The Effects of Technical-Advice Networks on Individual Adaptation to IT-Induced Change

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Title:
The Effects of Technical-Advice Networks on Individual Adaptation to IT-Induced Change

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Abstract

One of the most important conditions for effective performance and successful business operation is effective use of IT by organization members. Because of this demand in organizations, adaptation to IT-induced changes is one of the important challenges that organizations face with it. Technical-advice network has been used in order to better understand the effects of interpersonal communications on employee’s adaptation to IT-induced changes. In the other words the main focus of this research is to understand the effects of technical-advice network on individual IT-adaptation.

The research is carried out by the survey method in a unit of an organization with 51 employees. Two structural characteristics of the network have been examined as antecedents to adaptability. The results of study show that the strength of ties and density of network have positive effects on individual adaptation to IT-induced change. The research provided interesting results about the effects of technical-advice networks on individual adaptation to IT-induced changes.
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1. Chapter 1:

1.1. Introduction

Change is an important concept in many disciplines. It can take many names or forms, such as transformation, development, reform and learning. Information technology is related to change, leading to intended or unintended change of organizations, process, work practices, power relations and professional roles.

Information Technology (IT) is being spread out in the modern organizations so one of the most important conditions for effective performance and successful business operation is effective use of IT by organization members (Changki et al., 2007). Because of this demand in organizations, adaptation to these technological changes is one of the important challenges that organizations face. Since there is a rapid rate of work place IT-induced changes in recent decades and the effectiveness of many organizational functions are depend on using IT so degree of adaptation of organization members to IT-induced changes is not only important in effectiveness of IT-based operations but also it has an important role on the performance of the organization as a whole (Bruque et al., 2009).

Balkundi and Harrison (2006) defined adaptation to work place changes as a process that organization’s employees learn, negotiate and maintain the appropriate behavior for that organization. Appropriate behavior means alignment between behaviors demanded by the environment and individual’s behavior for achieving to valued goals. Adaptability to IT-enabled change is defined as the ability to assimilate changes in work processes enabled or imposed by IT (Fiol and Lyles, 1985; Ashford, 1986; Barley, 1990; Feldman and Rafaeli, 2002; Davidson and Chismar, 2007).

IT-induced change is one of the most important work place changes in organizations. Major transformation in people’s job happens after IT-induced changes (Venkatesh and Davis, 2000). Markus (2004) called these kind of changes as Technochange. For example new accounting software will change many accountant employees’ job in organization and requires change in old procedures and accepting new routines. Also it requires that employees learn how to use this software and manage their responsibilities by it. Technochanges are different from other changes in organizations as they might be risky and hard to carry out successfully (Markus, 2004). One of the reasons that technochanges are accompanied by uncertainty is because of
complex human response to major changes (Bruque et al, 2009). It is possible to predict functioning of a new device or technologies but it is not same for reaction of individuals to these changes.

Research show that interpersonal communications are important during organizational changes (Orlikowski and Gash, 1994). Bruque et al (2009) argued that one of the mechanisms that affect individual adaptations to IT-induced change is the structure of social supportive and informational networks. According to the Social network perspective, relationships exist between people provide opportunities or constraints on their behavior (Brass et al, 2004). This perspective is different from traditional organizational studies. Traditional organizational studies examine individuals in isolation but social network studies try to study relations and structured patterns of interaction (Brass et al, 2004).

1.2. Problem Statement and Research Question

This research tries to study the effect of “technical-advice networks” on adaptation to IT-Induced changes. Rizova (2006) defined technical-advice network as “technical-advice networks, which include the channels through which the employees obtained advice on technical issues as well as organizational matters (regarding, for example, project scheduling, assignments and coordination)”. A technical-advice network maps the relationships that people tap to solve specific problems. It differs from an “instrumental network”, which presents a broader view of how work-related content is more generally exchanged (Rizova, 2006). Employees have different reactions when a new information system implemented in an organization, some of them may resist and others may start using it. Based on the advice network definition individuals make relation to share resources for completing their assignments so in this network there are individuals that other employees have more interaction with them. The interactions between employees may cause a better adaptation.

The specific research question of this study is:

- What are the effects of technical-advice networks on individual adaptation to IT-induced changes?

As it can be understood by the research question, this study tries to find characteristics of technical-advice networks that have effect on individual adaptation. The issue is variation in adaptation between employees which implies that some individuals have better adaptation to changes than other employees. The research seeks to find factors in this type of network that has
effect on variation on adaptability in different employees within the same organization. While it is possible to study social networks in different level of analysis, the focus of this study is interpersonal level of analysis. Moreover adaptability has been studied in different levels of analysis (individual level, unit level and …) but according to the network level, individual level of adaptability is appropriate for this research.

1.3. Scope

This study is about IT-Induced change that happens in organizations. It focuses on employees’ adaptation to IT Enabled changes and effects of social networks on it. Technical-advice network is the type of social network of the study. The main purposes of this research are finding the characteristics of technical-advice networks which have effect on adaptation to an IT enabled change and understand the effects of these characteristics (positive/negative) on adaptation.

1.4. Aims and Objectives

The aim of this study is to examine the effects of informal social networks (Technical-advice) on employee’s adaptation to IT-induced change. This research will provide new insights into adaptation to IT-induced change.

The research involves a study of the network that exist within organizations and effect of the links between elements of that network on individual IT-adaptation. Two hypothesizes are developed during the research (Section 3.4, Methodology Chapter) and their validity has been checked by empirical data and statistical analysis. In order to achieve objectives of the study it is necessary to: 1. Study technical-advice networks within organization, 2. Identify factors which have an effect on adaptation to IT-induced changes, 3. investigate the effects and impact of these factors.

1.5. Justification

As mentioned before, IT-induced change is one of the important work place changes in organizations. Major transformation in people’s job happens after IT-induced changes (Venkatesh et al, 2003). Since this kind of changes is a major source of concern for many organizations, then there should be more attention to variables which makes a better fit between IT and organization members. Also it is argued that studying adaptation from social network
perspective is valuable not only for better adaptation but also for HR management (Bruque et al., 2009). There are studies that used social networks perspective for the analysis of HR development and management (Brass, 1995) but studying effect of individual social network on recruiting, selection and training practices is less explored (Bruque et al., 2009).

Changes in organizations happen continuously and quickly. Since change has become a day to day part of organizational dynamics so adaptation to these changes is an important subject in organizations. There are Research on adaptation to IT-Induced changes but studying effects of Technical-Advice network on adaptation is less explored (Bruque et al., 2009). So there is a lack of literature in studying adaptation based on technical relations among the employees. This study will investigate the relations between adaptation to IT enabled changes and informal networks in organizations. In this research social network will be used as a lens to study adaptation with a new perspective.

1.6. Disposition

The dissertation has the following structure; upcoming section (chapter 2) is reviewing of literatures in adaptation, IT-induced changes and social networks area. Afterwards (chapter 3) in methodology chapter knowledge claim, research method, hypothesizes, research settings of the study is presented. Next chapter (chapter 4) concerns with the results of statistical analysis on empirical data. Final chapter (chapter 5) is the conclusion of the research and directions for future researches.
2. Chapter 2: Theoretical Framework

In this chapter the current literature forming the basis for the theoretical framework used in this research study to analyze the effects of social networks on IT-induced changes is presented. Theories related to the studied phenomenon are introduced.

In the field of IT management there has been less attention to adaptation to IT-Induced change comparing to IT adaption process (Bruque et al, 2009). As a matter of fact there are differences between the meaning of adaptation and adoption. Bruque et al (2009) defined two differences between these two concept: 1. “adoption is an end result of a decision-making process that is often characterized by clear time boundaries” but adaptation is “usually a dynamic, cyclical, and long term process”, 2. “adaptation is best treated as a continuous-type variable that differs from the traditional dichotomous nature of adoption”. Regarding to IT adoption there are a large number of literature which are about individuals can accept or reject a particular technology or he/she can use it in a different way that from what it was designed for (Chau and Hu, 2002; Jeyaraj et al, 2006).

2.1. IT-induced changes

To understand IT-induced changes, framework defined by Gash and Orlikowski (1991) and identified conceptions of causal agency (Markus and Robey, 1988) in the literature of information technology and organizational change have been used here. Gash and Orlikowski (1991) proposed a way of viewing organizational change that have been induced by information technology in term of technological frames and orders of changes. They defined three orders for this type of changes. Causal agency is the researcher’s beliefs about the “Identity of causal agent”, “Nature of causal action” and “direction of causal influence” between elements of a theory (Markus and Robey, 1988). These conceptions are used in lined with orders of change for better understanding IT-induced changes in organizations.

In the first order change implementers do not plan to make a basic change in their previous ways of understanding or doing business but they intend to improve their old operations (Gash and Orlikowski, 1991). For example increasing throughput, performance, efficiency or decreasing costs of operations (Morton and Rockart, 1984). Using information systems for office automation caused changes in current structure and practices. Classic example of first order
Information technology changes are transactional processing systems such as accounting and payroll systems.

