com’s motivated organizations to capitalize on use of the Internet. (E5, E39, E44)
  - Decentralized purchasing environment (E43)
  - Many different “lines of business” (E61, E69)

- What is the political environment? For example, outside and inside negotiation, consultation, conflicts, and resistance are known to impact change and, therefore, are considered part of the political environment.
  - Negotiated contract (detailed in the awarded RFP). (E40)
  - Varying degrees of skepticism about a “big brother” initiated program. (E70)
  - Buyer compliance of early adopters was addressed through a productive and meaningful “all-for-one, one-for-all” dialogue to mitigate resistance to change. (E71)
  - Supplier participation (early adopters) based on a dialog about “increased opportunity.” (E68)

Strategies for Change Agents

- What are some of the strategies designed and executed by change agents?
  - Decentralization (E43, E44)
  - Tradition (E1)
  - Training – the trainer (E62)

- How do the change agents use different approaches in the project?
  - Targeted messaging approach
    - Buyer-side (E43, E67)
      - With users – using their examples in training to demonstrate improvements
      - With managers – using their business issues to demonstrate the business case
    - Vendor-side (E63, E68)
• Stand-up of vendor business support, not just technical support
• Proactive meetings for vendor walk-throughs
• Training/briefing materials emphasizing vendor perspectives

  o Traditional approach (E1, E42, E65)
    ▪ New procurement rules and policies
    ▪ Executive directives
    ▪ Presentations to upper management
    ▪ End-user training
    ▪ Spend targets and monitoring
  o Train-the-trainer approach (E62)
    ▪ Classroom-based

• How do stakeholders resist change?
  o Refuse or resist participation in eVA activities
    ▪ Push back using buyer-side management requests for eVA exemptions (E75)
    ▪ Push back using lobbying power (larger suppliers) to ask the Commonwealth to rethink its supply base consolidation effort (E72, E73)

**Basic Analysis Derived From the Evidence**

Mediating variables (environmental issues in the development phase) are extremely complex. This model does not attempt to conduct a deep or detailed analysis of the eVA project; instead, a research investigation captures a snapshot of some of the major environmental issues that are organized in the UPA framework. Results suggest that eVA was a vision that was appropriate for its time. The dot.com era set the stage for use of the Internet as an e-procurement solution, and numerous approaches and strategies were used in the development of eVA. Three major themes run through all of the approaches.

• Top-down support is essential.

• Focus on the end result, while remembering that “speed is your ally…time is your enemy.” (Seivert 2007)

• Embrace of change and combined approaches and/or strategies, as needed.
Context in which the approach originated:

The growth of the Internet and the dot.com influence inspired the vision of a custom e-procurement solution. The solution is developed by change agents through a collaborative and adaptive effort. eVA envisioned as Virginia’s total e-procurement solution would be used internally and externally.

Procedural guidance related to the information system solution:

The e-procurement information system offers a supporting role that accelerates process efficiency but does not define it.

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**Table 5.4 eVA Case Study Dependent Variable (DV) & Results in the Development Phase**

<table>
<thead>
<tr>
<th>Dependent Variable – A Successful System Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What is the evidence of improved quality in the system solution?</td>
</tr>
<tr>
<td>o Suppliers enter demographic information to confirm the accuracy of information prior to entry, thus enhancing quality of supplier data. (E22)</td>
</tr>
<tr>
<td>• What is the evidence of user acceptance in the system solution?</td>
</tr>
<tr>
<td>o Use of eVA increased substantially by March 2001, and DGS reported that over 54,000 purchases had been processed in eVA. (E8)</td>
</tr>
<tr>
<td>o eVA was declared for mandatory use instead of optional (July 2002). (E5)</td>
</tr>
<tr>
<td>• What is the evidence of user satisfaction in the system solution?</td>
</tr>
<tr>
<td>▪ No evidence found</td>
</tr>
<tr>
<td>• What is the evidence of improved budget and schedule performance in the system solution?</td>
</tr>
<tr>
<td>o FY01 – FY03 Market Basket savings: $45.5 million (E64)</td>
</tr>
<tr>
<td>o 2001: First total procurement system of its kind in the country (E47)</td>
</tr>
<tr>
<td>o 2002: Award ranking #1 by National Center for Digital Government (E49)</td>
</tr>
<tr>
<td>o 2003: Cost Effectiveness Award from National Electronic Commerce Coordinating Council (E51)</td>
</tr>
<tr>
<td>• What is the evidence of increased feelings of ownership in the system solution?</td>
</tr>
<tr>
<td>o Greater support in changing the procurement process. (E74)</td>
</tr>
</tbody>
</table>
**Basic Analysis Derived From the Evidence**

Because success can be measured in many ways, dependent variables (successful system solution in the development phase) are complex constructs. This study measures success as achieving pre-determined levels of 1) quality, 2) user acceptance, 3) user satisfaction, 4) budget and schedule improvement, and 5) heightened feelings of ownership. The results suggest that eVA evidenced success, although not documented in all areas.

**Procedural guidance:**

1. Set clear, well-defined goals.
2. Define and quantify deliverables in advance.

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**Evidence**

The following data is taken from the eVA database, which consists of an assortment of eVA project documents, eVA portal, academic sources, trade journals, etc. Data extracted from the eVA database is a sampling of evidence that supports the eVA Case Study tables above.

**Table 5.5 Development Phase Evidence**

(Data & Reference from an assortment of eVA project documents, eVA portal, academic sources, trade journals, etc.)

<p>| | |</p>
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<tbody>
<tr>
<td>1.</td>
<td>“The Contractor should provide a mature project management methodology and use structured systems development and implementation methodologies. It is highly desirable for the Contractor to provide a dedicated Project Manager that will coordinate with the COVA Department of General Services Functional and Technical Project Managers. The Contractor’s Project Manager will be expected to prepare steering committee briefings, status reports, and regular project work plan updates, and work with the COVA Department of General Services Project Team in implementing the Solution.” (Barnett 2000)</td>
</tr>
<tr>
<td>2.</td>
<td>“After reviewing available research on electronic procurement and contacting private and public sector entities, DGS formed a design team one year prior to issuing a request for proposals (RFP) to develop requirements. The design team consisted of representatives from the technology secretariat, three State agencies, three local governments, and three universities. Over a period of several months this team developed a set of preliminary...</td>
</tr>
</tbody>
</table>
requirements. DGS then presented these preliminary requirements at a statewide end-user forum to solicit additional input. After receiving comments, DGS held conferences with end-users and software companies to further refine the requirements.” (JLARC 2003)

3. “DGS took an innovative approach by holding a pre-solicitation conference using teleconferencing technology and an Internet forum with vendors and agencies that would use the system. Participants gained an understanding of the Commonwealth’s vision for electronic procurement and provided valuable input on potential solutions before the Request for Proposal was issued.” (NASCA 2001)

4. “A multi-disciplined team of end-users, financial, procurement and technology professionals from various agencies, institutions and local government, reviewed vendor proposals to ensure that the Commonwealth purchased the best possible solution for its procurement needs. Another team of financial experts in the Commonwealth developed the innovative self-funding program for eVA.” (NASCA 2001)

5. “Virginia’s total procurement solution combines all of the features necessary to promote and engage in e-commerce. It is the first total procurement system of its kind in the country.” (NASCA 2001)

6. “Line agencies have been reluctant to use the system because of their substantial investments in existing systems.” (JLARC 2003)

7. Line agencies have been unwilling to voluntarily commit their own resources to untested systems. (JLARC 2003)

8. “Use of eVA has increased substantially since March 2001, and DGS reports that over 54,000 purchases have been processed in eVA.” (JLARC 2003)

9. “One problem caused by the funding model has been the resistance by suppliers to the payment of transaction fees, which decreased support for the project among private sector entities, and has resulted in a $7.1 million charge to State agencies in the current fiscal year.” (JLARC 2003)

10. “The funding model assumed that the vendor would have an incentive to develop eVA in a timely manner in order to collect additional revenue, but this has not occurred. Instead, DGS modified the contract to provide accelerated payments to the vendor in exchange for the completion of specific tasks.” (JLARC 2003)

11. “The eVA project at DGS is an example of how the lack of involvement of end users can substantially decrease support for a project. DGS did not include end users at other agencies in the decision to make a substantial change to the project (declaring the system to be mandatory instead of optional), and instead used the agency’s rule-making authority.” (JLARC 2003)

12. “Agency finalizes decisions and signs off
- agency gives demo and reviews decisions with their key players (auditors, comptroller, agency mgmt, division/bureau directors, security and IT people)
- agency runs reports from the Collector agency team leader and security officer sign/dates and give them to eVA team leader
- agency gives Collector data to AMS lead to load into production” (Steps for eVA Agency Adoption 2001)

13. Project Management: Issues Database “Create issues reports and distribute to Team Leaders for action/update” (Tasks List Phase IA 2001)

14. "Project Management: Metaframe “Identify users to be setup on metaframe and have list approved” (Tasks List Phase IA 2001)
15. “After an extensive and rigorous selection process, the Commonwealth chose American Management Systems, Inc., (AMS) as a partner to deliver the eVA vision. Leading the business-to-government industry with their buysense product and service, AMS will provide the eVA functionality in three phases beginning March 1 with the core features and completing by December 1 with advanced capabilities.” (eVA ImpGuide Official 4-9 2001)
16. “eVA Executive Team - ESC Meetings - COVA/AMS” (MS Proj Detail V18 4-20 2001)
17. “QA/Risk Management Team - Contract Administration - Define revenue sharing accounting - COVA/AMS” (MS Proj Detail V18 4-20 2001)
18. “Agency Adoption and Rollout - Prepare rollout teams - COVA/AMS” (MS Proj Detail V18 4-20 2001)
19. “Marketing and Communications Team - Phase IA Marketing - COVA/AMS” (MS Proj Detail V18 4-20 2001)
20. “Blue Team (Total 25 Agencies)- Initial contact with Agency - 11 Kicked Off - COVA/AMS” (MS Proj Detail V18 4-20 2001)
21. “Quick Quote – Analysis & Design- AMS/COVA” (MS Proj Detail V18 4-20 2001)
22. “eVA also provides suppliers with a self-service tool to register across multiple government agencies. Suppliers can enter their own demographic information and confirm the accuracy of the information prior to entry—increasing the quality of the supplier data. Through vendor self-service, agencies avoid the time and resources needed to manage these processes.” (Lake 2006)
23. “Workflow enhancements- Analysis- AMS/COVA” (MS Proj Detail V18 4-20 2001)
24. “Workflow enhancements- Design- AMS/COVA” (MS Proj Detail V18 4-20 2001)
25. “Portal (Secure and Unsecure- Analysis- AMS/COVA” (MS Proj Detail V18 4-20 2001)
26. “Portal (Secure and Unsecure- Design- AMS/COVA” (MS Proj Detail V18 4-20 2001)
27. “Data Retention Requirements- Analysis- AMS/COVA” (MS Proj Detail V18 4-20 2001)
28. “Data Warehouse- - Analysis- AMS/COVA” (MS Proj Detail V18 4-20 2001)
29. “Data Warehouse- - Design- AMS/COVA” (MS Proj Detail V18 4-20 2001)
30. “Security Team - Application Security- Define and document user security roles and responsibility - COVA/AMS” (MS Proj Detail V18 4-20 2001)
31. “Security Team - Application Security- Define security management roles (AMS vs. COVA) - COVA/AMS” (MS Proj Detail V18 4-20 2001)
32. “Security Team- Application Security- Define security process - COVA/AMS” (MS Proj Detail V18 4-20 2001)
33. “Marketing and Communications Team - Supplier Marketing- Finalize eVA Marketing Plan - AMS/COVA” (MS Proj Detail V18 4-20 2001)
34. “Process Modeling, Process Mapping, Flow Charting, Decision Charts, TQM, Reengineering: We'll take ideas from all of these & apply them in the best way to fit your business/people.” (Seivert 2000)
35. “Capture professional experiences in knowledge base, acting as a source for help and lessons learned.”
36. “HOW TO DRAW the model I'll talk with you about 3 styles
Consult: generic, fancy, theoretical, can't be understood by itself
Consolid: Take pieces of other styles, mix with good dose of skepticism
Yours: what works for you, steal from me & everyone else” (Seivert 2000)
37. “Future eVA functionality will allow sharing of data between the eVA Purchasing and Vendor Data Warehouses and agency business systems. Information provided on your
financial and purchasing systems will help your Agency Adoption Team to advise you on configuration decisions you make that may affect this future functionality.”  (eVA ImpGuide Official 4-9 2001)

38. “While the team was still conceiving of the concepts for e-procurement in Virginia, they held brainstorming sessions with both suppliers and buyers across state government, local government, and the supplier community. They solicited ideas and feedback on the concept of operations and on the reverse funding model, which was a new idea in many quarters. This proof-of-concept tour helped to build consensus and a sense among government participants, particularly, that their ideas could affect the project’s direction.” (Lake 2006)

39. “These focus areas—executive sponsorship, stakeholder collaboration, project marketing, training, respect for decentralization, and an innovative project funding model—are important facets of any large technology solution that is intended to fundamentally change the way that government does business.” (Lake 2006)

40. “cross-governmental design team took the initial concepts and the group session results and turned these into a detailed RFP” (Lake 2006)

41. “Governor Jim Gilmore before me promulgated an executive order in May 2000 that laid the groundwork for building eVA as a prime element of a broad e-government vision.”

