Network Density as a Double-Edged Sword: A User Adaptation Approach of IT System Use

Research-in-Progress

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Abstract

Recently, few studies have investigated the relationships between advice seeking and giving network densities and IT system use. To fill the gap, this study explores IT system use by drawing on theories of advice networks, user adaptation and IT system use. Specifically, four types of user adaptation are examined, including IT adaptation, task adaptation, positive reappraisal and emotional venting. We predict that advice seeking and giving network densities play different roles in each type of user adaptation. Furthermore, IT adaptation, task adaptation and positive reappraisal will positively influence IT system use, whereas emotional venting will negatively influence it. To investigate the research model, a two-phase network survey is being conducted in the context of a newly implemented EMR in a hospital. We aim to theoretically open the black box between advice networks and IT system use, and provide practical insights for implementing, designing and using IT systems in organizations.

Keywords: IT system use, user adaptation, seeking network density, giving network density
Introduction

Today’s IT systems are complex and pose significant challenges for users (Sykes et al. 2009). Users face great technological uncertainties and negative feelings about using a new IT system, i.e., using the features in a new IT system that relate to the core aspects of tasks (DeSanctis and Poole 1994). Learning to use a new IT system entails a knowledge transfer process across users with different levels of skills (Sykes et al. 2009). Relationships that are developed for exchange of information needed to accomplish work-related tasks, i.e., advice networks, play a critical role in the knowledge transfer process (Reagans and McEvily 2003). Advice networks have been recently studied as a critical determinant of IT system use (e.g., Bruque et al. 2008; Magni et al. 2012; Sasidharan et al. 2012; Sykes et al. 2009; Venkatesh and Sykes 2013). However, few studies have theoretically distinguished the effects of advice seeking and giving networks. It is impossible to track directions of information exchange through a unitary conceptualization of advice networks. The knowledge heterogeneity among users leads to asymmetric information exchanges, resulting in an imbalance in the giving and seeking of advice (Flynn 2003). Therefore, making the distinctions between advice giving and seeking networks adds values to understand why users perform differently in IT system use in organizations.

The stream of network research presents two different types of network benefits from advice networks: (1) information access from advice seeking network, and (2) power and influence from advice giving network (Adler and Kwon 2002; Venkatesh and Sykes 2013). Since network benefits from advice seeking and giving networks accrue to users with certain network structures (Adler and Kwon 2002), the debate of network benefits between views of network closure (Coleman 1988) and structural holes (Burt 1992) still exist in studying IT system use. Therefore, studying network densities provides a useful lens for investigating influences of advice seeking and giving networks on IT system use (Magni et al. 2012). For instance, previous network research has shown that seeking network density, i.e., the extent to which a user’s direct contacts are connected to one another in the advice seeking network, and giving network density, i.e., the extent to which a user’s direct contacts are connected to one another in the advice giving network, influence IT system use by offering users with different levels of benefits (Gargiulo et al. 2009).

Despite the importance of network densities, there is still a black box on how network densities impact on IT system use (Elie-Dit-Cosaque and Straub 2011). Evidences from prior research (e.g., Gargiulo et al. 2009; Sasidharan et al. 2012; Sykes et al. 2009) together show inconsistent links from seeking and giving network densities to IT system use. Research attention has been called to broaden the conceptualization of IT system use by studying user adaptation toward IT systems (Barki et al. 2007; Benbasat and Barki 2007). It becomes important to understand user adaptation because it helps explain IT system use (Kock et al. 2006). User adaptation explains the underlying mechanisms between seeking and giving network densities and IT system use (Bruque et al. 2008). Network densities can enhance user adaptation toward IT systems by providing a stream of physical energy from information access and mental energy from power and influence (Hobfoll 2001). Users with appropriate user adaptation are more likely to achieve a better fit with IT systems and task for system use (Orlikowski 2000).