Organizational imperative is the conception of casual agency related to the first order change. In the organizational imperative it is argued that motivations and actions of information technology designers are the sources of organizational changes (Markus and Robey, 1988). In this perspective IT designers implement information systems to satisfy organizational requirements for information (Markus and Robey, 1988). As it is mentioned before in the first order changes designers intend to improve their old operations, moreover Jashapara (2004) argued that using information is a way of improving operations in organizations therefore implementing information system is a way of improving old operations. Figure 1 shows organizational imperative conception. Left circle shows the sources of organizational change (Designer’s purpose and information processing needs) in this perspective which have effect on organizational structure.

Figure 1: Organizational Imperative (Markus and Robey, 1988).

Gash and Orlikowski (1991) defined second order changes as changes caused by information technology in current situation by replacing previous ways of doing things. In second order changes implementers attempt to deploy information technology in order to make fundamental changes in assumptions, tasks, knowledge, processes, social relations, and strategies. Second order changes occur when users understand that current technology does not answer their new requirements (Gash and Orlikowski, 1991). This order of change is in line with technological imperative. In technological imperative information technology known as the source of organizational changes (Markus and Robey, 1988). From this perspective technology has an important role in behavior of individuals and organizations. Figure 2 shows the relation
between source of organizational change (Information technology) and organizational structure that has been affected by this change in technological imperative.

![Diagram: Information Technology to Organizational Structure](image)

**Figure 2: Technological Imperative (Markus and Robey, 1988)**

Third order changes require a different shift in managerial and technological frames (Gash and Orlikowski, 1991). In this type of change IT allows actors to be effective about design and use of technology. When current conditions change and underlying assumptions are no longer useful actors should be able to understand the situation and create a new technological artifacts which are more appropriate to current condition (Gash and Orlikowski, 1991).

Emergent perspective is the last conception which views organizational changes as the result of the interaction between information technology, human and organizational users (Markus and Robey, 1988). Gasser (Gasser, 1986) conducted a study about the current work settings and available computing resources. He found strategies which organizational actors change the situation to align technology and work demands. Figure 3 shows that information technology use, Meaning and behavior in organizations have effect on purpose and settings of the process and make some changes in organizational process that have effect on organizational structure and cause some changes in organization.
2.2. **Technology acceptance**

Computer and information technology in today’s organizations have been distributed dramatically (Venkatesh *et al.*, 2003). But one of the important factors for technology to be useful is its acceptance and usage by organization employees. Because of this important factor, explaining user’s acceptance of technology is an important research field in contemporary information system literatures (Venkatesh *et al.*, 2003). It is argued that there are different streams of research in adaptation studies about how and why individuals adopt to new technologies. One of these streams focuses on individual acceptance of technology by using intention or usage as a dependent variable (Compeau and Higgins, 1995). The outcomes of this research streams are determinants of behavioral intention and usage behavior such as attitude towards behavior, self-efficacy and subjective norm. Some of the popular models in this research domain are Technology Acceptance Model (TAM) (Venkatesh and Davis, 2000), Theory of Reasoned Action (TRA) (Davis, 1989) and Theory of Planned Behavior (TPB) (Harrison *et al.*, 1997). Figure 4 presents the basic conceptual framework that is basis of models explaining individual acceptance of information technology.
Venkatesh et al. (2003) tried to synthesize different models research findings in this area and they developed and tested “Unified Theory of Acceptance and Use of Technology” (UTAUT) as a model which they found this model more appropriate for technology acceptance than the previous models. Technology acceptance research is related to the present study, since both of them are focusing on factors that have effect on adaptation to changes. Interest of this research is finding determinants of adaptability to IT-induced changes. According to the IT-induced changes definition some parts of adapting to this type of changes involves using technology.

However, despite this similarity, there is one key point of departure of technology acceptance studies from this research. UTAUT model studies individuals in isolation level (e.g. performance expectancy, effort expectancy, facilitating conditions) but this research tries to find important factors that emerge from interactions between individuals and study important factors in adaptation by social network perspective. Although Venkatesh et al. (2003) considered a social relation construct in their model (Social Influence) but it is different from social networks perspective.

2.3. Adaptation to IT-Induced Changes

Managing change in response to various internal and external stimuli, such as environmental change, process change, etc., is a topic of rich discussion in research and practice. Information technology has added a new dimension to the study and practice of change management. Technology-induced change has been distinguished in extant literature from non-IT-based change in several significant ways, which has drawn considerable attention to the study of information & communication technologies (ICT) and organizational change (Alavi and Palmer, 2000; Markus, 2004; Orlikowski and Yates, 2006). For example, the need to “deal with technology”, its unique complications and the additional set of technology personnel, like IT
vendors, information systems specialists, etc., is recognized as one major point of distinction between change initiatives triggered by IT versus by other non-IT factors. This introduces a significant level of complexity in the change effort, which often causes the technology to become part of the problem, rather than the solution. Finally, IT is also an enabling factor in change efforts triggered by other agents, and, as such, occupies a unique position in the study and management of organizational change, in general (Orlikowski and Debra, 1997).

Extant studies of adaptability to change in the organizational literature have also varied along levels of analysis, just as they have in the Information Systems literature. At the individual level, behavioral adaptation in response to environmental changes (Ashford, 1986), and performance adaptations in response to changing job requirements (Griffin and Hesketh, 2005) have been documented. At the organizational level, adaptation has been studied as a way of learning from the environment by readjusting goals, attention rules, search rules, strategies and structures (Fiol and Lyles, 1985). At the group level, adaptability in terms of structural changes in response to variations in the environment has been studied in experimental settings (Moon et al, 2004). These studies have progressed within a variety of theoretical domains. Tyre and Hippel (1997) identified three primary domains that have been pursued in extant research: antecedents to adaptability (behavioral theories), process by which adaptability occurs (situated theories) and consequences from adaptability (cognitive theories). Situated theory of learning is different from behavioral theories and cognitive theories. Situated theory focuses on what problem solvers do when they have a problem and how they use available resources during this process (Tyre and Hippel, 1997). Cognitive theories, as cited by Tyre and Hippel (1997), focus on different type of results that occurs from learning process and behavioral theories have focus on whether and when adaptive learning occurs. Furthermore, other concepts related to adaptability enable clarity in defining the phenomenon of interest in this study. Organizational learning is one of those concepts. Similar to the idea of learning-by-doing, adaptation is often used interchangeably with learning (Argyris, 1976; Sorenson, 2003). Other research in this area has looked at adaptive learning, which refers to learning that occurs as part of problem solving. This distinction draws on notions of situated learning (Brown and Duguid, 2001) or tacit knowing (Nonaka, 1994) to view learning as a consequence of adaptation to change, problems, etc. Although key distinctions have been drawn between the two concepts, extant literature has treated adaptation the same as learning: “To the extent that the acquisition of a useful adaptation
to a changing environment counts as learning, we must say that this is a case of organizational learning” (Hutchins, 1991).

The key point significance of this study from this literature is that most studies in this area have focused on non-relational factors (e.g. attributes of individuals or firms) as antecedents to adaptability. This research is related to these literature streams in Information Systems and Management since it tries to investigate relational drivers of individual-level adaptability to IT-enabled change.

2.4. Role Theory

As the research focuses on individual level of relationships in an organization, using role theory is appropriate since it focuses on social structures. Role theory, as cited by Lamertz (2005), has a long tradition in sociology, psychology and organization studies. Role theory is a perspective in social psychology that considers most of everyday activity to be the acting out of socially defined categories (Biddle, 1986). Organizational structures provide a hierarchal structure of an organization and define formal roles of job positions, while social structures present informal positions and roles in organization. Studies in role theory focus on three concepts that construct social structure: Role, Position, Characteristics expectation (Biddle, 1986). “Position refers to the parts that people occupy in a social system and that are located relative to each other in a status order” (Biddle, 1986). “Role refers to a set of behavioral scripts that delineate actions typically performed by people who occupy these parts”(Biddle, 1986). “Characteristic expectation forms one social structural unit together with role and position and is used to explain why people enact roles” (Biddle, 1986). Katz and Kahn (1978), as cited by Lamertz (2005), according to different structure of organization divided employee performance in two categories: 1. Employees perform their implemented formal task according to their job definition in formal organizational structure. 2. Employees also participate in none-task behavior which is not implemented formally and it support informal structural context. In the other word individuals in organizations carry out an specific predefined task behavior and that task directly contribute to operation of the technical core of an organization (Borman and Stephan, 1993). The second category means employees perform an extra role that is not predefined in their task definition but it is necessary for organization and supports informal structural context in which the technical core operates (Borman and Stephan, 1993). The first category of behaviors are called “in role”, when individuals have formal and economic relations. The second behavior are
called “extra role” which relations are informal and social. Therefore employees participate in both informal and formal organizational structure but just formal role has been implemented in organizations (Lamertz, 2005). By looking from professional and personal point of view we can determine employee’s in role and extra role. An employee can finish assigned job because formal job definition requires so, or it can be done by his/her personal initiative or interest. Moreover, if an employee makes social relations with other employees, it will be extra role behavior.