42. “I quickly recognized that with more visibility and use, this solution had the potential to serve as a symbol for “government done right”—a businesslike approach that utilizes technology for better government performance.” (Lake 2006)

43. “The Commonwealth’s procurement function will remain decentralized and close to the customer permitting a greater understanding of customer requirements and flexibility in meeting those requirements. Agencies, institutions and public bodies (COVA Entities) will develop creative and innovative procurement approaches to improve customer support.” (Barnett 2000)

44. “At the same time, there will be a hosted web based procurement solution that will support the decentralized procurement environment through an electronic procurement portal on the Internet. This portal will allow COVA Entities and vendors to access information needed for conducting business in the Commonwealth including solicitations and contract awards. The portal will host tools such as central vendor registration and the electronic mall for on-line buying. These tools will enable the Commonwealth to leverage its buying power through increased competition. Through the procurement portal the Commonwealth will be able to conduct business in a decentralized manner while capturing the efficiency and effectiveness of a centralized organization. This solution will enable COVA Entities to obtain goods and services easier, faster, and at the best value.” (Barnett 2000)

45. “funding provided for these systems did not pay for line agency costs.” (JLARC 2003)

46. “EVA is not owned by the Commonwealth, but is instead provided by a service contractor, American Management Services (AMS).” (JLARC 2003)

47. “2003 eGov Magazine's Government Services Administration Trailblazer Award” ("Other eVA Awards" 2009)

48. “2003 State Government Innovator Award By Massachusetts Institute Of Technology and Accenture to honor best practices in existing services delivered via the Internet. Recipients were selected from nearly 200 nominations from across the United States” ("Other eVA Awards" 2009)

49. “2002 Named one of the nation's "Best in Breed" technology projects by The Center for Digital Government” ("Other eVA Awards" 2009)
50. “2002 Gold Award For Innovation In Technology at the 2002 annual Commonwealth of Virginia Information Technology Symposium (COVITS)” (“Other eVA Awards” 2009)
51. “2003 Cost Effectiveness Award from the National Electronic Commerce Coordinating Council” (“Other eVA Awards” 2009)
52. “Because our technical staff would brainstorm and white-board problems with their staff, rather than simply receiving a technical design that was prepared according to our RFP specifications, we produced a more flexible result.” (Lake 2006)
53. “A public-private partnership like this simultaneously encourages one’s investment in the other party’s interests and a better ability to ensure one’s own.” (Lake 2006)
54. “The business leaders determine the needs and drive the project, but at the same time they are in lock step with technology and finance to make the needs a reality. Members of the team are free to provide their insights into any area, whether it is their discipline or another. This kind of interactive exchange of information and mutual respect by every member for the insights of the other members has resulted in a formidable team that has overcome every challenge. This strong teamwork has been crucial to the success of this project.” (Lake 2006)
55. “14.4 a and b are revised concerning purchases from mandatory sources, mandatory use contracts, optional use contracts, and pricing agreements through the use of eVA by July 1, 2002, to the fullest extent possible.” (Bell 2002)
56. “eVA uses a reverse funding model that has not required up-front appropriations, which has been critical to our ability to continue its development despite the Commonwealth’s intense budgetary constraints. The funding streams are two: suppliers pay a 1% transaction fee, capped at $500 per order; and they also pay registration fees annually. This model was developed through focus groups with large and small suppliers who were asked what they would be willing to pay for value-added electronic commerce services like the ones offered through eVA.” (Lake 2006)
57. “Another contract in which payments were not tied to deliverables was the eVA electronic procurement project at DGS. The rationale for not doing so was that with a benefits funding model, the State thought that the vendor would have sufficient incentive to produce the deliverables because payments to the vendor would be tied to the successful implementation of the system. However, it was subsequently determined that without payments tied to deliverables, the vendor was providing only a minimal effort in meeting the requirements of the contract. As a result, the contract was modified to specifically tie payments to deliverables.” (JLARC 2003)
58. “Fourth, but not least, some of my cabinet secretaries and agency heads have also become personal and public eVA advocates in their own right. The Secretary of Administration and the Secretary of Technology immediately became visible proponents of the efficiencies and economies of the system. They take this message to many audiences, including the Virginia Legislature. They work to build knowledge of and awareness of eVA’s benefits with our legislative stakeholders, ensuring that legislators understand the value of eVA’s efficiencies and creative reverse funding structure in our tremendously constrained economic times.” (Lake 2006)
59. “COVA desires to receive proposed Solutions that promote process and workflow efficiencies; the integrity, impartiality, and openness of COVA’s procurement activities; and compliance with applicable provisions of the Code of Virginia including the Virginia Public Procurement Act and the Uniform Electronic Transactions Act. Notwithstanding this vision, it is not COVA’s desire to automate the existing process.” (Barnett 2000)
60. “>30% participation & awards to certified SWAM with Quick Quote sourcing events” (Seivert 2007)
61. “We found that the benefits of the interdisciplinary design team went beyond the obvious one of ensuring that all stakeholders have a voice. Because of the team members’ advocacy for the business needs of vastly different environments, we developed superior and demanding requirements that the system be operational for all possible business users.” (Lake 2006)
62. “User training is essential in any technology implementation; on a procurement project, the training challenge extends to both government and private sector users. For our government purchasing organizations, our early classroom-based “train-the-trainer” approach proved unworkable in producing the competencies required—because what was really needed was deeper cultural change.” (Lake 2006)
63. “On the supplier side, we have offered online materials and targeted training. This has worked well enough to build the base of 9,000 vendors who provide about 80% of the goods and services that the Commonwealth purchases.” (Lake 2006)
64. “Market Basket savings FY01 – FY03: $45.5 million” (Seivert 2007)
65. “the Traditional approach - thou shalt play. New procurement rules and policies; Governor directives; Presentations to upper management; End user training; Spend targets and monitoring” (Seivert 2007)
66. “the ‘Sell Themselves’ approach - steer from the rear. Long term success meant Win them over…we had to help them find their ‘own’ Vision. And since “Value” is relative…we got specific and found it from their perspective; How ? by identifying where they ‘suffer’ in their existing processes…by identifying what specific costs can be improved…” (Seivert 2007)
67. “Buyer-side with users – used their examples in training to demonstrate improvements with managers – we took their business issues and demonstrated the business case” (Seivert 2007)
68. “Vendor-side We recognized that it’s all about more business and saving money… getting known; new customers; new opportunities; faster orders; faster payment we stood up business support, not just technical support we held proactive meetings to show them how we offered training/ briefing materials that emphasized their perspective of better.” (Seivert 2007)
69. “Bob’s statement that government is not just a “single business,” but is actually comprised of many different “lines of business” tweaked my interest.” (Hansen 2007b)
70. “Unburdened by the misguided belief that tighter controls produce desired results, the Commonwealth brought a service mentality or attitude to the project. While there is almost always varying degrees of skepticism whenever, as Bob put it “big brother” initiates a program, the genuine effort to communicate with individual departments was invaluable in achieving the necessary buy-in for eVA’s success.” (Hansen 2007b)
71. “This doesn’t mean that Virginia did not ultimately establish a mandate which required individual stakeholder adherence. What it does mean is that by the time the mandate was introduced (which was well into the initiative), the majority of obstacles had been identified and removed. So while participation wasn’t “voluntary,” by the time eVA had gained critical mass it provided the right measure of departmental flexibility within a centrally established framework. In short, potential issues of compliance were addressed through a productive and meaningful “all for one, one for all” dialogue.” (Hansen 2007b)
72. “Now I do not want to mislead you into thinking that the Commonwealth of Virginia did not experience a degree “pushback” from the vendor community. Quite the opposite, as incumbent suppliers (especially the larger organizations) saw the consolidation strategy as a direct threat to their established revenue streams with individual agencies.” (Hansen 2007c)
“Despite these challenges combined with what was described as the significant “lobbying power” of the larger suppliers who were pushing the Commonwealth to rethink its consolidation approach, the overall commitment to the eVA vision remained strong. I doubt that this would have been possible if the sincere effort to understand the objectives of all internal stakeholders had not been the cornerstone of the eVA initiative from the beginning.” (Hansen 2007c)

“The most significant discovery is that the challenge to achieving success is it is not about the technology, it is about changing the culture. The technology exists to accomplish end-to-end procurement and meet all of the business needs. The greatest hurdle is convincing buyers and suppliers of the need to conduct business electronically and to get their buy-in to change the existing process. This issue combined with the age-old issue faced of “not invented here” has become the most significant challenge to Virginia achieving success. Virginia has met this challenge and overcome it by involving all of the different groups upfront in the design of eVA. This has fostered an ownership for the solution and greater support in changing the procurement process.” (Bell 2003b)

“On March 6, 2001, the governor’s Chief of Staff issued a memorandum which “strongly urged” agencies to “take advantage of the many benefits of electronic procurement and Virginia’s landmark eVA initiative.” DGS states that this memorandum, in conjunction with Executive Order 65, mandated the use of eVA by all State agencies. However, agencies continued to believe that participation was optional.” (JLARC 2003)
5.3 EMBEDDED CASE 2: The Implementation Phase of eVA

The eVA project was the first of its kind to integrate all aspects of electronic procurement (e-Procurement) and consisted of posting online supplier catalogs, handling bids, facilitating payments and providing contract data. The eVA project was developed to support the needs of suppliers and buyers and was accomplished by obtaining input from project onset (Figure 5.2).

Figure 5.2 eVA Portal
Reproduced from the (eVA ImpGuide Official 4-9  2001)

“The initial rollout had 6 early adopter agencies, 600 users, 400 registered suppliers and 70 catalogs, earning the distinction as one of the fastest procurement system rollouts ever achieved in the nation.” ("Commonwealth of Virginia - eVA" 2002)
Empirical Test #2: Results of Testing the UPA Propositions on eVA in the Implementation Phase

eVA was released with limited functionality in March 2001. Full implementation was achieved in January 2003. From March 2001 until January 2003, solution development and solution implementation occurred simultaneously.

Table 5.6 eVA Case Study Independent Variable (IV) & Results in the Implementation Phase

<table>
<thead>
<tr>
<th>Independent Variable - User Participation Approach (UPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What role has control over the system implementation process?</td>
</tr>
<tr>
<td>o Overall fit continues to be the Participatory Design Approach (i.e., multiple change agents (vendor lead (AMS/CGI), IT lead and a functional lead (COVA)) jointly controlling the project). AMS was sold to CGI in 2004. (E92, E94, E95)</td>
</tr>
<tr>
<td>• What roles are found in the goal-directed social network?</td>
</tr>
<tr>
<td>o Contract renegotiation re-established change agent roles as joint partners; the participant role encompasses end users, which may include management users if they are application users. Stakeholder roles may or may not be directly involved in eVA activities but, if stakeholders become a change agents and/or participants, they are grouped into teams that perform eVA implementation activities. (E115, E116, E117)</td>
</tr>
<tr>
<td>• In what context does the approach originate?</td>
</tr>
<tr>
<td>o A custom-built system was implemented for internal (buyers) and external (suppliers). In January 2002, when the new governor took office, eVA was declared an? underutilized foundation for bringing efficiency to government procurement. Underutilization was defined as not having enough state agencies using it routinely for purchasing and not having many registered vendors (those that regularly sold goods and services to Virginia agencies). (E90)</td>
</tr>
<tr>
<td>• What are the objectives of user participation in the project?</td>
</tr>
<tr>
<td>o To achieve central collaboration without threat to local autonomous agencies operating within their business rules. (E91, E110)</td>
</tr>
<tr>
<td>• What is the requirement elicitation process?</td>
</tr>
<tr>
<td>o Early establishment of collaboration mechanisms which continue to function. E92, E110, E118</td>
</tr>
<tr>
<td>o The design team evolves into a steering committee to offer feedback on specific concepts when important decisions must be made. (E92)</td>
</tr>
</tbody>
</table>
• How did the requirement elicitation occur?
  o As new functionality becomes available in eVA, the sponsor and leader work with
    the eVA Agency Adoption Team to plan, schedule, and implement future phases.
    (E117)

• What are the formal modeling tools?
  o The electronic purchasing component of eVA encompasses the formal
    procurement process of requisition initiation, solicitation development, bidder
    listing, bidding, reverse auctions, bid/RFP evaluation, and award. Effective
    workflow and approval functionality allows each organization’s business rules to
    be modeled. Buyers may specify accounting data, specifications, terms,
    conditions and any other information specific to the procurement. Vendors may
    choose to respond either by submitting an electronic file for import or by keying
    responses into an online eVA response form. (E119)

• What is the communication style?
  o Cooperative communication campaign, hands-on, collective methods of
    communication (demonstrate how), and communicate through documentation.
    (E102, E120)

• What project management guidance is evident on how to foster user participation?
  o Develop mutually beneficial solutions (E103)
  o Executive Sponsorship (E90)
    ▪ Governor support
    ▪ Executive Oversight Committee to provide senior support for the already
      strong eVA Project Team
  o Appropriate People to Participate (stakeholder collaboration) (E91, E94)
  o Consistent collaboration and adaptability, across all project phases and with all
    key stakeholders (E89, E91, E92)
  o Mentorship program (buyers) (E97, E98, E101)
    ▪ mentors who repeatedly visit offices personally and work side-by-side
      with buyers
    ▪ consultative approach to establish culture change helps people change, at
      whatever level of participation they require
  o online materials and targeted training (suppliers) (E99, E120)

User Participation
• What are some of the different types of participation activities involving participants,
  change agents, and stakeholders? (eVA ImpGuide Official 4-9 2001)
  Assign your Team Leader
  Review the Implementation Guide
  First Step Setup:
  ▪ Implementation team
  ▪ Top 25 vendors
  ▪ eVA users
Basic Description Derived From the Evidence

The preceding results (Table 5.6) contribute to the following description of the eVA UPA.

Requirement elicitation process:

Collaboration mechanisms established during development remain active. The design team evolves into a steering committee to offer feedback on specific concepts when important decisions must be made.

- Some stakeholders have become eVA advocates, but after the mandated use of eVA some stakeholders found other means to purchase. (E77)

- User (Participant) excited about rolling out eVA to more users. (E79, E82)
Where requirement elicitation occurs:

Meetings with buyers, vendors and suppliers were held regularly. User groups were established near the workplaces. A dedicated project room was set up at DPS headquarters for eVA project activities. eVA Agency Adoption Teams were established to offer buyer assistance at work sites.

Objectives of User Participation:

To achieve central collaboration to obtain buy-in and facilitate change without threatening the local autonomy of agencies to operate within their business rules.

Use of formal modeling tools:

Participants use the electronic purchasing component of eVA for modeling business rules.

Procedural guidance:

1. Develop mutually beneficial solutions.
2. Get executive sponsorship.
3. Have appropriate people participate.
4. Use a consultative approach to establish culture change.