Prior work (e.g., Bruque et al. 2008) tends to regard user adaptation as a global concept, without specifying various types of user adaptation and missing richness of the relationships between user, an IT system and tasks. Based on the Coping Model of User Adaptation (CMUA) (Beaudry and Pinsonneault 2005), user adaptation can be classified in terms of problem-focused and emotion-focused adaptation. Specifically, problem-focused adaptation includes IT adaptation (i.e., the degree to which users change an IT system in aspects of functionalities and interfaces to fit personal preferences and work patterns (Barki et al. 2007)) and task adaptation (i.e., the degree to which users change task procedures to accommodate an IT system (Barki et al. 2007)). Emotion-focused adaptation consists of positive reappraisal (i.e., the degree to which users look for something positive in an IT system (Carver et al. 1989)) and emotional venting (i.e., the degree to which users vocally and openly express negative emotions of an IT system (Carver et al. 1989)). These two classifications of user adaptation help us to examine the nuances of seeking and giving network densities on IT system use. Specifically, this study aims to address the following research questions:

- **RQ1.** What are the impacts of seeking network density and giving network density on different types of user adaptation?
- **RQ2.** How do the different types of user adaptation influence IT system use?
The theoretical contributions of this research are threefold. First, this study employs a user adaptation approach to understand IT system use by integrating theories of advice networks, CMUA and models of IT system use. Second, we investigate the importance of user adaptation by opening the black box between network densities and IT system use. Third, this research distinguishes the impacts of seeking network density and giving network density on four types of user adaptation, and contributes to the continuing debate of network benefits between views of network closure and structural holes in the network research. This research also provides significant practical contributions. First, this study can enrich organizational managers’ understanding of successful IT system implementations by exploring advice networks in user adaptation, given the lack and high cost of human capitals in organizations. Second, for IT system developers/designers, the findings provide guidelines of how to design IT systems by involving different types of user adaptation. Third, for IT system users, this study provides insights on how to make full use of their advice networks to address technological uncertainties and negative feelings when using a new IT system. Finally, our study also enriches the methodological knowledge of social network research in term of measuring networks.

**Theoretical Background**

*User Adaptation and IT System Use*

User adaptation has been diversely understood in the context of IS research. It fundamentally focuses on a key phenomenon: the way users respond to changes or disruptions induced by IT systems (Tyre and Orlikowski 1994). The IT-induced changes or disruptions create technological uncertainties and negative feelings for users toward the IT systems (Ashford 1988). Thus, CMUA proposes user adaptation as problem-focused and emotion-focused adaptation (Beaudry and Pinsonneault 2005). The purpose of user adaptation is to improve future IT system use by overcoming the associated uncertainties and negative feelings. Users with appropriate user adaptation are more likely to achieve a better fit between user, IT system and task (Orlikowski 2000). Hence, we propose to deepen understanding of problem-focused and emotion-focused by taking into account of the richness of the relationships between user, IT system and task, which are the three fundamental elements of IT system use (Burton-Jones and Straub 2006).

Problem-focused adaptation aims at managing the associated technological uncertainties with IT systems directly by changing IT systems in aspects of functionalities and interfaces and modifying task procedures (Beaudry and Pinsonneault 2005). It is consistent with the theoretical importance of IT specifications from task-technology fit theory (TTF) (Goodhue and Thompson 1995) and task characteristics from adaptive structure theory (AST) (DeSanctis and Poole 1994). TTF highlights the importance of IT adaptation to optimize outcomes of IT system use (Goodhue and Thompson 1995). If users invest time, energy and efforts to adapt a given IT system, they are self-motivated to use it more, in order to realize the expected benefits from their investments (Bhattacherjee and Harris 2009). On the other hand, AST suggests that task adaptation is with predictive implications for IT system use (DeSanctis and Poole 1994). Task adaptation results in a better fit and compatibility between IT systems and tasks, and it is positively related to IT system use (Beaudry and Pinsonneault 2010).