2.5. Social Networks

Social networks theory is a division of social science. It applies to a wide range of people organization from small group of people to all whole the nation. The term networks mean a set of object or nodes which a set of relation exist between them. In social networks individuals or a group of people are objects of the network different relations which exists between people maps to the relation in network (Hanneman and Riddle, 2005).

Formal and informal social relations are important descriptive variables in organizational research. Each individual is surrounded by specific network of social relations. These social relations are known as social networks. Studies show that the structure and content of these social networks have effect on attitudes and behaviors of people (Lange et al, 2004). Organizational social network studies show that different network exist in organization based on values, visions, ideas, financial exchange, friendship, kinship, dislike, conflict or trade. These networks are also different based on the level of study in organization: Interpersonal networks, Interunit networks, interorganizational networks.

Networks provide a structural and analytical framework that has been used in the study of various relational phenomena, such as communication, friendship, societal issues, innovation, performance, and knowledge-related processes, such as knowledge creation or transfer (Borgatti and Cross, 2003; Borgatti and Foster, 2003). The fundamental idea of social networks is that the structure of social interaction is effective on access to valued resources (enhance or constraint access) (Brass, 1984). It is possible to study social network in organizations in different levels. Brass et al (2004) made a multi level perspective study about the networks and organizations and consequences of each level. The study conducted in three levels: 1. Interpersonal networks, 2. Interunit networks, 3. Interorganizational Networks. This research will focuses on interpersonal networks level and try to understand adaptation affected by which characteristics of this network.
A variety of network types have been identified within the organizations. Ibarra (1992) made useful distinction between three type of network relations within the organizations (a) “Work-flow relationships [which] are the channels of communication and resource exchange used in getting things done on a daily basis”; (b) “Influence networks, associated with status, hierarchy and flows of authority and responsibility”; (c) “Intimate, expressive relations like trust and friendship”. In the face of organizational change, members of the organization have network relations at their disposal with an instrumental, hierarchical or more intimate nature (Torenvlied and Velner, 1998). Work-related resources such as task technical-advice and strategic information transferred through informal networks, but other concepts such as social identity and social support are also transmitted through them (Podolny and Baron, 1997). Work related networks represent the patterns of relationships which are based on various work roles and formal positions. In contrast, informal networks signify the emergent interactions, irrespective of formally defined roles, which also exist among members within an organization. These informal relations could be for a variety of reasons: friendship, social support, knowledge exchange, etc.

Figure 5 and figure 6 presents two sample for formal and informal networks in an organization. Most social network studies focus on informal networks, exploring how different types of these networks drive various organizational phenomena. Several studies have looked at the effects of informal networks in different dimensions of an organization. Sparrowe et al (2001) articulated that the exchange of task advice and information has a positive effect on the job performance and hindrance relations have a negative effect on job performance. Also there are studies that investigated the effects of negative relationships in informal networks in work organizations (Labianca and Brass, 2006). A research about the effect of change in technology on social network structure and power showed that change in technological change in organization caused a change in different characteristics of social network in organization. For example when employees with more centrality and power adopted earlier, existing patterns are reinforced and stability is maintained but when the less powerful members are early adopters it caused a change in power and structure of the network (Burkhardt and Brass, 1990).
Lincoln and Miller (1979) recognized that multiple types of networks simultaneously exist in organizations and compared the effect of a set of attributes—authority, education, sex, race and branch assignment—on the structures of instrumental networks, arising in the course of performing appointed organizational roles, and of primary networks, which are the informal social relations that arise among members of an organization. They found that the same set of attributes differentially affect the structures of instrumental versus primary ties. This study was interesting and different from most other network studies in comparing a set of five different organizations’ networks side-by-side, looking at the structures of instrumental and primary ties.
among members of each organization. In other words, they performed a side-by-side analysis of ten intra-organizational networks.

Other researchers have looked at the power that individuals are able to derive from their positions in formal versus informal networks and how this influences their involvement in innovations within the organizations (Ibarra, 1993). Formal sources of power arise from positions of authority that people hold within formal work-related networks, and informal sources of power arise from their central locations in informal or emergent networks. This work showed that network centrality, signifying informal sources of power, has a stronger impact on innovation involvement, and partially mediates the impact of formal positional sources of power as well as individual attributes like education, experience or professional activity.

Gender-based differences in the formation of work-related versus social support ties have also been noted in extant research (Ibarra, 1992), where women tend to form instrumental or work-related links to men but expressive links to other women, while men form both types of links with other men in an organization. Communication networks are another type of network that has been studied in the context of various organizational phenomena, including change (Granovetter, 1973; Brass, 1984; Krackhardt and Kilduff, 1999). Indeed this is a broad genre of networks, and many other types of networks, such as work or friendship networks are recognized as being variants of communication networks (Lincoln and Miller, 1979). Relatedly, friendship networks have also been considered as mechanisms for the exchange of social support, influence and information, which are particularly significant in the face of uncertainties associated with change efforts in organizations (Granovetter, 1973; Brass, 1984; Krackhardt and Kilduff, 1999).

Despite all of these different types of networks that have been studied in the context of organizational change, the majority of extant research in this context has focused on knowledge-sharing or information-sharing networks. For example, Kraatz (1998) showed that information sharing and communication via strong inter-organizational ties mitigate uncertainty and promote organizational adaptation in the face of change. Similarly, in a study of embedded relationships among 23 entrepreneurial firms, Uzzi & Lancaster (2003) identified structural embeddedness as the logic of exchange that promotes, among other things, complex adaptation. These authors showed how networks influence knowledge transfer and learning by creating channels for knowledge trade and reducing the risk of learning, which in turn, facilitates adaptation. The importance of network structures of information exchange has also been shown in the context of
innovation diffusion (Abrahamson and Rosenkopf, 1997); in the present context, an innovation introduced in an organization could be viewed as one type of change, which further corroborates the importance of information exchange networks in studies of change. Furthermore, even where other types of networks have been explicitly studied, such as communication or friendship, the exchange of knowledge through these networks was often found to play a significant role in the outcomes that were generated, such as innovation output, performance. Table 1 present different type of network studies related to change in organizations and different characteristics of social networks which they focused in their studies.

<table>
<thead>
<tr>
<th>Type of Network</th>
<th>Studied Network Characteristics</th>
<th>Context of Studies</th>
<th>Reference</th>
</tr>
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</table>
| Interorganizational network, social information sharing | Network size  
Network homogeneity  
Tie strength  
Age of network | How network ties drive adaptation of organizations to change and the social learning of adaptive responses from other organizations in the network | (Kraatz, 1998) |
| Work-related interactions: Collegial relations Formal, organizational relations | Frequency of interaction | Impact of technology on change via relational and non-relational aspects of work roles | (Barley, 1990) |
| Workflow Communication Friendship | Node characteristics-supervisor vs. non-supervisor  
Centrality of network position | Relation between organization structure and individual influence | (Brass, 1984) |
| Job-related communication | Network centrality:  
closeness, in-degree  
Power | Longitudinal study of effect of a change in technology on organizational structure and power | (Burkhardt and Brass, 1990) |
| Interorganizational networks of knowledge transfer | Embedded vs. arm's-length ties, based on social closeness | How networks influence knowledge transfer and learning processes by creating channels for knowledge trade and reducing the risk of learning | (Uzzi and Lancaster, 2003) |
| Information networks | Number of network links Small, seemingly insignificant idiosyncracies | Impact of the structure of social networks through which potential adopters find out information about social networks, on the extent | (Abrahamson and Rosenkopf, 1997) |
of an innovation's diffusion among members of the network. The innovation could be a change, in which case we would be talking about diffusion of change or the extent to which people embrace that change.