Main Communication style:

1. A cooperative style of information exchange
2. Hands-on, collective methods of communication (i.e., training, UAT, etc.)
3. Extensive communication via documentation review (i.e., Official Implementation Guide, eVA Web site, etc.).
### Mediating Variable – Environmental Issues

- **What is the content (operational issues)?** For example, scale and scope of the IS project, time for development, financial resources available and top management commitment are major operational issues.
  - Executive support of eVA continued under Governor Mark Warner (2002) and Governor Tim Kaine (2006).
  - eVA is owned by an application service provider (ASP), American Management Services (AMS). CGI purchased AMS in 2004 (E121, E122).
  - A self-funded financial model was adapted into a new hybrid financial model.
  - Project schedule: (Seivert 2007)
    - February 15, 2001: implementation of Phase I functionality and services
    - December 1, 2001: implementation of subsequent phases
    - December 31, 2002: Complete requirements of the IRF/RFP

- **What is the context (project environment)?** For example, external (competitors, strategies, government legislator, technological innovation, etc.) and internal (human resources, history and culture of an organization, etc.) factors are major project environment issues.
  - Decentralized purchasing environment (local autonomy) for creating enterprise data and delivering efficiencies to all users (central collaboration). (E102)
  - eVA, the internet enabled e-procurement solution (*eVA ImpGuide Official 4-9 2001*).
  - eVA provides for single sign-on to all technical functions produced by a variety of integrated products which allow buyers and suppliers to seamlessly move from module to module. A multi-jurisdictional capability allows workflow customization to accommodate organization-specific, table-driven business rules, thus enabling table settings changes as rules change without need for code modification. eVA is a virtual system that requires a Web browser and uses HTML and XML standards for easy access and data portability. (E104, E105, E107)

- **What is the political environment?** For example, outside and inside negotiation, consultation, conflicts and resistance are known to impact change and, therefore, are considered part of the political environment.
  - Contract modification (E84)
  - User-focused and stakeholder-driven (E89, E93)
  - Technology change (E78)
  - Joint collaboration and adaptability (E94, E103)

#### Strategies for Change Agents

- **What are some of the strategies designed and executed by change agents?**
  - Targeted messaging approach, traditional approach, train-the-trainer approach and a decentralized approach continue to be used as needed. (Seivert 2007)
The case study suggests that eVA is a phased development and implementation project that has considerable overlap in the two phases. The phased approach allowed the eVA vision to remain consistent over time and the environmental issues to be intertwined into both development and implementation phases.

The eVA approach to user participation in a successful solution implementation is one that thrives on collaboration and adaptability. It is not a “one size fits all” approach because it must continuously adapt user participation to the unique character of specific business needs as change agents learn more about the business situation. The eVA approach to user participation is user-focused and stakeholder-driven.
Context in which the approach originates:

The vision of a customizable e-procurement solution is developed by change agents through a collaborative and adaptive effort that continues through numerous gubernatorial changes. eVA continues to be used internally (buyers) and externally (suppliers).

Procedural guidance:

1. Use technology in a supporting role that accelerates process efficiency but does not define it.

3. Interface you’re the IS solution before attempting to integrate the solution.

3. Be willing to change you’re the system solution as knowledge grows.

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5.8 eVA Case Study Dependent Variable (DV) & Results in the Implementation Phase

**Dependent Variable – A Successful System Solution**

- What is the evidence of improved quality in the system solution?
  - eVA buyers can connect directly to GSA Advantage, the federal e-procurement system, and make electronic purchases from GSA Schedule 70. "Punchout" technology automatically creates the buyer's electronic purchase order, increasing accuracy and saving data entry time. (E85)
  - eVA captures and stores purchase history in its data warehouse. (E85)
  - Greater than 30% participation and awards to certified small, women and minority (SWAM) vendors with Quick Quote sourcing events (E60)

- What is the evidence of user acceptance in the system solution?
  - eVA use was declared mandatory instead of optional (July 2002) (E77)
  - 67% increase in publicly posted business opportunities (E125)
  - 176% increase in local governments publicly posting business opportunities (E125)

- What is the evidence of user satisfaction in the system solution?
  - Buyers and suppliers express satisfaction; for example:
    - “I recommend the process of purchasing through eVA to any purchasing officer who doesn’t have time to waste.” ("eVA Connections" 2008b)
    - “We love to use Quick Quote for informal bids with our purchase card.” ("eVA Connections" 2008b)
• What is the evidence of improved budget and schedule performance in the system solution?
  o Market Basket savings (Seivert 2007)
    FY01 – FY03: $45.5 million
    FY04: $69 million
    FY05: $44 million
    Annually thereafter > $30 million
  o In 2007, 80% to 90% of the total identified spending was processed through the eVA initiative. This represents a throughput increase from less than 1% to more than 80% in a 6-year period. (E109)
  o In 2008, PEW Center cites eVA for cost savings in 50-state report: Virginia Ranked #1 (E76).

• What is the evidence of increased feelings of ownership in the system solution?
  o Buyers and change agents express satisfaction. For example:
    ▪ “Everyone comes out ahead on projects like this,” said Bob Seivert. “Our buyers get to take advantage of the competitive federal pricing. GSA gets to optimize the potential savings for tax payers. And the GSA vendors get a chance at a wider customer base, through eVA.” ("Other eVA Awards" 2009)
    ▪ “I’d like to eventually have at least one buyer in every county department registered.”("eVA Connections" 2008b)
    ▪ A 2007 awards video tells the story of successful eVA vendors, and eVA’s local government users, and the City of Lynchburg. (E108)

**Basic Analysis Derived From the Evidence**

This study measures success as 1) quality, 2) user acceptance, 3) user satisfaction, 4) budget and schedule improvements, and 5) enhanced feelings of ownership. Results suggest that eVA has evidence of success that is easily documented. Numerous awards based on industry standards were helpful in defining success for an e-procurement solution. Self-reported budget and performance indicators are documented by numerous awards, presentations and government reports are presented on the eVA Web site.
Procedural guidance:

1. Obtain broad internal and external stakeholder involvement through collaboration
2. Successful IS solutions are user-focused and stakeholder-driven versus program-driven (technology).

EVIDENCE

The following data is taken from the eVA database, which consists of an assortment of eVA project documents, eVA portal, academic sources, trade journals, etc. The data extracted from the eVA database is an example of the evidence that supports the eVA Case Study tables shown above.

<table>
<thead>
<tr>
<th>Table 5.9 Implementation Phase Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Data &amp; Reference from an assortment of eVA project documents, eVA portal, academic sources, trade journals, etc.)</em></td>
</tr>
</tbody>
</table>

76. “PEW Center Cites eVA For Cost Savings In 50-State Report: Virginia Ranked #1” ("Other eVA Awards" 2009)
77. “Mandated use of the Commonwealth’s online purchasing system (eVA) has negated certain Purchase Card program efficiencies. As a result, some agencies are refusing to process Purchase Card transactions through eVA or choosing to purchase through eVA using means other than the Purchase Card.” (Bell 2003a)
78. “One of the greatest challenges was our culture in the Commonwealth, not just the technology,” according to Bob Sievert, director of the eProcurement Bureau and eVA Program Manager.” (Pollard & Seigler 2005)
79. “I am excited by rolling out eVA to more users.” ("eVA Connections" 2008b)
80. “Two successful eVA vendors, and the City of Lynchburg, one eVA's local government users tell their story in the awards video.” ("Other eVA Awards" 2009)
81. “Kudos to the eVA team! Keep it up.” ("eVA Connections" 2008a)
82. “DGS did not include end-users at other agencies in the decision to make a substantial change to the project (declaring the system to be mandatory instead of optional), and instead used the agency’s rule-making authority. However, the absence of end-user involvement in this major statewide project, which relies for its success on the cooperation of State agencies,
has led to significant resistance and a continued lack of user support for the project among State agencies and their suppliers.” (JLARC 2003)

83. “Today, there are more than 9,000 buyers, purchasing officers, and other users on eVA and since its initial introduction the Commonwealth has realized a savings of over $114 million.” (Pollard & Seigler 2006)

84. “Finally, the eVA project at DGS has been adversely affected because the original funding model did not function as intended, necessitating a contract modification and an additional assessment to line agencies.” (JLARC 2003)

85. “eVA and GSA established the first "punch-out" catalog between a state and federal e-procurement system. This collaboration yielded a direct link for eVA buyers to the GSA's Schedule 70, also known at Information Technology products and services. With this enhancement, eVA buyers can now connect directly to GSA Advantage, the federal e-procurement system, and make electronic purchases from GSA Schedule 70. "Punchout" technology automatically creates the buyer's electronic purchase order, increasing accuracy and saving data entry time. As with other electronic orders, eVA captures and stores purchase history in its data warehouse.” ("Other eVA Awards" 2009)

86. “According to the Journal of Public Procurement, the manual processing of a government purchase transaction typically costs $125.00 to $175.00 each time a buyer goes through the process, whereas, the typical electronic purchase transaction costs between $10.00 to $15.00 to process. Besides the cost per transaction, electronic purchasing has also reduced the order to delivery time making it on average 25% quicker than non-electronic purchasing.” (Pollard & Seigler 2005)

87. “Additional benefits reported by the buying entities include: helping to reduce maverick buying and spending, increase order accuracy, and improve procurement cycle times.” ("Commonwealth of Virginia - eVA" 2002)

88. “When eVA was first launched some were worried about the process being slow and the amount of time involved entering the data. However, through training and support services, users are increasingly becoming more proficient moving through the eVA electronic environment.” (Pollard & Seigler 2006)

89. “Another of the earlier concerns with eVA was registration. Feedback from vendors was that vendor registration was a complex and arduous task taking too long to complete. In an effort to pinpoint precisely what changes needed to be made, a user lab was conducted and business owners were videotaped as they tried to register in eVA. The general problems discovered included difficult navigation through the Web pages and unclear language. In less than six months, changes to the system were made reducing registration time. “We’ve [eVA] had our share of growing pains, but we have worked through them and have made the necessary changes to fit our users,” said Ron Bell, director of the division of purchases and supply for the Department of General Services. Registration has been simplified and the process will be improved even more when new modifications are introduced by the spring of 2006.” (Pollard & Seigler 2006)

90. “When I came in to office in January 2002, eVA was an underutilized foundation for bringing efficiency to government procurement. Not enough of our state agencies were using it routinely for their purchasing, and our registered vendor base did not include many of the companies who regularly sold goods and services to Virginia agencies.” (Lake 2006)

91. “We found that consistent collaboration, across all project phases and with all key stakeholders, has been an important success factor for eVA. Our objective was to achieve
central collaboration while not threatening the local autonomy of agencies to operate within their business rules.” (Lake 2006)

92. “During the implementation phase, we retained the design team as a steering committee so that they could offer feedback on specific concepts when important decisions had to be made. This forum helped iron out problems and offered cross-functional thinking, producing better solutions than a single business orientation would have produced.” (Lake 2006)

93. “In an effort to pinpoint precisely what changes needed to be made, a user lab was conducted and business owners were videotaped as they tried to register in eVA.” (Pollard & Seigler 2006)

94. “This Committee, with executive managers from the Commonwealth and American Management Systems, meets quarterly or more frequently as necessary to review the project.” (Lake 2006)

95. “The eVA project managers advise them of areas where executive level support is necessary to overcome roadblocks and the Committee provides strong advocacy for the project.” (Lake 2006)

96. “For our government purchasing organizations, our early classroom-based “train-the-trainer” approach proved unworkable in producing the competencies required—because what was really needed was deeper cultural change. Thus, we retained some classroom opportunities but moved to a mentorship model that has proven to be key. One-on-one mentoring has helped purchasing organizations learn to use the system and has dramatically improved the adoption rate in government.” (Lake 2006)

97. “Each of the 175 separate state purchasing offices across Virginia was assigned to one of eight DGS mentors, who repeatedly visit offices personally and work side-by-side with buyers to walk through transactions. This consultative approach is a realistic response to the challenge: we create culture change only through helping people change, at whatever level of participation they require.” (Lake 2006)

98. “After two years of mentoring, we are now able to return to the train-the-trainer model in state agencies and higher education institutions, as they bring more buyers and offices online.” (Lake 2006)

99. “On the supplier side, we have offered online materials and targeted training.” (Lake 2006)

100. “This has worked well enough to build the base of 9,000 vendors who provide about 80% of the goods and services that the Commonwealth purchases.” (Lake 2006)

101. “One training lesson learned is that we might have had earlier success in encouraging eVA use had we recognized sooner the need to move to a consultative, mentoring model. If we had organized our project and team around this need from the start and attacked the problem sooner, we would have had more success. However, we have also learned that change agents themselves must themselves be flexible, responsive, and adaptive to change.” (Lake 2006)

102. “Convincing agencies that eVA would support decentralization required an early communication campaign to the highest levels of the purchasing organizations.” (Lake 2006)

103. “Unquestionably, a reverse funding model requires a committed partnership that is outside the standard approach of a technology consulting firm that delivers a project, collects payment, and departs—a government must choose its business partner carefully. This approach drives both the Commonwealth and AMS to remain committed and engaged, because both are working to earn project revenue.” (Lake 2006)

104. “Although eVA appears to the supplier and the buyer as one common product set
accessed through a single sign-on to all functions, the functions are technically produced by different products and were integrated to allow user credentials to move from module to module while appearing to be seamless.” (Lake 2006)

105. “A second technical advance is eVA’s multi-jurisdictional capability. Every agency using eVA has its own workflow, approval levels, and accounting requirements—and each entity can maintain this autonomy because each has its own view of eVA. This customization can occur because the business rules for each entity are table-driven, so settings in tables can change as rules change—without need for software code modifications.” (Lake 2006)

106. “The software, customer support, and data center management is performed by AMS.” (Lake 2006)

107. “The data is normalized using the international XML standard and is easily taken into eVA for order delivery and data warehouse reporting.” (Lake 2006)

108. Two successful eVA vendors, and the City of Lynchburg, one eVA's local government users tell their story in the awards video. ("Other eVA Awards" 2009)

109. “In 2007 80% to 90% of the total identified spend was processed through the eVA initiative. This isn’t an intended rap against Ariba, but a throughput increase from less than 1% to more than 80% in a 6 year period paints a more effective picture than a nebulous 108% increase over either an unknown or inconsequential point of reference.” (Hansen 2007b)

110. “Virginia on the other hand was successful because the initiative champions realized early on that broad internal stakeholder involvement through collaboration was the only way to truly understand and therefore address end-user requirements. This synchronization of understanding internally was then extended to include external stakeholders such as suppliers.” (Hansen 2007c)

111. “While there are always numerous factors that can and in fact do influence outcomes, if I had to settle on one such factor it would be the aforementioned commitment to understand and respond to stakeholder interests.” (Hansen 2007a)

112. “I doubt that this would have been possible if the sincere effort to understand the objectives of all internal stakeholders had not been the cornerstone of the eVA initiative from the beginning.” (Hansen 2007a)

113. “What made Virginia’s model interesting is that in the first 4 years of the contract, the vendor CGI (formerly American Management Systems) absorbed the bulk of the upfront implementation costs. Hungry for business, CGI accepted the Commonwealth’s offer to be paid a percentage based on the volume of orders processed through the system. This of course provided CGI with the necessary impetus to ensure that eVA became “effectively” operational as quickly as possible.” (Hansen 2007a)

114. “The most significant discovery is that the challenge to achieving success is it is not about the technology, it is about changing the culture. The technology exists to accomplish end-to-end procurement and meet all of the business needs. The greatest hurdle is convincing buyers and suppliers of the need to conduct business electronically and to get their buy-in to change the existing process.” (Bell 2003b)