Emotion-focused adaptation is oriented toward user’s self and aims at changing perceptions of IT systems or at reducing negative emotions (Beaudry and Pinsonneault 2005). Social psychologists find that positive reappraisal is the main core theme of meaning-making approaches in changing users’ perceptions toward IT systems (Davis et al. 1998; Taylor 1983). Positive reappraisal enables users to appraise IT systems more positively and to arouse positive affects towards IT systems (Folkman and Moskowitz 2000). On the other hand, to reduce negative emotions, users intend to vocally and openly express emotions of the IT systems to eventually reestablish emotional stability (Beaudry and Pinsonneault 2010). However, emotional venting increases users’ emotional activation (Carver et al. 1989) and amplifies adverse effects of negative emotions (Brown et al. 2005), leading to refusal of using an IT system.

CUMA posits that the specific combination of problem-focused and emotion-focused adaptation depends upon the extent of users’ perceived mastery over an IT system based on the given resources (Lazarus and Folkman 1984). If users have a positive sense of mastery over an IT system, they will perform more problem-focused adaptation and less emotion-focused adaptation, and vice versa (Beaudry and Pinsonneault 2005). Problem-focused adaptation occurs primarily when users feel that they are in control.
of an IT system (Lazarus and Folkman 1984). In this case, relying heavily on emotion-focused adaptation rather than handling the issues associated with an IT system is likely to result in frustration and distress (Begley 1998). Alternatively, emotion-focused adaptation occurs mainly when users feel that they have limited mastery over an IT system (Lazarus and Folkman 1984). Over-relying on problem-focused adaptation in such a situation leads to frustration and distress, while having little effect on the issue at hand (Begley 1998). In the reality, users apply a combination of emotion-focused and problem-focused adaptation, to cope with the consequences of an IT system (Lazarus and Folkman 1984). In the next section, we justify theoretical foundations between seeking and giving network densities and user adaptation.

### Advice Seeking Network and User Adaptation

Network scholars argue that learning to use an IT system requires information access to reliable and readily available providers who are willing to assist and familiar with the IT system (Morrison 2002). The information access benefit accrues to users who have a dense advice seeking network (Adler and Kwon 2002; Coleman 1988). Although a sparse advice seeking network benefits the users with opportunities to access diverse IT-related information (Burt 1992), these opportunities require active cooperation of the knowledge providers that should not be taken for granted (Gargiulo et al. 2009). Therefore, we adopt the concept of seeking network density to explore influences of advice seeking network on user adaptation.

As a type of social resources (Thoits 1995), information access from advice seeking network influences user adaptation toward an IT system (Beaudry and Pinsonneault 2005; Lazarus and Folkman 1984). Information access can widen users’ pool of available resources and abilities to adapt to an IT system by providing a stream of physical energy (e.g., knowledge, information) (Hobfoll 2001). On the one hand, users would leverage various user adaptation behaviors to invest information access for obtaining further benefits from using an IT system, because users intrinsically strive for gaining benefits according to the conservation of resources theory (Hobfoll 1989). On the other hand, the perceived value of the physical energy hinges on its value in promoting or supporting one’s perceived mastery on an IT system (Hobfoll 1989). Specifically, the denser the advice seeking network is, the more likely the users get information access (Reagans and McEvily 2003), then the more self-capable of an IT system the users perceive themselves as (Hobfoll 2001). Therefore, seeking network density increases users’ efforts in IT adaptation and task adaptation and decreases their efforts in positive reappraisal and emotional venting according to CMUA (Beaudry and Pinsonneault 2005).

### Advice Giving Network and User Adaptation

Advice giving network indicates users’ power and influence over an IT system via responding to others’ IT-related requests (Adler and Kwon 2002). The power and influence benefit accrues to users who have a sparse advice giving network (Adler and Kwon 2002; Burt 1992). A sparse advice giving network (i.e. many structural holes) makes a user become the critical connecting link and a conduit for information flow between other users (Burt 1992), increasing others’ dependence on him/her (Adler and Kwon 2002). However, in a dense advice giving network, the users’ power and influence is lowered due to the alternative information exchanges among the other users (Foa and Foa 1975). The users’ power and influence is also diminished by reducing their freedoms in performing own tasks due to the social pressure in a dense advice giving network (Gargiulo et al. 2009). Therefore, we employ construct of giving network density to explore influences of advice giving network on user adaptation.