<table>
<thead>
<tr>
<th>Supportive Networks</th>
<th>Size of networks</th>
<th>Strength of ties</th>
<th>Density</th>
<th>The role of social networks on individual adaptation to IT-Induced change</th>
<th>(Bruque et al, 2009)</th>
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<td>Informational Networks</td>
<td>Strong ties Weak ties</td>
<td>Degree of overlap between two ego friendship networks</td>
<td></td>
<td>Investigates the macro-network implications of the strength of dyadic ties in friendship networks. Study has implications for diffusion of influence and information, mobility opportunity, and community organization. The idea of diffusion of information and influence may be relevant in change management situations, where adaptability to change is important.</td>
<td>(Granovetter, 1973)</td>
</tr>
<tr>
<td>Friendship networks</td>
<td>Strong ties Weak ties</td>
<td>Degree of overlap between two ego friendship networks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal, work-related networks</td>
<td>Centrality Rank of individuals- formal position</td>
<td>Role of individual attributes, formal position and network centrality of involvement in innovations, where the latter indicates exercise of individual power.</td>
<td></td>
<td></td>
<td>(Ibarra, 1993)</td>
</tr>
<tr>
<td>Informal or emergent networks</td>
<td></td>
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</tr>
</tbody>
</table>

Table 1: Network studies about changes in organizations

### 2.6. Technical-Advice Network

This section presents advice networks and some of reasons about why this kind of networks emerges in organizations. Since technical-advice network is a specific type of advice networks so the arguments in this section are appropriate for this type of networks. Morrison
(2002) defined organizations as institutions characterized by ambiguity, change and uncertainty. These situations may cause discomfort and anxiety, especially not knowing an individual what needs to know to be effective in his / her job can damage one’s career implications. A practical way for employees to deal with ambiguity and uncertainty is to seek information (Morrison, 2002). It is argued that information seeking exist in many different organizational contexts: employment interviewing, team interaction, performance appraisals, managerial scanning of the extent environment, and following any type of organizational change (Morrison, 2002). Network is a powerful model in management theory as well as a trigger fruitful research in network methodology and network theory (Nebus, 2006). Actor’s relationships have effect on their choice for advice and make both opportunity and constraint on their choices (Nebus, 2006). These relationships make an opportunity by presenting a pool of advice contacts. Also it makes some limitations on choosing advice contact by constraining actors to search for contacts who would provide better advices. The results of advice search are: a) gaining knowledge to finish assigned task and b) an ego-centered network of contacts (Nebus, 2006), which the second result forms an advice network that remains after the task has been finished. It is usual in organizations that a task assigns to a person without any clear path for achieving to the goals. So person to finish the assigned task will refer to others. The main purpose of the advice search is using others experiences and guidelines to achieve the goals and prevent repeating their mistakes (Nebus, 2006). Nebus (2006) argued that there are three reasons which people prefer to gain knowledge through talk to others: first reason is that tacit, complex and system dependant knowledge is not easily codifiable, second when knowledge is codifiable it needs adaptation to be useful in new context and third people prefer oral information in compare to written knowledge.

There are studies which show actors continue some relations in some network for specific functions. Burt (1997) conducted a study about an actor which have different type of network relationships. This research shows that there was little overlap between peoples in different networks. It means people in each network are almost unique and does not exist in other networks. An ego start searching for advice when individual encounters a problem or situation which does not have enough knowledge to find a solution. If this is the first time that ego is visiting this situation the ego-centered network has no alters (Burt, 1997). If there was same problem and situation in company so there may some alters already exist in ego centered
network. If this task is similar to a previous task ego may find appropriate altar from previous network to find a contact for new advice network (Burt, 1997).

2.7. Social Networks and Adaptation to IT-Induced change

Orlikowski and Gash (1994) about IT-Induced organizational changes argued that social groups in organizations which have relation together have shared frames and differences in these frames have effect on the actor’s interpretation and actions on IT systems. When an IT-Induced change happens in organization, environmental triggers may result an interpretive shifts. One approach for understanding the patterns in socially driven shifts is by studying effects of social networks on individual or group level reaction to IT-Induced changes (Bruque et al, 2009).

To analyze effect of social networks on individual adaptation to IT-induced changes, it is necessary to specify the type of social network. Networks provide a structural and analytical framework that has been used in the study of various relational phenomena, such as communication, friendship, societal issues, innovation, performance, and knowledge-related processes, such as knowledge creation or transfer (Borgatti and Cross, 2003; Borgatti and Foster, 2003). A variety of different types of social networks have been studied in the context of various organizational phenomena. Within this body of work, a broad distinction is made between work-related networks and informal networks. These have also been referred to as instrumental networks, consisting of links arising in the course of work-role performance, and expressive networks, consisting of informal relations providing friendship and social support (Ibarra, 1993; Ibarra and Andrews, 1993). Ibarra’s (1993) conceptual framework for network classification is used for specifying the type of social network in this study and based on this framework technical-advice network is used as the specific network of this study. In this framework there is distinction between prescribed and emergent networks in organizations (formal and informal structure). A prescribed or formal networks is a set of formally defined relationship that exist in different levels of individuals and groups in organization who must interact to each other to accomplish a defined task (Ibarra, 1993). Work-related networks signify the patterns of relationships arising from various work roles and formal positions within an organization. Organizational chart represent a simple form of formal social networks. In the emergent networks or informal networks relations are based on work related, social or combination of both (Ibarra, 1993). In contrast, informal networks signify the emergent interactions, irrespective of formally defined roles, which also exist among members within an organization. These informal
relations could be for a variety of reasons: friendship, social support, knowledge exchange, etc. Technical-advice network is one of informal networks that exist in organizations. Rizova (2006) defined technical-advice network as “technical-advice networks include the channels through which the scientists, engineers and technicians obtained advice on technical issues as well as organizational matters (regarding, for example, project scheduling, assignments and coordination)”. From this definition it seems that technical-advice network and instrumental network are same but there are differences between them. Technical-advice networks are based on relationship that people make, to solve specific problems but instrumental networks present a broader view of how work-related contents generally transferred between individuals (Rizova, 2006).

Bruque et al (2009) studied effects of informal networks on individual adaptation to IT-induced changes. They focused on supportive networks and informational networks as well as other factors such as age, work team size and IT-related educations. They developed a theoretically based adaptation scale for measuring adaptation level. The research shows that the size of individual supportive social network and the strength of ties in individual informational network have positive effect on individual adaptation to IT-induced changes. It is argued that effects of technical-advice networks are still unexplored (Bruque et al, 2009). This research examines effects of this type of network on adaptation by using Bruque et al (2009) theoretically based scale to measure individual adaptation to IT-induced changes.

Bruque et al (2009) developed their measure to assess individual adaptation to IT-induced change according to Ashford and Taylor’s (1990) definition about individual adaptation to a job transition. Ashford and Taylor (1990) defined individual adaptation as a set of behavioral habits or routines which individuals reorganize them to fit themselves with environmental demands which emerged by a job transition. If individual can successfully adapt themselves with the job transition then the routines will keep him/her on track to the new environment. Moreover it is argued that the adaptation regarding to the organization goals will be judged as suitable by organization (Ashford and Taylor, 1990). According to this definition Bruque et al (2009) generated six items for assessing individual adaptation to IT-induced change. They used several strategies to assess the content, predictive and convergent validity of these six adaptation items. The result of these validities and pilot studies is following four items for measuring adaptability:
1. The employee has quickly become familiar with the new IT platform.
2. It was not difficult for the employee to adjust him- or herself to the new IT platform.
3. The employee has skillfully used the tools and applications the new IT platform provides.
4. The employee has accurately managed all the facilities the new IT platform provides.

They used these four items as a Likert base questioner to measure the adaptation of individuals to it IT-enabled changes.
3. Chapter 3: Methodology

3.1. Research Approach

This research will adopt positivist paradigm. Positivist paradigm is appropriate for this study because the research involves hypothesis testing through data collection and statistical analyses (Orlikowski and Baroudi, 1991). Myers and Avison (2002) articulated that “positivists generally assume that reality is objectively given and can be described by measurable properties, which are independent of the observer (researcher) and his or her instruments”. According to this argument other researchers by conducting this research will achieve to the same result as the current study.

3.2. Research Strategy

Yin (2003) argued that three conditions should be considered when researcher needs to choose a research strategy: “(a) the type of research question posed, (b) the extent of control an investigator has over actual behavioral events, and (c) the degree of focus on contemporary as opposed to historical events”. Since the type of research question is “what” and the research does not require the control of behavioral events and focuses on contemporary events then survey will be appropriate research strategy for this study.

Survey is a quantitative strategy of inquiry which Creswell (2003) defined as “studying by using questionnaires or structured interviews with the intent of generalizing from sample to a population”. Data collection methods for this research are close-ended questions and interview.

There are some steps required to carry out to reach research objectives; Phase 1, involved a study through literature of social networks and IT-adaptation. This step formed an essential basis for the rest of the work by providing an overview of past research in this field. Phase 2, involved the study of a chosen organization to determine the social and technological factors that affect adaptation to IT-induced changes. This phase required data collection via surveys. Phase 3, was analyzing the collected data, using statistical testing and mapping using SPSS and UCINet.

3.3. Ethical Considerations

Lange et al (2004) argued that social networks questions are different from ordinary survey questions in two ways. First social network questions are threatening or sensitive questions. These questions investigate the privacy of the people and they may be afraid that individuals
other than researcher may have access to their answers. Second characteristic that make social network questions different from the other questions are burdensome nature of these questions. Because of this sensitive nature, social network researches need more attention from the ethical perspective.

In this research following ethical considerations have been considered:

Personal information of the people who participated in interviews and questioners never spread to the company. People are not coerced into participating in research. This research does not place any of the participants at risk. It would be tried to ensure the security of company’s critical information during and after completion of the research. Also it is tried to maintain research result independent from the effect of personal or others biases.