115. “Each agency needs an Executive Sponsor. This is the executive-level decision maker who will follow the overall implementation plan and will work with the eVA Executive Committee on any issues that arise.” (eVA ImpGuide Official 4-9 2001)

116. “As new functionality becomes available in eVA, the sponsor and leader will both work with the eVA Agency Adoption Team to plan, schedule, and implement these future phases.” (eVA ImpGuide Official 4-9 2001)
117. “There is also a strong partnership between the ASP, AMS and the commonwealth of Virginia. Although contractually based, the project still could not be successful unless there was a strong collaboration and team effort between the contractor and Virginia. By being flexible within the framework of the contract, both partners have helped each other to succeed.” (Bell 2003b)

118. “Today the eVA Program continues to meet with users, both buyers and suppliers, to obtain their input as the program evolves because eVA is designed to grow with technology and is constantly being enhanced based on their input.” (Bell 2003b)

119. “The electronic purchasing component encompasses the formal procurement process of requisition initiation, solicitation development, bidder lists, bidding, reverse auctions, bid/RFP evaluation, and award. Effective workflow and approval functionality allows each organization’s business rules to be modeled. Buyers may specify accounting data, specifications, terms and conditions and any other information specific to the procurement. Vendors may choose to respond either by submitting an electronic file for import or by keying their response into an online eVA response form.” (eVA ImpGuide Official 4-9 2001)

120. “Training materials, including PowerPoint presentations and hands-on exercises, have been developed and are now available. An independent self-guided, web-based training program is being developed and is expected to become the primary training medium.” (eVA ImpGuide Official 4-9 2001)

121. Ron Bell, the Director of Purchasing and Supply for the Virginia Department of General Services, noted the importance of the partnership established between the Commonwealth and CGI: “The success of the Commonwealth's e-Procurement Program, eVA, is attributed to the blending of a talented, dedicated team, a strong commitment from our private sector partner, and the trust and support of our Governor and his entire staff. Our success is also due to a number of agencies and institutions who get the vision for e-Procurement and the promise of greater efficiencies.” ("CGI introduces ideal integrated procurement solution for the Commonwealth of Virginia" 2005)

122. “The project involved numerous stakeholders, including 171 state agencies and institutions of higher education and Fairfax County. This level of cooperation maximized the buying power of Virginia throughout the strategic sourcing implementation.” ("CGI’s Spend Management Strategy pays dividends for the Commonwealth of Virginia " 2007)

123. “This mentorship program was no small endeavor. Each of the 175 separate state purchasing offices across Virginia was assigned to one of eight DGS mentors, who repeatedly visit offices personally and work side-by-side with buyers to walk through transactions. This consultative approach is a realistic response to the challenge: we create culture change only through helping people change, at whatever level of participation they require.” (Lake 2006)

124. “the ‘Sell Themselves’ approach - steer from the rear ; Long term success meant Win them over…we had to help them find their ‘own’ Vision; And since “Value” is relative…we got specific and found it from their perspective; How ? by identifying where they ‘suffer’ in their existing processes… by identifying what specific costs can be improved…” (Seivert 2007)

125. “67% increase in publicly posted business opportunities 176% increase in local governments publicly posting business opportunities.” (Seivert 2007)
5.4 Summary

This chapter presents evidence supporting a UPA in a successful total procurement solution (eVA) and draws conclusions that contribute to building a description that can be documented in the UPA typology. The initial section of this chapter introduces a style and method similar to those used for the Markus and Mao (2004) study to present theoretical support for using the UPA process model as way to organize numerous complex variables in a total e-procurement solution. Thereafter, this dissertation reflects hypothetico-deductive logic to scientifically investigate and test the propositions (see Table 3.2) organized by the UPA model.

The empirical investigations and tests are organized by the UPA model, a device designed to result in a broad (not deep) descriptive case study and social network analysis of eVA. Use of UPA propositions constrains this study methodologically by including the most valid descriptive data while ignoring other descriptive data. eVA case study tables are based on the table shell (Table 4.3) presented in chapter 4. Evidence tables contain data identified and referenced from the eVA data collected. This information completes the table shell requirements, and the results form the basis for an eVA UPA. Evidence presented within the chapter assists the reader during validation of data analysis and resulting conclusions. It also prepares the reader information presented in Chapter 7.
CHAPTER 6 – SOCIAL NETWORK ANALYSIS OF eVA

6.1 Introduction

In this chapter, the emergence of a single, directed, binary social network describing the flow of information among 10 formal roles identified during a successful system solution eVA project conducted in a public organization is considered from a social network perspective. Network data is derived from multiple, dissimilar sources (undirected, multiple ties, valued ties, etc.), and each analysis uses measures that best capture answers to the research questions posed in the study. A surprisingly large amount of information can be extracted from a single binary matrix when using the basic graph concepts embedded in Ucinet and NetDraw software.

Descriptive Analysis of the Embeddedness of eVA

In social network analysis, the concept of *embeddedness* argues that work-related transactions and/or activities tend to overlap with social relations (Granovetter 1985). The work-related activities under investigation involve the activities that concern the development and implementation of a successful e-procurement solution (eVA) embedded in a public sector environment. The substantial investment in information technology (IT) for hardware, software and manpower for this procurement setting resulted from a management belief that IT is a driver for improved financial viability for procurement in the COVA. The back story focuses on true collaboration between stakeholders and reflects a strategy shift from technology-driven efforts to stakeholder-driven efforts. The eVA project team made it happen and can boast of successful teamwork.
If one thing has made the eVA project a success, it is the strong teamwork between all disciplines forming the eVA Project Team. It is absolutely essential that the team for this kind of project include procurement, technology, and finance. These members have worked closely together to support each other and the project, and the results have been phenomenal accomplishments with very limited resources. The business leaders determine the needs and drive the project, but at the same time they are in lock step with technology and finance to make the needs a reality. Members of the team are free to provide their insights into any area, whether it is their discipline or another. This kind of interactive exchange of information and mutual respect by every member for the insights of the other members has resulted in a formidable team that has overcome every challenge. This strong teamwork has been crucial to the success of this project. (Lake 2006)

The rapidly evolving fields of procurement and IT affect the operational efficiency of government and competitive positioning of suppliers. To keep pace with constant change and effectively support high quality procurement mandated by the state, the Department of General Services division of purchase and supply (DPS) revisited redefined the COVA procurement vision. The e-procurement project that resulted, which included user participation as a critical component, determined the focus of total procurement solution efforts needed as well as operational activities and resulting projects of the department. Thus, this dissertation, where based on a social network perspective, suggests that the eVA project is embedded in a social network and, therefore, that patterns of activities and processes within and between participants and change agents may depart from what might be expected from a purely economic perspective.

6.2 The Emergence of a Social Network

Another major contributor to the emergence of a social network is goal-directedness. Goal-directedness is described as involving relationships that are formed to achieve, plan, coordinate or decide on individual or collective activities (Kilduff & Tsai 2003; Salancik 1995). Analysis of the e-procurement setting RFP and eVA related documents suggest that a social
network that consisted of a variety of DPS roles began emerging as a result of the executive order signed by the governor of Virginia to implement a total procurement solution.

The following information is adapted from the DPSStaff (2001) excel spreadsheet. It contains an eVA function, the eVA team that worked on the development and implementation of that function, and the participation dates of the team.

<table>
<thead>
<tr>
<th>eVA Function</th>
<th>Development and Implementation Teams</th>
<th>Participation Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>eVA Lite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proveout/Test</td>
<td>*SaGl (B), NkNa (AMS)</td>
<td>6/15 - 8/21</td>
</tr>
<tr>
<td>Decision Package</td>
<td>*BbSt (BD)</td>
<td>8/22</td>
</tr>
<tr>
<td>Analytic Reporting</td>
<td>*GKr (BM), WnMl (B), MaMo (TS), PaCe (TS)</td>
<td>8/16 - 10/24</td>
</tr>
<tr>
<td>(Viador)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bid List</td>
<td>*JnBd (B), PIHs (PM)</td>
<td>6/15 - 9/10</td>
</tr>
<tr>
<td>Change Order Analysis</td>
<td>*PtTt (B), DeGr (PM), BbSt (BD)</td>
<td>8/1 - 9/15</td>
</tr>
<tr>
<td>(eMail)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract &quot;Tru-ing&quot;</td>
<td>*ByBt (B)</td>
<td>8/1 - 9/30</td>
</tr>
<tr>
<td>Custom Workflow</td>
<td>*GKr (BM), MnLr (TM)</td>
<td>6/15 - 9/3</td>
</tr>
<tr>
<td>Data Controller, Web</td>
<td>*MnLr (TM)</td>
<td>7/30 - 10/24</td>
</tr>
<tr>
<td>Data Warehouse</td>
<td>*MnLr (TM), ByBt (B), BbSt (BD)</td>
<td>6/15 - 12/14</td>
</tr>
<tr>
<td>eMail Push</td>
<td>*Jan Bond, Diane Coles, BbSt (BD)</td>
<td>6/15 - 8/27</td>
</tr>
<tr>
<td>Fixes/Enhancements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eProcurement-Prototype</td>
<td>*SaGl (B), EdPn (B), JyWe (B), ByBn (B), JkAg (B), ByBt (B), GlKr (BM), CeAn (C)</td>
<td>9/3-9/30</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eProcurement-DPS</td>
<td>*ByBt (B), BbSt (BD), GlKr (BM)</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenditure Approver</td>
<td>*SaGl (B), MnLr (TM)</td>
<td>8/2001</td>
</tr>
<tr>
<td>Bug UAT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filters 2 &amp; 3</td>
<td>*TyTe (BM), BbSt (BD), WnMl (B)</td>
<td>8/2001</td>
</tr>
<tr>
<td>Interfaces/Integration</td>
<td>*AdKk (TS), MnLr (TM), EeAn (PM), BbSt (BD), JnFs (TD)</td>
<td>6/15 - 12/31</td>
</tr>
<tr>
<td>P.O. Print Format</td>
<td>*WnMl (B), PeLg (C)</td>
<td>8/6 - 9/3</td>
</tr>
<tr>
<td>Changes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCard Only Signer Rule</td>
<td>*GyJn (B), TaOs (TS)</td>
<td>8/20 - 8/24</td>
</tr>
<tr>
<td>PCard Checkbox/Not Pcard Vendor Rule</td>
<td></td>
<td>9/10 - 8/14</td>
</tr>
<tr>
<td>PCard Self-Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public/Private Portal</td>
<td>*GlKr (BM), BbSt (BD)</td>
<td>6/15 - 11/30</td>
</tr>
<tr>
<td>Receiving</td>
<td>*JnFs (TD), JkAg (AB), ByBn (AB)</td>
<td>10/1 - 10/26</td>
</tr>
<tr>
<td>Enhancements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quick Quote</td>
<td>*ByBt (B), JeDa (B), MtMn (B), PIHs (PN), DeGr (PM), TyTe (BM)</td>
<td>9/17 - 10/12</td>
</tr>
<tr>
<td>Record Retention</td>
<td>*MnLr (TM), ByBt (B), PyMn (TS), EeAn (PM), JnFs (TD)</td>
<td>10/1 - 12/14</td>
</tr>
<tr>
<td>Task</td>
<td>Responsible</td>
<td>Start Date - End Date</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>User Admin. 2.0</td>
<td>*JnFs (TD), MnLr (TM)</td>
<td>9/10 - 12/3</td>
</tr>
<tr>
<td>Vendor Reg/Advantage/VSS'-Transition to Advantage 2.0</td>
<td>*JnBd (B), PlHs (PM)</td>
<td>8/20 - 8/24</td>
</tr>
<tr>
<td>- Assess Advantage 3.0/New VSS</td>
<td>*JnBd (B), PlHs (PM)</td>
<td>9/3 - 9/20</td>
</tr>
<tr>
<td>- New vendor data model analysis</td>
<td>*MnLr (TM), BbSt (BM), PlHs (PM), TmSi (AB)</td>
<td>9/3 - 10/26</td>
</tr>
<tr>
<td>Vehicle Contracts</td>
<td>*DeGr (PM), GyJn (B)</td>
<td>8/2001</td>
</tr>
<tr>
<td>VDOT Fuel Contracts</td>
<td>*TyTe (BM), TmSi (AB), DkKd (B), BbSt (BD)</td>
<td>8/2001</td>
</tr>
<tr>
<td>DPS Contracts Team</td>
<td>*DkKd (B), AnWr (B), JeDa (B), JyWe (B), PtTi (B), SlWs (B), JnSd (B), TyTe (BM), LaFl (C), PeLg (C), DeCs (C), CeAn (C)</td>
<td>8/1 - 3/1/02</td>
</tr>
<tr>
<td>Strike/Support Team</td>
<td>*GlKr (BM), SnCn (B), BbPe (B), EdPn (B), DkKd (B), MtMn (B), WnMl (B)</td>
<td>7/30 - 3/1/02</td>
</tr>
<tr>
<td>eVA NewsBytes</td>
<td>*KnSr (C), CeAn (C)</td>
<td>8/1 - 12/31</td>
</tr>
<tr>
<td>Registration Cleanup</td>
<td>*MnPn (C), ChYl (C)</td>
<td>8/1 - 4/1/02</td>
</tr>
<tr>
<td>Vendor Support/Paper Reg.</td>
<td>*DaNa (C)</td>
<td>8/1 - ongoing</td>
</tr>
<tr>
<td>DPS Contracts Web Update</td>
<td>*CeAn (C), PeLg (C)</td>
<td>8/1 - 4/1/02</td>
</tr>
<tr>
<td>DPS Contract Catalog Coord.</td>
<td>*LaFl (C)</td>
<td>8/1 - 4/1/02</td>
</tr>
</tbody>
</table>

Note: the asterisk (*) indicates the designated change agent.

The team information above is coded into matrices using the Ucinet software. These matrices are mathematical algebraic representations of relational data. The basic form is a sociomatrix (also called adjacency matrix, (e.g., figure 6.4). It is a tabular display, typically a square array of numerical elements arranged in rows and columns. Social network data is stored in an adjacency matrix. Commonly, the [i,j] element of the adjacency matrix corresponds to the interaction of actor i to actor j. The rows of the array are the COVA entity. The columns of the array are -- and note the key difference from conventional data -- the same set of COVA roles.
In each cell of the array describes a relationship between the COVA employees. The number one (1) shows the presence of a relationship and a zero (0) shows that no relationship exists. For example:

<table>
<thead>
<tr>
<th></th>
<th>SaGl</th>
<th>NkNa</th>
<th>BbSt</th>
<th>GlKr</th>
</tr>
</thead>
<tbody>
<tr>
<td>SaGl</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>AMS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BbSt</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GlKr</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

The following COVA roles (Table 6.1) are identified in the eVA data (DPSStaff 2001) as being present in the emerging eVA network (development and implementation teams) structure and composition. The development and implementation teams consist of end users (e.g., clerical support, DPS buyers, agency buyers, business managers, business directors, and procurement managers) and technical support (e.g., technical support, technical managers, technical directors, American Management Systems). Numerous participants represent each COVA role.