3.4. Hypothesis Development

Sociocognitive theory, as cited by Bruque et al (2009), “proposes that individuals’ behavior is the result of the interaction between individuals’ social environment and their cognitive abilities” (Bandura, 1986). Compeau and Higgins (1995) applied and extended SCT to the context of computer utilization. Compeau and Higgins (1995) research is about computer use, but Venkatesh et al (2003) argued that the nature of the model and the underlying theory allow it to be extended to acceptance and use of information technology in general. Sparrowe et al (2001) articulated that the exchange of task advice and information has a positive effect and hindrance relations have a negative effect on job performance. A research about the effect of change in technology on social network structure and power showed that technological change in organization caused a change in different characteristics of organization social network (Burkhardt and Brass, 1990). For example when employees with more centrality and power adopted earlier, existing patterns are reinforced and stability is maintained but when the less powerful members are early adopters it caused a change in power and structure of the network (Burkhardt and Brass, 1990). In technological adaptation process individuals are social actors who are affected by environment. Saccol and Reinhard (2006) in actor metaphor theory argued that individuals cognitions and attitudes related to IT-induced changes are influenced by internal or sometimes external organizational boundaries sources. Based on this theory that social-environmental sources have effects on individuals’ attitudes to IT-induced changes and since technical-advice networks are one of these social-environmental sources so the structure of this network may have effect on IT-induced changes.
3.4.1. Technical-Advice Networks

Technical-advice network, which is a specific type of informal social networks, exists in every organization. Technical-advice networks are channels which individuals obtain advice on technical issues (Rizova, 2006). They provide task related assistance, especially useful when employees seek to achieve technical career related information. As cited by Bruque et al (2009), this kind of networks may play an important role during organizational change since informational ties can be used to better manage new knowledge (Lazarus, 1966) and to attain assistance and guidance (Sparrowe et al, 2001).

Technical-advice networks are effective and they will have implication on individual adaptation to IT-enabled changes. It is proposed that there is relation between density of technical-advice network and individual adaptation to IT-induced changes. Density means relative number of ties between the individuals in technical-advice networks (Hanneman and Riddle, 2005). Balkundi and Harrison (2006) argued that high-density informal networks have higher levels of information sharing, collaboration and cooperation which are required to finish assigned tasks. In networks which there are not too much interaction between individuals, job-related ideas will be less exchanged between employees (Hansen, 1999). In the other word low density networks are less effective in exchanging task-related information.

It is argued that individuals in organizations in order to be a master in new job require access to sources of information, who are available and have enough knowledge about the particular requirement of that job (Granovetter, 1973). During an IT-induced change individuals require to learn and gather information about the changes in organization to be able to work and adapt with new changes. Dense technical-advice networks may enhance access to this kind of information. In dense technical-advice networks individuals can use close network ties to inform each other about the technical problems which happened for them and their solutions. An important benefit of dense technical-advice networks is that employees can inform each other about valuable information to prevent others from duplicating those practices (Rizova, 2006).

Strength of ties is another important characteristic of technical-advice networks which may be effective on individual adaptation to IT-induced change. Hanneman and Riddle (2005) defined strength of ties as “the frequency of interaction -- do actors have contact daily, weekly, monthly, etc”. Strong ties in advice networks between actors make enhance knowledge sharing since strong ties may predict actor’s motivation for knowledge sharing (Nebus, 2006).
Haslberger (2005), as cited by Bruque et al. (2009), revealed that during an IT-induced change organizational members need in-depth and frequent knowledge which is better transferred via strong ties. In contrast with weak ties, strong ties are more useful to enhance information flow and one of the important characteristics of these ties are greater depth of information search (Friedkin, 1982). Figure 7 shows two network structures that are same in number of nodes, but different in densities and strength of ties.

![Figure 7: Density and Strength of Ties](image)

According to the above discussion it seems when IT-induced changes happens in organization individuals take benefits from strong ties and dens technical advice networks. These two hypotheses are concluded from previous arguments:

**Hypothesis 1:** Stronger ties between individuals in technical-advice network have positive effect on individual adaptation to an IT-induced change.

**Hypothesis 2:** denser individual technical-advice network have positive effect on individual adaptation to an IT-induced change.

Figure 8 shows the research model of this study.
3.5. **Data Collection**

Survey is the selected strategy in order to gather empirical data of the research. According to the research hypotheses, two types of data are required to be collected during survey: 1. Technical-advice network data. 2- Degree of individual adaptability to IT-induced changes.

The entire population in the field site has been selected (51 employee) to make more generalizable results and all the individuals in the field site involved in the research.

This research designed to determine a variable (technical-advice networks characteristics) causes or effect on outcome variables (IT-adaptation) (Trochim, 2000) therefore it is a causal study and it is necessary to specify dependent and independent variables of the research. Trochim (2000) defined independent variables as “what you (or nature) manipulates-a treatment or program or cause”. According to this definition independent variables of this study are network attributes (Density and Strength) which we developed hypotheses about them. Furthermore he defined dependent variables as “what you presume to be affected by the independent variable-your effects or outcomes”. Dependent variables of this study which we predict to be affected by independent variables are employee’s adaptation to IT-enabled changes. Units of analysis in social networks on interpersonal level are the relationships between individuals. In the following section methods for gathering data about each type of variables will be described.
3.5.1. Research Settings

Data were gathered from employees of Registration division of Department of Justice in Iran which we call it field site. The empirical data has been collected from one of their units. Before 2007 computers has been used rarely in the field site and they decided to implement a project for integrated Property Registration Network. The main goals of this project were automating the workflow of processes to avoid human mistakes, cheating and convert a slow manual system to a fast and accurate computer-based system. After one year the system has been implemented according to their requirements and installed in the field site by software supplier company. According to the defined framework for IT-induced changes by Gash and Orlikowski (1991) the change in this company is first order of change. According to the definition in the first order change implementers do not plan to make a basic change in their previous ways of understanding or doing business but they intend to improve their old operations (Gash and Orlikowski, 1991). For example increasing throughput, performance, efficiency or decreasing costs of operations (Morton and Rockart, 1984). The new system had a significant impact on employees’ task and routines. Before implementation of the system, all business processes (such as archiving, legal checks, and data gathering for generating different types of ownership documents) have been done by employees but after implementing the system, a large number of these work processes have been automated by the system. First we communicated with chief manager of the software supplier company and they asked managers of field site to participate in research. They allowed us to gather empirical data just from one of their units. As it is described in section 3.5.3 four employees of supplier company have been used in order to both help us in conducting research and answering to individual adaptation questions about employees. A telephone interview made by researcher with four trainers and described the project and their responsibilities during empirical data gathering. Furthermore a guideline has been written that describes each question in IT-adaptation questioner and sent them to the trainers. Data has been gathered during one week. Since it wasn’t possible to present the goals of the research in company for employees, to encourage them to participate in survey one page summary has been provided. The summary was contained the research goals and how gathered data will be used in the research. Furthermore the it was included some sentences about ethical considerations of the study such as participation in survey is not mandatory and gathered data will be used just for the research and researcher has access to their responses. Also it is asked from employees to write
their suggestion, if they have any, on the provided papers and deliver it to the trainers. This information file has been sent to the trainers and asked them to distribute it between employees. One of the trainers has been chosen as a responsible of conducting survey. He assigned an ID to each employee and sent employees’ list and assigned ID to us.

After these prelaunch preparations both network and IT-adaptation questioners have been sent to the selected trainer by email. He printed them and wrote one of the assigned ID on each questioner. He distributed questioners for network data between employees and gathered them after one week. In parallel, four trainers answered IT-adaptation questions about employees during this period.

3.5.2. Network Data

The most numerous research in social networks use either “whole-Network” or “egocentric” designs (Carrington et al, 2005). Carrington et al (2005) argued that “Whole-network studies examine sets of interrelated objects or actors that are regarded for analytical purposes as bounded social collectives, although in practice network boundaries are often permeable and/or ambiguous”. Egocentric studies really focus on a focal or objects and local relationships that objects have to each other (Hanneman and Riddle, 2005). By gathering information about the connection between other actors and focal node it is possible to draw a good picture of the local networks and neighborhoods of individuals (Hanneman and Riddle, 2005). Marsden (Marsden, 2002), as cited by Carrington et al (2005), argued that whole-network contains an egocentric for all objects of the network. Egocentric method is used to elicit network data in field site.

Setting network boundaries in egocentric method typically set during data collection. In egocentric networks name generator method (which is described next) will set network boundaries (Carrington et al, 2005).

In order to gather network data in ego-centric network studies, a typical procedure is using one or more name generator questions to determine membership in a respondent’s network and gather more information about relation via name interpreter (Burt, 1984). Marsden (1990) categorized name interpreters questions in three branches: (a) reports on attributes of persons or alters enumerated (e.g. age, education, race, ethnicity); (b) reports on properties of the tie between respondent and alter (e.g. frequency of contact, duration of acquaintance, intensity); and (c) reports on the intensity of ties between pairs of alters, which can be used to measure the
structure of the egocentric network (e.g. in terms of density). Two step name generator and name interpreter methodology have been followed to extract network data. Name generators method identifies respondent’s alters and name interpreter gathers information about alters and their relationships (Carrington et al, 2005). Name generators are free-recall questions which set network boundaries and name interpreters collect data about alters and both ego-alters and alter-alter relationships (Carrington et al, 2005). Self-reports of the existence or nonexistence of relationships between individuals are the most common methods used to gather network data (Marsden, 1990). These kinds of data in social networks are usually gathered by single-item questions ask a respondent to specify those individuals with whom he or she has direct ties of a specified kind (Marsden, 1990). In delimited studies a list of population can be used to individuals recognize their contacts from it (aided method) but often only unaided method are practical with networks of large size. In this situation respondents are not asked to write the names from a performed list but are asked to write name of the people who are appropriate in response to name generator question.

For name generator method respondents were asked to give name of the people “who have been valuable sources of information when you need someone with technical competence and skills”. This question basically has been designed according to Rizova’s (2006) definition for technical-advice networks and Bruque et al’s (2009) research for eliciting informational network data and other researches in advice networks (Sparrowe et al, 2001; Lange et al, 2004).

There were not any limitations about the number of names which people provide for name generator method. Related studies which employed similar designs collected additional data according to only first five persons (Carroll and Teo, 1996; Morrison, 2002; Bruque et al, 2009). In this research we asked respondents to write name of the people in first cell of the table and answer other questions according provided name in each row. Questions are presented in appendix 1. All these questions has been designed according to research by Bruque et al (2009).

First respondents should provide name of the people according to the proposed question. In next step they should put five names in the first column of the table and answer other questions according to the provided Likert scale. Questions in other columns are related to network variable data (density and strength of ties).
3.5.3. Individual Adaptation Data

To collect required data in order to measure individual adaptation level, we used a method similar to method which has been used by Buque et al (2009) (Appendix 2). They used two different groups of people in organization as source for collecting information about individual’s adaption. The sources were departmental directors and employees who have been trained to spread knowledge and skills related to the implemented system throughout the organization. In our field site we didn’t have these two sources of knowledge. But there was one similar source of information. Technology supplier company had four persons in field site to train employees of organization. For period of one month after training classes they have to be available in the company during the days and if employees had any question related to the technology could ask from them. We call them trainers. These four persons have been used as source of information for individual adaptation.

3.6. Validity and Reliability checks

All the measures for constructs in this research were obtained from instruments were already used and validated in other related literatures. Also discussions have been made with academic experts and theoretical analysis has been done in order to choose the best and appropriate constructs and measures for the study. After this step the selected constructs and measures have been tested for validity and reliability in context of my study. It is argued that when an instrument is using in different studies its validity should be tested in context.

To achieve validity in this research we have to consider four types of validity test: Conclusion Validity, Internal Validity, Construct Validity and External Validity (Trochim, 2000).

Conclusion validity of study asks about the relationships between variables. To support that there is a relation between dependent variables and independent variables of this study and achieving to conclusion validity we used both statistical analysis and reliability (Trochim, 2000). The detail of the statistical formula is described in analysis part. For validity and reliability testing a random sample of 10 employees are chosen to participate in pretest survey. After conducting this sample survey Cronbach’s alpha measured on the responses to sample survey for assessing reliability of the items and instrument and construct validity. A reliability coefficient of 0.70 or higher is considered “acceptable” in most social science research situations (Trochim, 2000).
We used Inter-Rater method to estimate the reliability of the research. Inter-Rater reliability used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon (Trochim, 2000). To assess reliability of adaptability measurement, we divided trainers into two groups and each group answer questions related to IT-adaptation about the 10 selected employees. After this step we calculated average of responses as a degree of adaptation for each employee. Cronbach alpha value was 0.887 ($\alpha=0.887$) indicating acceptable reliability level closing to the cut-off alpha value of 0.70, as it is mentioned before, it is considered acceptable for social science researches. Following to this validity test we asked respondent to send their suggestions about wording and layout of adaptation scale questioner.

In order to test content validity of the study we talked about following topics with an expert from academia: 1. the operationalization of each variable fitted its conceptual definition, 2. the items were clearly worded and 3. comprehensiveness as well as appropriateness of the items chosen to measure each variable. In the next step wording and layout of the questions was tested. For this step a group of people from field was selected and it is requested to focus on wording and layout of the questions and instructions provided for answering the questions. Their suggestions led to some changes in questioner and improving instructions. During the prelaunch preparations employees mentioned that they prefer to stay anonymous when they response to the questions. But there was a problem with their request. A distinction of network data is that all respondent should be uniquely identifiable in order to be able generate the network from the responses. So we used a coding system to encourage employees to complete survey and avoid such validity issue. We assigned a unique ID to each employee and wrote the IDs on their response form. Using this procedure helped to protect the confidentiality of respondent and identifying them uniquely.

According to network literatures, network questions in the survey ask about actual exchanges that exist between respondent instead of asking about role relationships or affect-based links (Lange et al, 2004). Studies on social network methodology show that responses to actual exchanges are more accurate in affect based interactions (Marsden, 1990). In questions related to actual exchanges, questions are about what respondent currently do instead of what they would do in different situations. It is argued that questions like what people would do in different situations may not be useful about ties that currently exist, it would guide people to talk about what they would do in future or in an ideal state (Marsden, 2002).
The network questions of this research (after translation) are worded to ask respondent about their actual exchanges which typically they have, instead of asking about their interaction about particular time. The questions forced respondent to think about their day to day actions and who they tend to interact with. This guidelines helps to solve problems in validity of networks data which happens when respondent report their interaction in a specific time, for example in specific day or week.

3.7. Analysis

The analysis of quantitative data has been done by using statistical analysis such as correlation and regression analysis. UCINet software used to analyze the network portions of the data and guide in the interpretation of the statistical results. Data analysis involves three major steps:

1. Data Preparation: involves checking or logging the data in; entering the data into the computer; transforming the data; and developing and documenting a database structure that integrates the various measures (Trochim, 2000).

2. Descriptive Statistics: are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. With descriptive statistics it is possible to describe what is, what the data shows (Trochim, 2000).

3. Inferential Statistics: are to test hypotheses of the research. We use inferential statistics to make inference from our data to more general conditions (Trochim, 2000).

In order to prepare data for the next step, data has been inserted into the SPSS and two calculations have been done to measure strength and density of network. Furthermore to visualize technical-advice network of the field site, network data has been inserted in UCINet. Figure 9 shows the technical-advice networks of the field site which has been visualized by UCINet. Thickness of ties shows strength of relationships that exist between employees. The network map of the field site is a directed graph showing the individuals to whom people turn when seeking someone with technical competence and skills. Head of the vectors shows direction of the relation and characters near each node is initials of employees’ names.
Figure 9: Visualized technical-advice networks between employees of the field site

Information for the density of network gathered by the question in last column of table in appendix A “Indicate how many people from the list this person usually talks to” (Morrison, 2002; Bruque et al, 2009). Density was measured as sum of the ties between the members of the network divided by the number of possible ties (Hanneman and Riddle, 2005; Bruque et al, 2009). The formula used for calculating density is \[ \sum T_j / n(n - 1) \]. \( T \) is the number of links from alter \( j \) and \( n \) is the total number of alters identified.

Strength of informational network has been computed by averaging responses to the question “My relationship with this person is very close” (Ibarra, 1993; Morrison, 2002; Bruque et al, 2009). Responses to this question was a seven Likert point scale (1= totally disagree; 7= totally agree).

Statistical correlation used to describe the degree of relationship between two variables (density, IT-adaptation and Strength, IT-adaptation). Since variables of this study are at interval level appropriate type of correlation is Pearson Product Moment Correlation (Trochim, 2000). The formula for the correlation is: \[ r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}} \]. Symbol \( r \) stand for
correlation and it is always between -1.0 and +1.0. If the correlation is negative then we have negative relationship and if it is positive then we have positive relationship.

After computing correlation, it is necessary to determine the probability that the observed correlation occurred by chance (Trochim, 2000). Significance test has been conducted. Significance level of alpha which has been used in significance test is 0.05. The degree of freedom calculated by this formula $df = n - 2$. Since we do not know that the relationship between dependent variable and independent variable is positive or negative we will use two tailed test (Trochim, 2000). With these pieces of information it is possible to test the significance of the correlation.

Since there are three variables in this research (two independent variables and one dependant variable) and the research is about studying effect of two independent variables on dependent variable so multiple regression analysis has been used in order to check the validity of the hypothesizes (Sirkin, 1995).

The regression formula used for this step is $Y = \alpha + \beta_1 x_1 + \beta_2 x_2$. Which Y is the dependent variable, $\beta_1$ and $\beta_2$ are the independent variables of the study and $\alpha$ is a constant amount. If $\beta_1 = \beta_2 = 0$ then null hypothesis will be true and the defined hypothesizes are not correct. Null hypothesis of this study is “density and strength of ties in technical-advice network do not have any effect on individual adaptation to IT-induced changes”. If at least one $\beta_i \neq 0$ then one of the hypotheses will be correct (or both of them). The significance level to reject null hypothesis is 0.05. It means that if calculated p-value was less than 0.05 then null hypothesis will be rejected and our defined hypothesizes are correct and acceptable.
4. Chapter 4: Results

Analysis (Data Preparation, Descriptive Statistics and Inferential Statistics phases) has been done according to the previous section and the results will be presented in this section.