Table 6.1 COVA Roles at the beginning of the eVA Implementation

<table>
<thead>
<tr>
<th>COVA ROLE</th>
<th>Role Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clerical Support</td>
<td>(C)</td>
</tr>
<tr>
<td>Technical Support</td>
<td>(TS)</td>
</tr>
<tr>
<td>DPS Buyer</td>
<td>(B)</td>
</tr>
<tr>
<td>Agency Buyer</td>
<td>(AB)</td>
</tr>
<tr>
<td>Business Manager</td>
<td>(BM)</td>
</tr>
<tr>
<td>Business Director</td>
<td>(BD)</td>
</tr>
<tr>
<td>Technical Director</td>
<td>(TD)</td>
</tr>
<tr>
<td>Technical Manager</td>
<td>(TM)</td>
</tr>
<tr>
<td>Procurement Manager</td>
<td>(PM)</td>
</tr>
<tr>
<td>Vendor:</td>
<td></td>
</tr>
<tr>
<td>American Management Systems</td>
<td>(AMS)</td>
</tr>
</tbody>
</table>

For the analysis of social networks, it is often useful to examine graphs. Figure 6.1 shows the COVA di-graph (directed graph) generated by Ucinet and Netdraw software using the coded
DPSStaff (2001) data. This di-graph shows the formal social network (via information exchanges) between eVA teams at the beginning of the eVA implementation:

![Di-graph showing formal social network](image)

**Figure 6.1 Emerging eVA Project Team Information Exchange Socio-Gram (directed graph)**

Information exchange exists in the information domain—very different than the material domain. The material domain is concerned with things that are "conserved" in the sense that they can only be located at one node of the network at a time (Von Bertalanffy & Sutherland 1974). Movements of things (i.e., people, computers, money, etc.) between people and/or organizations are examples of material things which move between nodes -- and hence establish a network of material relations. Informational things are "non-conserved" (i.e., they can be in more than one place at the same time) (Von Bertalanffy & Sutherland 1974). For example, if a buyer knows something and shares it with another buyer, then both buyers now know it. In a way, the knowledge that is shared by the exchange of information may also be said to establish a tie between two buyer nodes. One needs to be cautious, however, not to confuse the simple
possession of a common attribute (e.g. buyer role) with the presence of a tie (e.g. the exchange of views between two persons on issues of procurement).

Participants, stakeholders and change agents (types of ego) can play different roles (Table 6.2), depending on network structure and composition. The following eVA roles are identified in the eVA raw data (DPSSStaff 2001):

<table>
<thead>
<tr>
<th>Role</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Agent (Team Leader)</td>
<td>(CA)</td>
</tr>
<tr>
<td>Participant</td>
<td>(P)</td>
</tr>
</tbody>
</table>

There are 10 COVA roles (Table 6.1) and only two user participation eVA roles (Table 6.2). Each shows a different perspective of the emerging eVA social network. Both are embedded in a "connected" social network, but the roles of change agent and participant are much more useful in this investigation of eVA’s success. Why? Because, by looking at
participants and change agents (both subsets of stakeholders actually given the chance to participate in the ISD activities), we gain insight as to how information exchange through eVA activities contributes to a successful solution. The change agent is of particular interest as this role often has the job of selecting good participants from among the stakeholders.

Change agents and participants are a subset of existing stakeholders. Table 6.3 shows the relationship of eVA change agents and participants to the COVA roles of managers, buyers, IS professionals, clerical support and the external vendor (AMS). Numerous participants represent each COVA role. For example, while some actors designated with COVA clerical support role are participants, some are also designated as change agents.

<table>
<thead>
<tr>
<th>EVA STAKEHOLDER ROLES</th>
<th>COVA ROLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Agent (CA)</td>
<td>Clerical Support (CS)</td>
</tr>
<tr>
<td>(Team Leader)</td>
<td>Technical Support (TS)</td>
</tr>
<tr>
<td></td>
<td>DPS Buyer (B)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant (P)</td>
<td>Clerical Support (CS)</td>
</tr>
<tr>
<td></td>
<td>Technical Support (TS)</td>
</tr>
<tr>
<td></td>
<td>DPS Buyer (B)</td>
</tr>
<tr>
<td></td>
<td>Agency Buyer (AB)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>VENDOR: American Management Systems (AMS)</td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE 6.1 AND 6.2 ANALYSIS:**

Change agents are the “people who play important roles in designing and executing participation opportunities for stakeholders” (Markus & Mao 2004). Analysis of the emerging social network suggests that change agents are represented by a variety of COVA and vendor
roles. They can decide who participates and how they participate (via surveys, focus groups, or on ISD project teams) and what participation techniques and tools (e.g., CASE, discussion aids, white boards) are used. In addition, a change agent is often the team leader or facilitator for the user participation process and may have the authority to resolve or remove participants if conflict occurs (Sabherwal & Robey 1993).

**FIGURE 6.1 AND 6.2 SUMMARIZED RESULT:**

1. The eVA social network is led by the change agent role.
2. The eVA social network consists of multiple change agents from varied business roles (i.e., analyst, vendor, user leads).
3. Participant roles emerge in the social network as the actual application users that perform development and/or implementation activities
4. Procedural Guidance: It is important to vary the skill sets among change agent and participants.

In Figure 6.3, there are four key spots in the directed graph. Key spots can be found by asking the question: if a node was removed, would the structure become divided into un-connected systems? These four key spots are referred to as "cutpoints." They may be particularly important to the eVA implementation because they act as brokers among otherwise disconnected groups. The divisions into which cutpoints divide a graph are called blocks.
It is important to note that these roles (CeAn, DeGr, GyJn, SaGl) can be more easily disrupted than networks with redundant paths. For example, if DeGr is removed from the eVa implementation, the social network splits into two groups (groups A and B). It follows then that, when a role from group A conducts/initiates meetings, discussions and presentations, group B has no relationship to group A; thus, the flow of information and/or ideas is disrupted if the only method of information flow is through DeGr to GyJn and TaOs.

**FIGURE 6.3 ANALYSIS:**

In the data set examined, analysis suggests that, of the four cutpoints, only one of the four appears to be interesting. Why? Cutpoints GyJn and DeGr play the role of connecting an
otherwise isolated single node (TaOs) to the other members of the network. Although this may not be an optimal network configuration, it is not unusual for occasional instances such as this to happen. Node CeAn is a little more interesting. It is an eVA change agent role (COVA clerical support role) that is tied to a very dense area of the network. A high degree of “in” and “out” ties exists, as well as more reciprocal ties than any other cutpoint. Reciprocal ties are important in a directed socio-gram because they show a higher likelihood of high quality information exchange. This suggests that CeAn has the potential to be very influential. The fourth cutpoint (SaGl) is interesting because it is the node tied to vendor (AMS) in the emerging social network. This suggest that cutpoint SaGl has the initial job of delivering the appropriate information to the vendor AMS.

Figure 6.3 clearly shows that not every possible connection is present. Therefore, "structural holes" are presented in the graph.

Opinion and behavior are more homogeneous within than between groups, so people connected across groups are more familiar with alternative ways of thinking and behaving. Brokerage across the structural holes between groups provides a vision of options otherwise unseen, which is the mechanism by which brokerage becomes social capital. (Burt 2004a)

A broker is the middle node (GyJN) of a directed triad (note that DeGr is NOT connected to TaOs). Another example of a middle node is (SaGl) of a directed triad (note that AMS is NOT connected to ByBt). Analysis results suggest that the cutpoints identified (red nodes) are also brokers. They emerge as administrative entities that act as brokers. They plan and coordinate activities of the network as a whole, thereby accumulating social capital.

Social capital is characterized generally as having ties to resource-filled others, but Burt (1992) redirected attention to the topology of a social network. He describes structural holes as a
lack of ties among others in the network and argues that spanning of structural holes provides the actual mechanism that can make weak ties have positive outcomes (Burt 1992a; Granovetter 1973). Burt’s topological view contrasts with the point of view (Coleman 1990) that suggests that a dense social network allows everyone to coordinate with each other to create emergent outcomes.

The notion of capital suggests that people can create and accumulate value for themselves and others. Resources that are productive are not just entities (e.g., things and people), but are also social relationships among people (Coleman 1988; Putnam 1993). Regarding information systems, social capital brings together a variety of research relating a person’s ties (or network position) to significant outcomes such as power, leadership, mobility, influence, and group performance (Burkhardt & Brass 1990; Chen 2007; Cohen & Prusak 2001; Huysman & Wulf 2004; Johnson 2007; Kianto & Kosonen 2007; Wasko & Faraj 2005; Widen-Wulff, et al. 2008; Ye & Agarwal 2003a, 2003b). Outcomes are an emergent side effect of previous activities and an enabler of future activities.

FIGURE 6.3 SUMMARIZED RESULT:

1. A different look at the network supports the need for a varied skill set. It also suggests that cutpoints should have a varied skill set.

2. Know your cutpoints and keep a strong partnership by having the right cutpoints in position. The right cutpoint is a node that channels critical information as needed by the project.

3. Results of the analysis suggest that the cutpoints identified (red nodes) are also brokers. They emerge as administrative entities that act as brokers. They plan and coordinate activities of the network as a whole, thereby accumulating social capital.
4. The change agent role guides participants in development and implementation activities and, as a result, often represents a powerful position in the network.

6.3 ADJACENCY MATRIX

Graphs are very useful in gaining an astute grasp of the important features of a social network. The more connections you have, the harder it is for graphs to help. Looking at a graph can give a good idea of what is going on, but descriptions cannot be precise. To achieve higher precision, Ucinet applies algorithms to calculate mathematical measures of graph properties. This makes working with an adjacency matrix (instead of using the graph format) necessary. The eVA data graphed in Figure 6.2 is shown as an asymmetric adjacency matrix in Figure 6.4. The larger the network, the more empirically rare are fully saturated networks (i.e. one where all logically possible ties are actually present).

From previous analysis and the matrix (Figure 6.4), there appear to be some differences among the nodes regarding how connected they are (compare node TaOs, technical support participant, to the role of ByBt, a change agent and business manager). ByBT is more likely to send information than receive it. As a result of the variation in how connected the roles are, some roles may be quite some "distance" from other roles. There appear to be groups of roles that differ in this regard (ByBt and BbSt seem to be in the center of the action; TaOs and PaCe seem to be more peripheral). Therefore, this dissertation examines the concept of centrality, a factor important to understanding power, ranking and inequality in social networks.
Betweenness Centrality