Number of responses to the questionnaire was 38; it means that 74 percents (74%) of the employees responded to the survey. Table 2 shows descriptive statistics and table 3 presents correlations of the variables that have been calculated by SPSS according to the employees’ responses. In table 2 there are three columns (Mean, Std. Deviation and N). Mean is the sum divided by the number of cases for each variable (Arithmetic average). As it is presented in the table we can see the average level of adaptation, density and strength in the field site. Third column is the Standard deviation of the empirical data. It is a measure of dispersion around the mean. In a normal distribution, 68% of the cases fall within one standard deviation of the mean and 95% of the cases fall within two standard deviations. For example, the mean for adaptation level is 4.1, with a standard deviation of 1.4, 95% of the cases would be between 6.9 and 1.3 in a normal distribution (the square root of the variance). Last column shows the number of cases for each variable.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
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<tbody>
<tr>
<td>Strength</td>
<td>3.3158</td>
<td>1.03311</td>
<td>38</td>
</tr>
<tr>
<td>Density</td>
<td>.01904</td>
<td>.010558</td>
<td>38</td>
</tr>
<tr>
<td>Adaptation</td>
<td>4.1908</td>
<td>1.44778</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 2: Descriptive Statistics

Table 3 is the overall model fit of the results. R is the square root of R-Squared and is the correlation between the observed and predicted values of dependent variable. R-Square is the proportion of variance in the dependent variable (IT-adaptation) which can be predicted from the independent variables (Density and strength). This value indicates that 23.5% of the variance in IT-Adaptation level can be predicted from the variables Strength and density of technical advice network. Note that this is an overall measure of the strength of association, and does not reflect the extent to which any particular independent variable is associated with the dependent variable. R-Square is also called the coefficient of determination. Adjusted R-square - As predictors are
added to the model, each predictor will explain some of the variance in the dependent variable simply due to chance. One could continue to add predictors to the model which would continue to improve the ability of the predictors to explain the dependent variable, although some of this increase in R-square would be simply due to chance variation in that particular sample. The adjusted R-square attempts to yield a more honest value to estimate the R-squared for the population. The value of R-square was .235, while the value of Adjusted R-square was .191. Adjusted R-squared is computed using the formula $1 - ((1 - \text{Rsq}) \times (N - 1) / (N - k - 1))$. From this formula, you can see that when the number of observations is small and the number of predictors is large, there will be a much greater difference between R-square and adjusted R-square, because the ratio of $(N - 1) / (N - k -1)$ will be much greater than 1. By contrast, when the number of observations is very large compared to the number of predictors, the value of R-square and adjusted R-square will be much closer because the ratio of $(N - 1) / (N - k - 1)$ will approach 1. The standard error of the estimate, also called the root mean square error, is the standard deviation of the error term, and is the square root of the Mean Square Residual (or Error).

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.484\textsuperscript{a}</td>
<td>.235</td>
<td>.191</td>
<td>1.30223</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Predictors: (Constant), Strength, Density

Table 3: Overall Model Fit

Table 4 is the main matrix of the Pearson's output. Variables have been arranged in a matrix such that where their columns/rows intersect there are numbers that tell about the statistical interaction between the variables. According to this table there is a positive relation between IT-adaptation and strength of ties as well as density of individual networks. Three pieces of information are provided in each cell -- the Pearson correlation, the significance, and number of cases (Significance and Pearson Correlation are described in analysis section). When a variable interacts with itself, the correlation will obviously be 1.00. No significance is given in these cases. Notice that for example the .404 (strength and adaptation correlation) has asterisks by it. As it is indicated at the bottom of the output, these asterisks show that the correlation is significant at 0.05.
Table 4: Pearson Product Moment Correlation

Table 5 shows regression analysis of the data and calculated values for $\beta_1$ and $\beta_2$. The first column of Unstandardized Coefficients (B) is the values for the regression equation for predicting the dependent variable from the independent variable. These are called unstandardized coefficients because they are measured in their natural units. As such, the coefficients cannot be compared with one another to determine which one is more influential in the model, because they can be measured on different scales. The second column of Unstandardized coefficients (Std. Error) is the standard errors associated with the coefficients. The standard error is used for testing whether the parameter is significantly different from 0 by dividing the parameter estimate by the standard error to obtain a t-value. The next column in the table is the standardized coefficients (Beta). These are the coefficients that would be obtained if we standardized all of the variables in the regression, including the dependent and all of the independent variables, and ran the regression. By standardizing the variables before running the regression, all of the variables have been put on the same scale, and it is possible to compare the magnitude of the coefficients to see which one has more of an effect. Last column provide the Sig. or P-value. As it is described in previous section by values in this section it is concluded that the values are significant and null hypotheses are rejected. For the density of network the real value of Sig (p-
value) is 0.079 that is higher than 0.05 and shows that this value is not significant. Since the correlation shows a positive relation between density and adaptation so we can divide the value by 2 and if it was less than 0.05 it is possible to conclude that the results for density is also significant.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.968</td>
<td>.744</td>
<td>.012</td>
</tr>
<tr>
<td>Strength</td>
<td>.450</td>
<td>.217</td>
<td>.321</td>
</tr>
<tr>
<td>Density</td>
<td>38.379</td>
<td>21.233</td>
<td>.280</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Adaptation

Table 5: Regression analysis of technical-advice network variables on individual adaptation to IT-induced changes

Hypothesis 1 is supported according to regression analysis shows in table 4. Network strength variable is positive and significant then ($\beta_1 = 0.45$ and $P – Value < 0.05$): Stronger ties between individuals in technical-advice network have positive effect on individual adaptation to an IT-induced change. Regression results show that the second hypothesis also has been supported ($\beta_2 = 38.37$ and $P – Value < 0.05$) then: denser individual technical-advice network have positive effect on individual adaptation to an IT-induced change. Thus members of technical-advice networks who have stronger ties adapt better than the others who have weak ties. Moreover members of the networks who have denser technical-advice network adapt better than others to IT-induced changes.
5. Chapter 5: Conclusion and Final Discussion

Findings of the research, contribution to the fields, limitations and possible future research directions will be discussed in this section.

5.1. Conclusion

This study examines the effects of social relations between employees on variations in the individual’s adaptability to IT-induced change. Social networks were used to examine the characteristics of social structure within employees that were related to adaptability. The main focus of this study was on technical-advice networks as an effective factor to adaptability. Regarding the research question two characteristics of this network have been examined. Hypothesizes of research are about the positive effects of strength of ties and density of networks on individual adaptation to IT-induced changes. The results of the analysis on empirical data supported developed hypotheses of the research and showed that stronger ties and denser technical advice network have positive effects on individual adaptation to IT-induced change. This research showed that interpersonal communications in technical-advice networks are important during IT-induced changes and enhance individual adaptability to this type of changes.

5.2. Discussion

This study examines the impact of social structures between employees, on variations in the individual’s adaptability to IT-induced change. In this research social networks were used to examine the characteristics of social structure within employees that were related to adaptability. Since the exchange of help and insights is essential to adapting, therefore, social structures underlying such exchange would be relevant for adaptability. In considering technical-advice networks, the less explored perspective of social networks and adaptability have been taken (Bruque et al, 2009). Access to knowledge related technical issues as well as organizational matters provided the basis for theorizing about the relationships between structural characteristics of this network and interpersonal-level variations in adaptability.

5.2.1. Role Theory

According to Role theory (section 2.4) people in their daily activities act out of their socially defined responsibilities (Biddle, 1986). This theory supports the results of this study. Organizational charts present the structure of an organization, the relationships and relative ranks
of its parts and positions/jobs. It shows employees defined role in organization, however according to role theory employees perform more than their defined responsibility. Informal relationships which are studied in this research are not written like organizational charts but they exist in organizations. Organizational structures provide a hierarchal structure of organization and define formal role of job positions, while social structure provide informal positions and roles in organizations. For example although in reality employees respond to others questions in different situation but it is not a defined task in their defined formal role. The question asks about the employees’ extra role and the result shows that this kind of roles exists in organizations. The important thing is that these kinds of roles and informal relationships are necessary for all organizations in different aspects (e.g. finishing assigned task, better adaptation to changes and etc.) to achieve to their goals.

5.2.2. Social network

Findings of this research are also related to social network literatures (section 2.5). Social networks studies show that the structure of social interaction is effective on access to valued resources (Brass, 1984). Social network literature defined formal and informal networks as two broad categories of social networks in organizations. Empirical findings of this study (effects of density and strength on adaptation) contribute to social networks literature since it showed that the strength and number of a specific type of informal relationships have effect on individual adaptation. Regarding to Brass’s (1984) definition and results of the research these two characteristics of technical-advice network have positive effect on access to valued resources. The valued resource in this research is colleges’ knowledge and experiences. Employees by asking questions from others try to find someone who has been in same situation and has an experience about it. The organizational social networks in these conditions help individuals to use other’s best practices and find a solution for their problems.

5.2.3. IT-Induced change

According to the information about the implemented system and changes in the field site, implementers did not make fundamental changes in their previous ways of doing business and they just tried to improve performance and reliability of old operations. This type of IT-induced change is related to the IT-induced changes literature (Gash and Orlikowski, 1991) which they defined three orders for it. Changes in field site was first order of change which the definitions
by Gash and Orlikowski (1991) and specifications of change in field site show the relations between them. Furthermore the IT changes in the organization are related to the organizational imperative of causal agency which is discussed previously in 2.1. In the organizational imperative motivations and actions of information technology designers are the source of changes. The IT designers implement the system to satisfy information requirements of the organization which is also related to the changes in the field site.

5.2.4. Advice Network

Two structural characteristics of technical-advice network between employees have been examined as antecedents to adaptability. Results support the hypotheses that higher network density and stronger ties are positively related to individual adaptability. The research provided interesting results about the role that technical-advice networks plays in individual adaptation to IT-induced changes. First the results show that technical-advice network which is made up of strong ties can enhance flow of information between individuals. This enhanced flow of information in network has positive effect on individual adaptation to IT-induced changes. The result is related to the previous researches in IT adaptation. It is argued that strong ties predict actor’s motivation for knowledge sharing (Nebus, 2006) and Haslberger (2005) revealed that during an IT-induced change organizational members need in-depth and frequent knowledge which is better transferred via strong ties. These studies support the result of this research. According to the results, it can be concluded that denser technical-advice networks are more important in individual adaptation to IT-induced change. A dense technical-advice network is more effective because during a change individuals can use it as a tool to access to information about different problems and have better understandings about the new system. This part of research result is related to Hansen Studies (1999). He argued that networks with low density will decrease the exchange of job-related ideas between employees. During an organizational change employees require knowledge about the change to be able to work with it and other employees’ experience are one of the important sources of this knowledge.

5.2.5. Contribution to the Field

Answers to the research question of this study have important implications for many research areas within the domain of Information Systems and Management, including IT use and assimilation, IT adaptation, social networks and organizational change. A gap that has been
identified in the social networks literature as well as in the change management literature is that relational factors has remained relatively underexplored in the study of adaptability (Bruque et al, 2009). This gap exists in social networks literature since less attention has been paid to adaptability as a dependent variable of interest. In the change management literature, although studies have focused on adaptability as the dependent variable, they have not examined the role of patterns of relationships as an effective factor on adaptability, focusing instead on non-relational factors (for example, characteristics of individuals like tenure, age, IT-related educations) as antecedents (Milton and Westphal, 2005). This study addresses this gap by identifying specific characteristics of social structures of technical-advice networks that are relevant to adaptability. Findings from this study suggest that even after commonly understood non-relational factors characterizing the individual are held constant, there is something about the specific pattern of relationships between individuals that is related to its extent of adaptability. According to this study and other relevant researches (Bruque et al, 2009) the specific characteristics of these relational patterns that are relevant to adaptability vary depending on the type of relationships. Relevant structural patterns that are significant antecedents to adaptability could be different depending on whether the structure includes technical-advice networks or another type of social networks like social supportive networks. Findings from this study therefore suggest the importance of relational as well as non-relational characteristics in driving adaptability. This contributes to social network research by identifying an additional organizational phenomenon on which social networks have an influence. The contribution to change management literature is by identifying additional sets of factors (relational characteristics) that explain more of the variance in individual level adaptability than could be explained by previously known (non-relational) factors.

The method to measure dependent variable (individual adaptation) of this study is another important significance of this research. Previous studies in adaptation employed self-report measures for individual level of adaptability but in this research an external rated indicators of member behavior (developed by Bruque et al 2009) have been used to measure employees’ adaptation level. Advantage of using this method is decreasing biases rather than previous methods. It is argued that in previous methods there were worries about personal biases since both dependent and independent variables were based on self-reported data (Bruque et al, 2009).
The relationship between IT and social structure has been examined in some well-known works within organizational studies (Barley, 1990) and social networks research (Burkhardt and Brass, 1990). But, focuses of these studies are about the impact of IT on social structure. In contrast, the impact of social structure on the ability to assimilate IT has remained relatively less well-explored (Bruque et al., 2009). This is another gap in literature that has been addressed in this study, which specific characteristics of social structure relating to advice on technical issues as well as organizational matters are explicitly investigated in relation to the adaptability. The dependent variable in this study measures the individual adaptation level of IT. The findings from this study show that the relationship between specific characteristics of social structure and the extent of accomplishment of IT-enabled goals from work processes. This makes clear the impact of these social structures on the ability of individuals to assimilate IT-induced changes in work processes, which is defined in this study as the individual adaptability to IT-induced change. The findings from this research are related to the works of other researchers such as Barley (1990) and Burkhardt & Brass (1990) that show the interrelationship between social structure and IT.

Much of existing literature on technology acceptance (Venkatesh et al., 2003) has taken an atomistic view towards IT use, viewing use as the individuals’ interaction with the technology. By focusing on adaptability to IT-induced change, this study relates to the IT acceptance and use literature but also extends beyond it by considering the individual’s use of the technology, not in isolation, but as one part of the broader process changes enabled by the technology. Findings from this study relate not only to the adaptation of the technology, but to the assimilation of the work process changes (orders of changes) that the technology enables. In taking this focus, my study relates not only to IT success but also to IT-business success, which is of increasing importance to the IS literature.

Another contribution of this research is to the HR management field. Regarding the results of the study it is important during recruitment, HR department consider the individual abilities in making relationships with others. Also the results of the study show that managers of organizations should encourage employees for both their formal and informal relationships during their daily activities.
5.3. Limitations

The first limitation of this research is the type of social network, that just effects of technical-advice network have been examined within the organization and effects of other networks such as hindrance network (Sparrowe et al., 2001) or organizational–advice network (Rizova, 2006) did not considered. The second limitation is that the selected social network just focuses on interpersonal relation and the effect of this kind of network on interunit level have not been studied. The other limitation of this work is some important factors which have effect on individual adaptation are not included. In most instances when a new IT system implemented, organization provide instruction and support to help user to adapt the new system. Although the effect of this factors are not included but there are researches that acknowledge formal training have effect on adaptation to IT-induced changes (Bruque et al., 2009). Another limitation of this study is the effects of variables such as tenure, age, IT-related educations and gender are not considered in this work. The last limitation is IT black boxing. IT black boxing means that due to the nature of the research it doesn’t give any regards to technology per se. IT changes is an important component of this research but it used like a black boxed and there is not any detailed discussion about it. For example when an ERP system is implemented it has different effects on organization from another system like Transactional Processing System or a simple office automation system. Then it would be helpful in future researches consider IT in more details, like type of it and other important components of the implemented IT system.

5.4. Future Research

It is possible to explore a number of research directions in future. In this study I have looked at technical-advice network. Future research could investigate different kinds of networks such as hindrance networks (Sparrowe et al., 2001), organizational advice networks (Rizova, 2006) or awareness networks (Borgatti and Cross, 2003). Also it is possible to examine the interaction between different networks (e.g. technical-advice network and awareness network), exploring how variations in these interactions affect adaptability to IT-induced changes and other organizational phenomena. Moreover network analyzed here includes social ties inside the workplace; future studies can study ties inside as well as outside the workplace. Another important direction for future studies is level of the network analysis. This study focuses on
interpersonal networks it would be interesting to analyze networks on interunit level networks in organizations and examine effect of social networks on unit level of adaptability in organizations.

Moreover, in future studies, it would be interesting to investigate other organizational factors such as leadership style and self-monitoring (Mehra et al., 2001). Another interesting direction in this area could be studying social networks characteristics simultaneously with idiosyncratic characteristics of individual (such as tenure).
6. References


7. Appendix 1  

Technical-Advice Network Questions

Please, write the name of the people who have been valuable sources of information when you need someone with technical competence and skills.

| Write the names here | Rate on a 1-7 scale this assessment:  
My relationship with this person is very close | Indicate how many people from the list this person usually talks to |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Appendix 2

IT-Adaptation questions

Please answer the questions according to the provided employee’s name (Rate on a 1-7 scale):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>the employee has quickly become familiar with the new IT platform</td>
</tr>
<tr>
<td>2</td>
<td>it was not difficult for the employee to adjust him- or herself to the new IT platform</td>
</tr>
<tr>
<td>3</td>
<td>The employee has skillfully used the tools and applications the new IT platform provides</td>
</tr>
<tr>
<td>4</td>
<td>the employee has accurately managed all the facilities the new IT platform provides</td>
</tr>
</tbody>
</table>