Betweenness centrality (of binary data) views a role as being in a central position to the extent that the role falls on the geodesic paths between other pairs of presented roles in the social network. In other words, the more people that depend on a particular role in the social network to make connections with other people, the more power that role has. However, if two roles are connected by more than one geodesic path, and the role is not on all of them, the role loses some power. Using Ucinet, it is quite easy to locate the geodesic paths between all pairs of roles—and
to count how frequently each role falls in each of these pathways. Ucinet calculates, for each role, the proportion of time they are located “between” other roles for the sending of information in the system solution data. This sum is a measure of role centrality. We can normalize this measure by expressing it as a percentage of the maximum possible betweenness that a role can have. The results from using Ucinet to calculate Freeman's betweenness measures for actors are shown in figure 6.5.

```
<table>
<thead>
<tr>
<th>Freeman Betweenness Centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input dataset: C:\Users\Angela\Documents\DataFiles\eAVATeam scarc</td>
</tr>
</tbody>
</table>

Important note: this routine binarizes but does NOT symmetrize.

Un-normalized centralization: 74.05  8.07

<table>
<thead>
<tr>
<th>Betweenness</th>
<th>nBetweenness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

| 3 | 174.993 | 12.728 |
| 20 | 95.573 | 11.853 |
| 16 | 100.000 | 100.000 |
| 15 | 40.000 | 1.822 |
| 17 | 63.972 | 3.409 |
| 11 | 46.404 | 2.901 |
| 13 | 46.350 | 2.728 |
| 1 | 35.457 | 14.677 |
| 7 | 77.473 | 1.947 |
| 21 | 70.000 | 1.024 |
| 41 | 78.370 | 2.396 |
| 19 | 69.000 | 0.946 |
| 14 | 69.000 | 0.946 |
| 8 | 46.000 | 0.946 |
| 7 | 46.000 | 0.946 |
| 15 | 46.000 | 0.946 |
| 44 | 46.000 | 0.946 |
| 13 | 46.000 | 0.946 |
| 24 | 46.000 | 0.946 |
| 16 | 46.000 | 0.946 |
| 29 | 46.000 | 0.946 |
| 26 | 46.000 | 0.946 |
| 20 | 46.000 | 0.946 |
| 21 | 46.000 | 0.946 |
| 34 | 46.000 | 0.946 |
| 20 | 46.000 | 0.946 |
| 36 | 46.000 | 0.946 |
| 37 | 46.000 | 0.946 |
| 38 | 46.000 | 0.946 |
| 40 | 46.000 | 0.946 |
| 4 | 46.000 | 0.946 |

DESCRIPTIVE STATISTICS FOR EACH MEASURE

<table>
<thead>
<tr>
<th>Betweenness</th>
<th>nBetweenness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

| 1 | 2 |

| 1 | 18.959 | 1.194 |
| 2 | 37.993 | 2.416 |
| 3 | 766.036 | 49.536 |
| 4 | 1420.043 | 5.835 |
| 5 | 726.036 | 297.954 |
| 6 | 5622.791 | 235.241 |
| 7 | 279.250 | 17.240 |
| 8 | 0.000 | 0.000 |
| 9 | 199.293 | 12.775 |

Network Centralization Index = 11.87%

**Figure 6.5 Betweenness Centrality for eVA Information Exchange**
FIGURE 6.5 ANALYSIS:

We can see a large variation in actor betweenness (from zero to 199.3) and some variation (std. dev. = 37.7 relative to a mean betweenness of 19). The overall network centralization is relatively high. This makes sense because it is known that most connections cannot be made without the aid of a broker; hence, there is a good amount of "betweenness." It follows that there is a lot of structural constraint (power) in this network. The change agents in the core of the structure (i.e., ByBt, BbSt, DkKd, etc.) appear more powerful than others by this measure. Clearly, there is a structural basis for these roles to perceive that they are "different" from other change agents in the population. Indeed, it would not be surprising if these nodes saw themselves as the main e-brokers (for the whole network) that plan and coordinate eVA activities. Therefore, betweenness power in the system is important for group formation and coordination.

The measure of betweenness centrality is another way to look at eVA change agents and examine their power. By definition, one would expect a change agent to have positional advantage, or power, to the extent that it falls on the shortest (geodesic) pathway. It is interesting to note, however, that centrality betweenness is a measure that can support the proposition that all change agents have different degrees of power. The premise behind this finding is that the more a change agent has the opportunity to broker information exchanges, the more it will translate into power.

FIGURE 6.5 SUMMARIZED RESULT

1. Change agents at the core of the structure (i.e., BbSt, DkKd, ByBt, etc.) appear by this measure to more powerful than others.
2. There is structural basis for the role of change agent to perceive that they are "different" from other change agents in the population.

**Flow Centrality**

It is important to note in the case where two of the identified roles want to have a relationship, but the geodesic path between them is blocked by a reluctant broker. When another pathway exists, blocked roles are likely to use the new pathway even if it is longer and less efficient.

In general, actors may use all of the pathways connecting them, rather than just geodesic paths. The flow approach to centrality expands the notion of betweenness centrality. It assumes that actors will use all pathways that connect them, proportionally to the length of the pathways. Betweenness is measured by the proportion of the entire flow between two actors (that is, through all of the pathways connecting them) that occurs on paths of which a given actor is a part. (Hanneman & Riddle 2005)

The flow betweenness centrality calculates the role and graphs flow betweenness centrality measures. Results of applying this to the health care system solution information exchange network are shown in figure 6.6.
<table>
<thead>
<tr>
<th></th>
<th>FlowNet</th>
<th>nFlowNet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39.625</td>
<td>2.560</td>
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<td>2</td>
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<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>191.714</td>
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<td>4</td>
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<td>2.379</td>
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<td>6</td>
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<td>0.000</td>
</tr>
<tr>
<td>9</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>10</td>
<td>36.476</td>
<td>2.338</td>
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<td>11</td>
<td>67.694</td>
<td>4.339</td>
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<tr>
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<td>0.000</td>
</tr>
<tr>
<td>13</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>14</td>
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<td>26</td>
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<td>27</td>
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<td>4.428</td>
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<tr>
<td>40</td>
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<td>0.000</td>
</tr>
<tr>
<td>41</td>
<td>19.952</td>
<td>1.279</td>
</tr>
</tbody>
</table>

Network Centralization Index = 11.403%

**FIGURE 6.6 ANALYSIS:**

Some roles are clearly more central than others, and the relative variability in flow betweenness of the roles is fairly great (the standard deviation of normalized flow betweenness is
34.8 relative to a mean of 10.1, giving a coefficient of relative variation). Flow betweenness has a relatively high amount of variation, with a network centralization index of 11.4%. The flow centralization index is slightly lower than the index for the betweenness measure that was based only on geodesic distances.

By the flow betweenness measure of centrality, change agent BbSt is clearly the most important broker-coordinator (mediator). DkKd, fairly important when considering only geodesic flows, appears to be less important. While the overall picture changes only slightly, the elaborated definition of flow centrality does provide a somewhat different impression as to the role most central in this network.

**FIGURE 6.6 SUMMARIZED RESULT:**

1. By the flow betweenness measure of centrality, change agent BbSt is clearly the most important broker-coordinator (mediator). DkKd, fairly important when considering only geodesic flows, appears to be less important.

2. In general, participants and change agents may use all pathways connecting them, rather than just geodesic paths. The flow approach to centrality expands the notion of betweenness centrality. It assumes that change agents and participants will use all pathways connecting them.

3. The measurements of centrality support the conclusion that the eVA social network is led by multiple change agents.
6.3 SUMMARY

This chapter uses social network analysis (SNA) to map and measure relationships and flows between stakeholders, change agents and participants assigned to specific roles in a successful system solution (ISD project).

SNA provides both visual and mathematical analysis of human relationships in the user participation process. Information is adapted from the DPSSStaff (2001) excel spreadsheet and coded. The spreadsheet tracks the eVA development and implementation teams, eVA tasks and participation dates. Two-dimensional diagrams called sociograms were generated using Ucinet and Netdraw software which calculates ties and displays relationships among change agents, participants and stakeholders in ISD (a bounded social system).

**Control over system design and design process:**

Analysis of Figures 6.1 and 6.2 suggests that the eVA social network is led by the change agent role. Measurements of centrality support the conclusion that the eVA social network is led by multiple change agents.

**Roles in a goal-directed social network:**

Analysis of Figures 6.1 and 6.2 suggests that the eVA social network consists of multiple change agents from varied business roles (i.e., analyst, vendor, user leads). Change agents collaborate with stakeholders as demonstrated in the adjacency matrix (Figure 6.4). The change agent role guides participants in development and implementation activities and, therefore, often occupies a powerful position (Figure 6.3) in the network. The participant role emerges in the
social network as the actual application-supported users that perform development and/or implementation activities.

Chapter 6 supports a more comprehensive mapping and examination of the richness and complexity of human behavior (Cohen & Manion 1989) during development and implementation of a successful system solution. Results reported in this chapter add value to future research underpinning creation of UPA decision models that guide establishment of social network structures that increase chances of a successful IS development and implementation system solution. These models may aid the quest to establish UPA best practices.
CHAPTER 7 – SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION

This chapter summarizes research and results reported herein and draws conclusions about the approach to user participation in the development and implementation of a successful e-procurement solution. In addition, the limitations of this study and proposed areas for future research will be discussed.

Dissertation Overview

This dissertation presents evidence supporting a methodological approach to the user participation process in a successful total procurement solution (eVA) and draws conclusions that contribute to a better understanding of value to be derived by requiring user participation when developing and implementing a successful system solution. This chapter is organized in line with the three research questions and summary of findings.

1. What is the approach to user participation in a successful IS solution?

The approach to user participation in a successful IS solution is one that thrives on collaboration and adaptability. It is not a “one size fits all” approach as it must continuously adapt as it “learns” more about the business situation from user actions and reactions to unique characteristics of specific business needs. The approach embraces change, rather than avoiding it, through the strategic placement of change agents who
thoughtfully incorporate end users as participants. The approach to user participation is user-focused and stakeholder-driven.

2. How does user participation contribute to a successful IS solution?

User participation contributes to a successful IS solution by creating an environment that is user-focused and stakeholder-driven. Such an environment prioritizes the needs of the end user as long as such needs are within the bounds of the business requirements and meet budget and performance schedules. It engages the user in significant meaningful involvement, therefore creating an opportunity to influence the user attitudes. It also establishes an effective arrangement of co-ownership where everyone shares equally in success or failure of the system solution. User participation focuses on enhanced quality, usefulness and usability of the system solution, as well as empowering end users to develop and adapt the solution themselves.

3. What is the formal social network in a successful IS solution?

A formal social network consists of multiple change agents from varied business roles (i.e., technical support, vendor, end users). The change agent role—the most connected role, is the central role and presents optimal opportunity to guide participants in development and implementation activities. The participant role includes actual application users (eVA end users) and the technicians who perform development and/or implementation activities.
Each question is related to the three broad objectives presented in the introductory chapter.

- Describe and extend the line of inquiry on user participation.
- Determine an exemplary approach to user participation in a successful IS solution.
- Develop guidelines that increase the chance of success in a specific IS solution.

As discussed in Chapter 3, this dissertation describes and extends the line of inquiry regarding user participation in numerous ways. First, a style and method similar to the Markus and Mao (2004) study is used to present theoretical support for using the UPA process model as way to organize numerous complex variables in a total e-procurement solution. UPA propositions (Table 3.2) were developed into a table shell (4.3) that served as a data collection guide, and the UPA model (Figure 3.3) was used to organize the variables.

This research is a mixed methods study. In Chapter 5, a case study approach is used to scientifically investigate eVA, a total e-procurement solution. The case study approach uses hypothetico-deductive logic (Lee 1989a, 1989b) as a basis to investigate (test) UPA propositions. It is a descriptive study that uses a comparative case study structure (Yin 1994). Chapter 6 introduces a social network perspective used to look at the emergence of a single directed binary social network that describes the flow of information among 10 identified formal roles (eVA Team) taken from a successful system solution conducted within a public organization. Social network analysis is used construct a different perspective to the approach to user participation. Mixed methods proved helpful to the investigation, but it also revealed the extreme complexity of such a broad analysis on user participation in eVA.

This dissertation is both a follow-up to the Markus and Mao (2004) theory building study of user participation and a new instance of focus on the actual approach taken to user participation. The investigation produces:
• a description of the exemplary approach to user participation in the development and implementation of a successful e-procurement solution; and
• a social network perspective of how the user participation approach informs the social network of a successful IS solution.

By analyzing the same propositions in the development and implementation phases, each phase could be viewed as a separate case embedded in the larger case as different instances of the same proposition can produce different results. The embedded case design is used to enhance insights into the eVA case. However, some aspects to this method of analysis need refinement to produce consistent results. This dissertation discusses these refinements in detail in the following concluding section.

Table 7.1 presents a summary that maps research activities conducted in this dissertation to the purpose of the activities.

Table 7.1 Summary Dissertation Research Map

<table>
<thead>
<tr>
<th>ORGANIZE</th>
<th>UPA Model (Figure 3.3) is used to effectively organize a plethora of existing user participation research (Table 2.2) into a descriptive investigation (chapter 5) of user participation approaches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCEPTUALIZE AND OPERATIONALIZE</td>
<td>Propositions (Table 3.2) and an UPA Typology (Table 3.3) are deduced from review of the literature. Propositions guide data collection and analysis. The UPA Typology (Table 3.3) is used to systematically arrange user participation approaches into categories (according to criteria or extrinsic information attributed to them) that aid management of user participation during information systems development.</td>
</tr>
<tr>
<td>ANALYZE</td>
<td>Case Study (presented in Chapter 5) supplies critical investigation of a successful system solution (eVA) organized by the UPA Model. Social Network Analysis (presented in Chapter 6) is a useful tool to visualize (eVA) and manage user participation in a successful system solution. SNA provides both visual and mathematical analyses of the eVA social networks.</td>
</tr>
</tbody>
</table>


**CONCLUSION**

Analysis from Chapters 5 and 6 result in a description of the approach to user participation in a successful e-procurement solution. It also contributes the descriptive information necessary to perform an adaptation to the UPA typology for comparative purposes. This typology offers guidelines from the traditional approach, the alternative user participation approaches put forth in Chapter 3 and guidelines of the eVA Collaborative Approach presented in this dissertation. Use of these guidelines can increase the chance of success in a specific IS solution.

7.2 A REVIEW OF THE FINDINGS

The following table summarizes the development phase and the implementation phase analysis of the case study results.

**Table 7.2 Summary of the Case Study Analysis**

<table>
<thead>
<tr>
<th>eVA (A Successful e-Procurement Solution)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Empirical Test 1) Development Phase UPA:</strong></td>
</tr>
<tr>
<td>Requirement elicitation process:</td>
</tr>
<tr>
<td>A design team was formed to follow an iterative and flexible collective process through research and via conferences, forums, focus groups, proof-of-concept tour, prototyping, interactive meetings and experimentation (i.e., user acceptance testing (UAT)).</td>
</tr>
<tr>
<td>Where requirement elicitation occurs:</td>
</tr>
<tr>
<td>Traditional and innovative methods (i.e., teleconferences, Internet forums, and on-site visits) were used to gather requirements in or near the participant workplaces and in a designated project team room.</td>
</tr>
<tr>
<td>Objectives of User Participation:</td>
</tr>
<tr>
<td>Change agents focused on solution design and quality (requirement gathering), enhanced usefulness and usability of the system solution and empowering end users to develop and adapt the solution themselves using an adaptive approach through interaction with participants (to obtain buy-in and facilitate change).</td>
</tr>
<tr>
<td><strong>(Empirical Test 2) Implementation Phase UPA:</strong></td>
</tr>
<tr>
<td>Requirement elicitation process:</td>
</tr>
<tr>
<td>Collaboration mechanisms established during development remain active. The design team evolves into a steering committee for feedback on specific concepts when important decisions had to be made.</td>
</tr>
<tr>
<td>Where requirement elicitation occurs:</td>
</tr>
<tr>
<td>Meetings with buyers, vendors, and suppliers were held regularly. User groups were established near the workplaces. A dedicated project room was set up at DPS headquarters for eVA project activities. eVA agency adoption teams were established to assist buyers at work sites.</td>
</tr>
<tr>
<td>Objectives of User Participation:</td>
</tr>
<tr>
<td>To achieve non-threatening central collaboration of local autonomous agencies (to obtain buy-in and facilitate change).</td>
</tr>
</tbody>
</table>
Use of formal modeling tools: Participants describe and draw workflows with “low tech” graphical tools. Change agents encourage participant involvement through use whiteboards, chalkboards or “use whatever works.”

Use of formal modeling tools: Participants use the electronic purchasing component of eVA for modeling their business rules.

Main Communication style:
1. Interactive exchange of information exists. 2. Stakeholders have a mutual respect for the insights of the other stakeholders 3. A large amount of communicate through documentation (website, PowerPoint presentations, etc.).

Main Communication style: 1. A cooperative style of information exchange 2. Hands-on, collective methods of communication (i.e., training, UAT, etc.) 3. A large amount of communicate through documentation (i.e., Official Implementation Guide, eVA website, etc.).

Context in which the approach originated:
The growth of the Internet and the dot.com influence inspired the vision of a custom e-procurement solution. The solution is developed by change agents through a collaborative and adaptive effort. eVA would be used internally and externally envisioned as Virginia’s total e-procurement solution.

Context in which the approach originated: The vision of a customizable e-procurement solution is developed by change agents through a collaborative and adaptive effort that continues through numerous executive (Governor) changes. eVA continues to be used internally (buyers) and externally (suppliers).

The following table summarizes the procedural guidance during the development and implementation phases suggested in the case study results.

**Table 7.3 Summary of the Procedural Guidance**

<table>
<thead>
<tr>
<th>eVA (A Successful e-Procurement Solution)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development Phase UPA:</strong></td>
</tr>
<tr>
<td>1. Establish a strong, innovative, and flexible core team that is multi-discipline and multi-skilled; 2. Get executive sponsorship; 3. Listen to all your stakeholders 4. Empower your users.</td>
</tr>
<tr>
<td>The e-procurement information system has a supporting role that accelerates process efficiency; but does not define it.</td>
</tr>
</tbody>
</table>
Social network analysis (SNA) maps and measures relationships and flows between stakeholders, change agents, and participants assigned to specific roles in a successful system solution (ISD project).

**Sociogram (figures 6.1, 6.2, 6.3) analysis suggests:**

1. the eVA social network is led by the change agent role;

2. the eVA social network consists of multiple change agents from varied business roles (i.e., analyst, vendor, user leads);

3. the participant role emerges in the social network as the actual application-supported users that perform development and/or implementation activities;

4. change agents emerge as administrative entities that act as brokers. They plan and coordinate activities of the network as a whole, thereby accumulating social capital; and

5. the change agent role occupies a powerful position in the network.

   o Change agents in the core of the structure appear more powerful than others.

**Mathematical analysis of figures 6.4, 6.5, 6.6 suggests:**

1. change agents collaborate with stakeholders (as demonstrated in the adjacency matrix);

2. there is a mathematical basis for the change agent roles to perceive that they are "different" from other change agents in the population. Some are more central than others;
3. measurements of centrality support the conclusion that the eVA social network is led by multiple change agents.

The following table synthesizes the analysis of the eVA social network results.

**Table 7.4 Summary of the Formal Social Network**

<table>
<thead>
<tr>
<th>eVA Social Network in a Successful e-Procurement Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control over system design and design process:</strong></td>
</tr>
<tr>
<td>The eVA social network is led by the change agent role. Measurements of centrality support the conclusion that the eVA social network is led by multiple change agents.</td>
</tr>
<tr>
<td><strong>Roles in goal-directed social network:</strong></td>
</tr>
<tr>
<td>The eVA social network consists of multiple change agents from varied business roles (i.e., analyst, vendor, user leads). Change agents collaborate with stakeholders as demonstrated in the adjacency matrix (Figure 6.4). The change agent role guides participants in development and implementation activities and therefore often has a powerful position (Figure 6.3) in the network. The participant role emerges in the social network as the actual application-supported users that perform development and/or implementation activities.</td>
</tr>
</tbody>
</table>

**7.3 Conclusions**

Among numerous findings of interest, three were of particular interest. First, it is evident from summary tables (Tables 7.2 and Table 7.3) in this chapter that there were numerous levels of user participation between the development phase and the implementation phase.

This dissertation reflects use of the Markus and Mao (2004) study to define system development success “as a high quality process of system development (methodologies used, interactions and conflicts, progress against schedules and budgets) and/or a high quality outcome of system development, namely a project, a system, or an IT artifact.” System implementation success is defined as a “high quality process of preparing the target user community for use of the system (often called “change management”) and/or a high quality “change” outcome”,

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namely that the intended users (regardless of whether they participated in development) adopt the system, and use it as expected.

Table 7.2 synopsizes the requirements elicitation process for comparison purposes. This process is defined as eliciting the requirements as to how a system should behave or a description of system properties or attributes. It can alternatively be a statement of what an application is expected to do (Sommerville & Sawyer 1997). At first glance, it would seem that the requirement elicitation process would be necessary only in the development phase, but analysis and results show that it remains important in the implementation phase.

The findings suggest that change management begins in the development phase. Evidence suggests that the methodologies used and progress against schedules and budgets remain extremely important to implementation success. For example, system development officially began in May 2000. eVA was released with limited functionality in March 2001. Full implementation took place in January 2003. Figure 7.1 illustrates a timeline for the development and implementation schedule of eVA (Seivert 2007). This dissertation concludes that considerable overlap exists between system development success and system implementation success.

![Figure 7.1 eVA Development and Implementation Schedule Reproduced from Seivert (2007)]
A comparison of the requirement elicitation process presented in Table 7.2 is important for two reasons: (1) development is still occurring during the implementation phase. (2) Concurrent development and implementation requires change agents to evolve to meet the increased demands due to the increased complexity.

The design team has an iterative and flexible collective process, but during the implementation phase it evolves into a steering committee, so that they can continue to offer feedback on specific concepts when important decisions had to be made. The evolution in the requirement elicitation process is one way that increased demands due to the increased complexity are met. Requirement elicitation occurs regularly between buyers, vendors, and suppliers. User groups were established near the workplaces and a dedicated project room was setup at DPS headquarters for eVA project activities. eVA Agency Adoption Teams were established, so that buyers could be assisted at their work site.

This study suggests that a flexible core team that is multi-disciplinary and multi-skilled is important to a successful IS solution. User-focus and being stakeholder-driven appear to be an important part of the core eVA values. This study revealed that during the development phase change agents focused on the solution design and quality (requirement gathering) using an adaptive approach through meetings with participants (to obtain buy-in) (Traditional Approach). By focusing on enhanced usefulness and usability (Contextual Design Approach), as well as empowering end users to adapt the solutions by themselves (End-User Development Approach), the change agents adapted their approach to user participation as needed.

This adaptive approach is achieved through cross-functional thinking and by embracing change, producing better solutions than a single traditional approach would have produced. This is important because the results of the case study show that the benefits of the interdisciplinary design team went beyond the obvious one of ensuring that all stakeholders have a voice.
(Participatory Design). It ensures that the change agents’ will promote the business needs of vastly different environments. The result is a collaborative and adaptive user participation approach that contributes to a successful system solution for all possible business users. Lastly, “a public-private partnership like eVA simultaneously encourages one’s investment in the other party’s interests and a better ability to ensure one’s own.” (Lake 2006) A public-private partnership like eVA results in the feeling of co-ownership.

The objective of user participation is to achieve central collaboration (to obtain buy-in and facilitate change), while not threatening the local autonomy of agencies to operate within their business rules. This conclusion is also supported by the modeling tools evidence. Participants describe and draw their workflow with “low tech” graphical tools. Change agents encourage participants to use whiteboards, chalkboards or” use whatever works.” Because change agents would brainstorm and white-board problems with their participants, rather than simply receiving a technical design (based only on the RFP) or requiring modeling tools that were difficult for non-technical change agents and/or participants to use, a more flexible, innovative and successful contribution would result.

Lastly, the results of the case study and social network analysis support the conclusion that consistent collaboration, with all key stakeholders, has been an important success factor for eVA. The case study and sociograms suggest that the eVA social network structure is led by numerous change agents from a variety of COVA role.

SNA suggests that change agents emerge as administrative entities that act as brokers. They plan and coordinate activities of the network as a whole, thereby accumulating social capital. The change agent role has a powerful position in the network. An interesting note to that is change agents in the core of the structure appear to be quite bit more powerful than others.
The participant role emerges in the social network as the actual application users that perform development and/or implementation activities.

Change agents collaborate with stakeholders. The case study reports evidence in the development phase and the implementation phase to suggest this conclusion. The social network analysis also supports this with the soicograms and a mathematical analysis. The measurements of centrality support the conclusion that the eVA social network is led by multiple change agents.

This dissertation concluded that the eVA development solution and implementation solution was led by multiple change agents from varied business roles (i.e., technical support, vendor, end users) in a stakeholder collaborative and adaptive effort. Government does go “beyond a mere org chart (Hansen 2008).”

The following summary table (Table 7.5) compares the synthesized cross-case results of this dissertation to Table 3.3. It is evident from Table 7.5 that the impact of user participation approaches in a successful development and implementation solution is significantly different from the four approaches identified in Table 3.3. This dissertation suggests that the major catalyst for this difference is evident in the eVA case study and social network analysis. Across cases it is suggested that change agents learned that they themselves must be flexible, responsive, and adaptive to change. They must be committed to understanding and responding to stakeholder interests (Hansen 2007c), which included support for decentralization within a centralized environment. Effective communication centered on the mentality of having an “open door,” which made the consultative and mentoring of participants another key success factor (Lake 2006). This led to all stakeholders feeling free to provide their insights into any area and fostered a discerning and interactive exchange of information and mutual respect for all the involved stakeholders.
Another important success factor was having the vision and the expertise (change agents) involved that could accurately define the business need (i.e., defined in the RFP) and understand the financial considerations. During the first four years of the contract, the vendor now known as CGI (formerly American Management Systems) absorbed the bulk of the upfront implementation costs. This provided CGI with the necessary impetus to become a “true stakeholder.” This led to another key success factor; an external vendor and a vested collaborator, with the same objective, that eVA must as quickly as possible become effectively operational. Today, eVA has evolved from an electronic purchasing tool to a data powerhouse used in e-procurement. The valuable data collected through eVA allows the Commonwealth to leverage its vast purchasing power to reduce costs for state and local government entities.

Successful IS solution:

1.) Business needs drive the vision.
2.) Finance considerations impact the solution.
3.) Internet and technology drive the solution.
4.) User participation impacts the solution.

![Figure 7.2 User Participation in a Successful IS Solution](image-url)
<table>
<thead>
<tr>
<th>Control over system design and design process</th>
<th>Coordinating roles in a goal-directed social network:</th>
<th>Context in which the approach originated</th>
<th>Objectives of User Participation:</th>
<th>Requirement elicitation process:</th>
<th>Where requirement elicitation occurs</th>
<th>Use of modeling tools</th>
<th>Main Communication style</th>
<th>Project management guidance for change agents on fostering user participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Analyst-led</td>
<td>Analyst-led (change agent role); Participant role: anyone who uses the system and is affected by it including management; participant is involved early in the process, but is largely passive</td>
<td>Custom systems developed and used internally</td>
<td>Focuses on the system design and quality (requirement gathering) in a structured manner through meetings with participants (to obtain buy-in) and change agents.</td>
<td>Traditional SDLC: collected early, usually through interviews, questionnaires, and iterative methods (i.e., prototyping and JAD)</td>
<td>Usually project team room; meetings are much like “focus group” settings</td>
<td>Apply formal data model descriptions using data modeling (IT) techniques such as data flow diagrams and modeling languages</td>
<td>Communicate through documentation</td>
<td>Methodologies, such as JAD: Sample of procedural guidance; Conduct meetings run by skilled change agents Get executive sponsorship Get appropriate people to participate Set clear, well-defined goals Define deliverables in advance</td>
</tr>
<tr>
<td>II. Joint Collaboration</td>
<td>Change agent role and participant role are equal partners; Participant role: actual application users—no management</td>
<td>Custom systems developed and used internally and sometimes externally</td>
<td>Focuses on the work environment as a socio-technical fit that enhances participants’ quality of work life.</td>
<td>An iterative collective process via prototyping and interactive experimentation.</td>
<td>In or near participants’ workplaces</td>
<td>Computers as tools and user-friendly discussion aids</td>
<td>Cooperative hands-on (communicate by doing), collective methods of communication</td>
<td>Sample of procedural guidance; Select different types of participants Provide a more creative change agent Visualize current workplace work activities, skills, experience Visualize possible workplace problems What-if to improve work conditions Prototyping</td>
</tr>
<tr>
<td>Change Agent-led</td>
<td>Multiple change agents from varied business roles (i.e., analyst, vendor, user leads). Change agents collaborate with all stakeholders. This role guides participants in development and implementation activities. Participant role: actual application users who perform development and/or implementation activities.</td>
<td>Internet growth and dot.com influence inspired vision of custom e-procurement solution. The solution would be developed by change agents and used internally and externally.</td>
<td>Focuses on the solution design and quality (requirement gathering) by change agents in an adaptive manner through collaboration with participants (to obtain buy-in and facilitate change) while not threatening the local autonomy of their business. Includes a focus on enhanced usefulness and usability of the system solution, as well as empowering end users to develop and adapt the solution by themselves.</td>
<td>Form a design team to conduct an iterative and flexible collective process through research and via conferences, forums, focus groups, proof-of-concept tour, prototyping, interactive meetings and experimentation (i.e., user acceptance testing (UAT)).</td>
<td>In or near participants’ workplaces in traditional and innovative ways (i.e., teleconferences, Internet forums, and on-site visits), and in a designated project team room.</td>
<td>Participants describe and draw workflows with “low tech” graphical tools. Change agents encourage participants to use whiteboards, chalkboards or “use whatever works.”</td>
<td>Communicate to all stakeholders through formal and informal cooperative, collective, hands-on, and documentation methods</td>
<td>Sample of procedural guidance: 1. Establish a strong, innovative, and flexible core team that is multi-disciplined and multi-skilled; 2. Get executive sponsorship; 3. Listen to all your stakeholders and empower your users. 4. Set clear, well-defined goals; 5. Define and quantify deliverables in advance. 6. Use solution technology in a supporting role. It should accelerate process efficiency; but not define it.</td>
</tr>
</tbody>
</table>

Table 7.5 Summarized Guidelines of User Participation Approaches (UPA Typology) Reproduced and Adapted from Chapter 3 (Table 3.3) for Comparison Purposes
<table>
<thead>
<tr>
<th>Control over system design and design process</th>
<th>III. Developer-initiated</th>
<th>IV. User-led</th>
<th>Change Agent-led</th>
</tr>
</thead>
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<tr>
<td>Coordinating role in goal-directed social network</td>
<td>Contextual Design Approach</td>
<td>End-User Development Approach</td>
<td>eVA Collaborative Approach</td>
</tr>
<tr>
<td></td>
<td>Change agent role (developer) attempts to foster mutual learning with (customer) stakeholders</td>
<td>Change agent (non-professional software developer) attempts to empower users’ work, save time on the job and/or raise productivity</td>
<td>Multiple change agents from varied business roles (i.e., analyst, vendor, user leads). Change agents collaborate with all stakeholders. This role guides participants in development and implementation activities. Participant role: actual application users that perform development and/or implementation activities.</td>
</tr>
<tr>
<td>Context in which the approach originated</td>
<td>Software solutions developed by vendors for external customers; optional adoption by customers, although once adopted it may become mandatory for stakeholders</td>
<td>Activities or techniques that allow people who are not professional developers to create or modify software artifacts.</td>
<td>Internet growth and dot.com influence inspired vision of custom e-procurement solution. The solution would be developed by change agents and used internally and externally</td>
</tr>
<tr>
<td>Objectives of User Participation</td>
<td>Enhanced usefulness and usability of system solution</td>
<td>Empowering end users to develop and adapt systems themselves</td>
<td>Focuses on the solution design and quality (requirement gathering) by change agents in an adaptive manner through collaboration with participants (to obtain buy-in and facilitate change) while not threatening the local autonomy of their business. Includes a focus on enhanced usefulness and usability of the system solution, as well as empowering end users to develop and adapt the solution by themselves.</td>
</tr>
<tr>
<td>Requirement elicitation process</td>
<td>Collected in an iterative process via observation and interview/ prototyping and interactive experimentation</td>
<td>Flexibility to respond to new requirements; experimentation with system requirements</td>
<td>Form a design team to do an iterative and flexible collective process through research and via conferences, forums, focus groups, proof-of-concept tour, prototyping, interactive meetings and experimentation (i.e., user acceptance testing (UAT)).</td>
</tr>
<tr>
<td>Where requirement elicitation occurs</td>
<td>Where the work takes place</td>
<td>Where the work takes place</td>
<td>In or near participants’ workplaces in traditional and innovative ways (i.e., teleconferences, Internet forums, and on-site visits), and in a designated project team room.</td>
</tr>
<tr>
<td>Use of modeling tools</td>
<td>Participants are solicited to describe and diagram work</td>
<td>Participants describe and diagram work with powerful, user-friendly software tools</td>
<td>Participants describe and draw workflows with “low tech” graphical tools. Change agents encourage participants to use whiteboards, chalkboards or “use whatever works.”</td>
</tr>
<tr>
<td>Communication Style</td>
<td>Communicate through documentation</td>
<td>Hands-on, informal methods of communication</td>
<td>Communicate to all stakeholders through formal and informal cooperative, collective, hands-on, and documentation methods of communication</td>
</tr>
<tr>
<td>Procedural guidance for change agents on fostering user participation</td>
<td>Literature provides principles; Sample of procedural guidance; Extensive ISO documentation</td>
<td>Literature provides principles; Sample of procedural guidance; Parameterization - the user guides a computer program by indicating how to handle data in a different way Annotations - users write comments next to data and results in order to remember what they did.</td>
<td>Sample of procedural guidance: 1. Establish a strong, innovative, and flexible core team that is multi-discipline and multi-skilled; 2. Get executive sponsorship; 3. Listen to all your stakeholders and empower your users. 4. Set clear, well-defined goals; 5. Define and quantify deliverables in advance. 6. Use solution technology in a supporting role. It should accelerate process efficiency; but not define it.</td>
</tr>
</tbody>
</table>
7.4 Limitations of the Study

It is generally accepted that no research design is without some limitation. Some were recognized and explained in Theory and Concepts Relevant to the UPA (Chapter 3). It is, however, important to reevaluate the study for limitations following data collection and analysis. The instant study demonstrated limited replicability and generalization. As all participants were involved in a public/private partnership, their successful approach may be atypical of successful solutions at large. In addition, environmental issues (i.e., political environment) surrounding the solution development and implementation place them in a unique “public entity” subset.

Opponents of case study research often argue that such research methodology is a subjective approach to the implementation, presentation and evaluation of research, considered by some as weak because it relies on human interpretation of the evidence. Results may not be decomposable, are difficult to test for validity and rarely offer guidance to practitioners or researchers. This study attempts to overcome such potential weaknesses by using an accepted, systematic case study approach to data collection and analysis (Lee 1989a, 1989b; Yin 1994). The case study approach (as outlined in table 4.2) permits the building of credibility for the implementation, presentation and evaluation of case study research in this study.

Another limitation encountered related to lack of clarity and explicitness for variable definitions. The concepts of attitude, feelings of ownership and user satisfaction are complex, relative and change over time. Moreover, the scholarly community does not define them in a consistent way (Barki & Hartwick 1994). As a result of this lack of consensus in the information systems literature, this researcher accepts the responsibility of creating reasonable working definitions. For example, when examining the eVA data for evidence of “user satisfaction” in the implementation of eVA, one instance was determined to be the statement, “I recommend the
process of purchasing through eVA to any Purchasing Officer who doesn’t have time to waste.” ("eVA Connections" 2008b). Thus, the result of this evidence is arguable. The research design does address the limitation, although it is not explicitly discussed in the research design chapter. Great care was taken to rigorously define variables based on numerous theoretical propositions. Each variable reflected numerous propositions; thus, the variable did not rely on any one piece of evidence for its description.

Replicability hinges on the fact that a case study usually involves studying conditions that will never occur again. First, anything that prevents another researcher from duplicating the same study becomes an issue that needs to be addressed. This study addresses it by replicating findings in another set of conditions (i.e., a different embedded case)(Lee 1989a, 1989b) and by conducting a social network analysis. Simply said, theory propositions were applied to different phases of case study and to a social network analysis. This created a new, unique set of findings based on the same predictions of what one would expect to observe if the theory is valid in the new case. While recognizing that the design was, in reality, the procedure was not practical because the two embedded cases proved to overlap considerably. Yin (1994) suggests the need to be flexible and willing to change plans when the need arises. The planned research design to investigate (test) the development phase and implementation as different cases continued even though it became evident that doing so would result in a very broad (not deep) analysis. The decision to continue the format was clearly the best under the circumstances as it allowed variables to be compared within a range of conditions, not in a single set of circumstances.

The main limitation encountered with the application of SNA to the eVA team is like treatment of all roles and actors without differentiation of individual arguments. In another words, because the network was artificially bound to stakeholders who participant at a certain
point, it may not represent the social network at a different point. Because the analysis does what it was originally designed to do, that is, provide a different perspective of the formal social network of change agents and participants, any such criticism is unjust.

7.5 **Directions for Future Research**

There are numerous directions for future research. Three are suggested here: the study of informal social networks in the user participation process, the creation of a decision model for the approach to user participation, and the creation of a User Participation Approach Management system.

The study of informal and formal social networks in the user participation process would supply a foundation for a comparative study compared to the broad analysis of formal social networks conducted in this dissertation. For example, a detailed study of the informal social networks formed during solution development and solution implementation would be an important contribution. Informal social networks could be defined and operationalized in a detailed manner that would allow for a survey approach and/or additional social network analysis to be performed. This would be quite insightful in the analysis of what social structures are contributing to solution development success and solution implementation success.

Another interesting research direction follows detailed investigation of points made by Hansen (2008) with regard to his decision process resulting in his conclusion that Virginia achieved success. For example:

- “senior management actively sought, and ultimately understood the “special needs, special rules and special challenges” at the department and agency level”
• “Recognizing the flaws with a shared services strategy, Virginia’s team had the courage to change course.”

• “Avoided the trap of eVA becoming a software (IT) project.”

• “Shifted focus from application (ERP) compliance and cost justification to one of process understanding and refinement.”

• “Recognized that success was not dependent upon a particular vendor or technology.”

• “Virginia was one of the first to successfully leverage the Software as a Service (SaaS) pricing models.”

The current study incorporates some of these points to some degree, but an interpretation from the perspective of how the approach to user participation was affected in detail would add additional insight to this line of research. A natural research follow-up refinement of the UPA model and UPA typology with any new, related research.

Further, value is perceived to result from future research pertaining to development of a simple, intuitive UPAM system design in line with decision models developed from the research presented in this writing.

What is an UPAM solution?

It is anticipated that UPAM would be a system solution used to help manage the approach taken to user participation. It would supply UPA awareness and best practices. UPAM could also be used to present organization-specific information regarding user participation policies, procedures or methodology. Moreover, it would facilitate confirmation of understanding and acceptance of those policies and practices.
In conclusion, this researcher is excited about the plethora of opportunities that exist for future research. They offer numerous opportunities to make contributions to the academic, business and practitioner community.
REFERENCES


Butler, T., & Fitzgerald, B. (1997). *A case study of user participation in the information systems development process* Paper presented at the Proceedings of the eighteenth international conference on Information systems, Atlanta, Georgia, United States


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Appendix A:

Examples of eVA-Data

What is eVA?
eVA is a web-based purchasing system used by Virginia government. State agencies, colleges, universities and many local governments use eVA to announce bid opportunities, invite bidders, receive quotes, and place orders for goods and services.

For Businesses eVA Means...

- Greater Marketing Potential
  - Reach more than 12,000 buyers
  - Increased bid opportunities
  - Available around the clock
  - Marketing directly to end consumers
  - Improved customer relationships
  - Manage orders electronically

For Buyers eVA means

- Saving Money
  - Reach more than 32,000 vendors
  - Lower prices through more competition
  - Faster ordering
  - Improved vendor diversity
  - Pricing done for you through hundreds of statewide contracts
  - Reduce "maverick" spending
  - Analyze volume spending

Business Tools

- Email or fax bid notices
- Free advertising with eVA electronic catalogs
- Free eVA reports that show who buys your product or service
- Free online, on-demand training
- "Quick Quote" electronic bidding—small purchases (under $50,000)
- "Virginia Business Opportunities"--large purchases (over $50,000)
- Electronic award notices and bid tallies
- Online directories for statewide

Buying Tools

- eVA eMail lets you "shop" within hundreds of vendor index catalogs
- eVA interfaces directly with vendor "Punch Out" sites
- eVA Bidder's List quickly searches vendors matching your needs
- "Quick Quote" electronic bidding alerts vendors immediately to your small purchase needs
- Online purchase requisitions with built in approval workflow
- Electronic Purchase Orders sent automatically saves you time
## RFP No. 194-0-12RPB

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<td>Work Breakdown Structure</td>
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Dear Agency Representative,

Technology is creating new opportunities each and every day. Not only is it touching our personal lives, it's simplifying our work. The Commonwealth of Virginia is proud to be part of a technological revolution that has the potential to make procurement easier and faster. I am pleased to announce the future of state procurement - eVA, our new business-to-government Web site.

eVA will streamline and automate government purchasing activities in the Commonwealth beginning March 1, 2001. Developed by the Department of General Services, with assistance from agencies and institutions, the site (http://www.eVA.state.va.us) complements the Commonwealth's efforts to harness the power of the Internet through its electronic initiatives. This site will host the most comprehensive Internet e-procurement solution to date. This initiative will empower state agencies to improve their operations and offer many benefits such as:

- Easier and faster purchasing process.
- Less time-consuming administrative tasks associated with purchasing.
- Reduced cost of goods and services through increased competition and leveraged buying power.
- More vendor sources to choose from through central vendor registration.
- Single source for procurement information.
- Improved management decisions through real-time information and visibility of purchases.
- Increased business opportunities for small, women owned, and minority businesses.

Within the next several weeks, Ron Bell, Director of the Division of Purchases and Supply (DPS) and the DPS staff will make contacts. They will discuss your participation in this initiative, and assist you in preparing to use eVA.

I hope you will enjoy this new way of doing business in Virginia. We look forward to working with you as together we change the face of procurement in the Commonwealth!

Sincerely,

Donald C. Williams

202 North Ninth Street
Suite 209
Richmond, Virginia 23219-3402
Voice/TDD (804) 786-6152
FAX (804) 371-6305

Consolidated Laboratory Services • Engineering & Buildings • Purchases & Supply
Appendix B:

Propositions of the updated IS theory of participation (Markus & Mao 2004)

Proposition 1: There is no necessary relationship between solution development success and solution implementation success. Participation activities that promote one set of outcomes might fail to promote or even inhibit the other set of outcomes.

Proposition 2: Participation activities that result in solutions of high socio-technical quality, not just high functional quality, are also likely to promote solution implementation success.

Proposition 3: Participation activities are more likely to result in solution development and implementation success when participants include representatives from a larger, rather than smaller proportion of affected stakeholder groups, where stakeholder groups include intended operational users, their management personnel, and relevant external stakeholders.

Proposition 4: Stakeholder groups differ in their ability to contribute by their participation to solution development or solution implementation success.

4a: Managerial and operational employees and external stakeholders can make the same kinds of contributions to solution development success through their participation: They can provide useful information about functional and other requirements.

4b: Managerial participants can make a greater contribution than operational users to solution implementation success through their participation: Managerial participants are more likely than operational participants to be able to secure the acceptance and use of the solution by others.
Proposition 5: The quality of change agents’ efforts in designing and executing participation activities is related to solution development and solution implementation success.

5a: Change agents of various types (e.g., IS professionals, HR specialists, managerial personnel, external consultants, and vendors) can make greater contributions to solution development success and solution implementation success when they select participants effectively.

5b: Change agents of various types (e.g., IS professionals, HR specialists, managerial personnel, external consultants, and vendors) can make greater contributions to solution development success and solution implementation success when they focus, not just on developing solutions, but also on developing effective relationships with participants and other stakeholders.

5c: Change agents of various types (e.g., IS professionals, HR specialists, managerial personnel, external consultants, and vendors) can make greater contributions to solution development success and solution implementation success when they work effectively together to design participation opportunities, rather than if they work independently or competitively.

Proposition 6: Different types of participation activities are related to different outcomes.

6a: Solution development participation is most closely related to the outcome of solution quality.

6b: Solution implementation participation is most closely related to the outcome of solution acceptance and use. Solution implementation participation is more likely to
increase solution acceptance and use when the quality of the solution to be implemented is high. Solution implementation participation alone is *unrelated* to the outcome of solution quality.

6c: Project management participation is most closely related to the outcome of project success (a solution development outcome).

6d: All three types of participation could be related to the relational outcomes of change agent-participant interactions (e.g., conflict or its resolution) or change agent credibility.

Proposition 7: Participation richness is related to solution development and solution implementation success.

7a: Other things being equal, rich participation activities (e.g., being a full-time member of a project team or working iteratively with functional prototypes) have a stronger relationship with solution development or implementation success than thin participation activities (e.g., focus groups, one-time prototype demos, beta testing). For example, stakeholder participation in system development by means of working iteratively with functional prototypes is more likely to promote system quality and better relationships among developers and users than participation via responding to a requirements questionnaire.

7b: When rich participation opportunities cannot be provided for certain stakeholder groups (for example, with external consumers or business partners), solution development and implementation success are more likely to result when change agents provide thin participation opportunities for members of inaccessible stakeholder groups than when they provide no participation opportunities.
7c: When rich participation opportunities cannot be provided for certain stakeholder
groups (internal or external), solution development and implementation are more likely to
be successful when change agents use approaches (e.g., anthropological methods,
workplace observation) that provide them with a rich understanding of potential users’
needs without requiring extensive stakeholder time commitments.

Proposition 8: Change agents’ choice of participation methods is related to solution development
and solution implementation success.

8a: When developers choose analysis techniques that are appropriate for users’ non-
specialist IT knowledge (e.g., business process modeling instead of data flow diagrams),
participation in system development is more likely to contribute positively to system
quality.

8b: (Proposition 2 restated) When developers choose analysis techniques that capture
socio-technical requirements in addition to functional requirements, participation in
system development is more likely to contribute positively to both system quality and
system implementation success.

8d: When developers use the cognitive elaboration approach, participation in system
development is more likely to contribute positively to system quality.

8c: When change agents use a “facilitation” approach rather than a “technical expert”
approach to participation, participation in solution development is more likely to
contribute positively to both system quality and solution implementation success
(because neutral facilitation is more likely to elicit socio-technical requirements in
addition to functional requirements than technical expert leadership is).
Proposition 9: Change agents’ manipulation of the conditions of participation is related to solution development and solution implementation success.

9a: Securing the full-time availability of employee participants is likely to increase solution development success.

9b: Conducting participation activities in or near the intended users’ workplace is likely to increase solution development success.

9c: Successful lobbying for project schedule and budget resources for stakeholder participation is likely to increase solution development and implementation success.