Power and influence from advice giving network, as another type of social resources (Thoits 1995), also influences user adaptation toward an IT system (Beaudry and Pinsonneault 2005; Lazarus and Folkman 1984). Power and influence can enhance users’ abilities to cope with an IT system by providing a stream of mental energy (e.g., self-esteem, self-efficacy) (Hobfoll 2001). On the one hand, users would perform various user adaptation behaviors to protect themselves from losing power and influence on an IT system, since users sensitively strive against resource losses (Hobfoll 1989). On the other hand, the perceived value of the mental energy hinges on its value in promoting a positive self-sense that one user can master the IT system (Hobfoll 2001). Particularly, the sparser the advice giving network is, the more influential and powerful the users are (Gargiulo et al. 2009), then the more self-capable of the IT system the users perceive themselves as (Hobfoll 2001). Therefore, giving network density reduces users’ efforts in IT adaptation and task adaptation and raises their efforts in positive reappraisal and emotional venting based on CMUA (Beaudry and Pinsonneault 2005).
Research Model and Hypotheses Development

Based on the theoretical analysis, this study proposes a research model (see Figure 1) for addressing the identified research questions.

![Figure 1. Research Model](image)

**Effects of Seeking Network Density on User Adaptation**

Seek network density enables users to increase investing their efforts in IT adaptation. Specifically, seek network density guarantees users with timely access to relevant qualified IT-related information (Adler and Kwon 2002), which helps to learn how an IT system operates and the underlying functions (Sasidharan et al. 2012). Seeking network density positively influences users’ perceived self-capabilities over an IT system and increases their efforts in changing them according to personal preferences and tasks to gain future benefits from using it (Hobfoll 2001). Therefore, we hypothesize that:

\[ H_{1a}: \text{Seeking network density is positively associated with IT adaptation.} \]

Seeking network density encourages users to spend more efforts in task adaptation, since it assists users in learning new working processes in an IT system (Sykes et al. 2009). Users in a dense advice seeking network are able to learn the ways others are using the IT system both via direct and indirect information flows (Magni et al. 2012). Information of performing tasks using the IT system is private and confidential for the providers, seeking of that information will be impaired if trust and cooperation norms are lacked between the seeker and the provider (Reagans and McEvily 2003). Seeking network density also confirms users with the benefits of the IT system and encourages them to put efforts in modifying their tasks to fit the IT system for positive outcomes (Beaudry and Pinsonneault 2005). Therefore, we posit that:

\[ H_{1b}: \text{Seeking network density is positively associated with task adaptation.} \]

Seeking network density decreases users’ efforts in positive reappraisal, because it enhances users’ perceived mastery over an IT system (Hobfoll 1989; Hobfoll 2001). Particularly, users in a dense advice seeking network are confident to adapt to an IT system and hold positive expectations from using the IT system at the beginning (Sykes et al. 2009). Otherwise, users in a spare advice seeking network are less self-capable and experience negative feelings toward the IT system. Users who have negative experiences with the IT system may try to see something positive in the IT system (Yi and Baumgartner 2004). They still attempt to try the IT system, presumably because users strive to obtain future benefits from the IT system (Hobfoll 2001). Therefore, we propose that:

\[ H_{1c}: \text{Seeking network density is negatively associated with positive reappraisal.} \]

Seeking network density reduces users’ efforts in emotional venting toward an IT system, since users in a dense advice seeking network are self-capable over it (Hobfoll 2001). The self-capable users are less likely to experience negative feelings toward the IT system, thus they are less likely in a need to spend efforts in expressing negative emotions (Carver et al. 1989). Furthermore, seeking network density enables the users to be confident with the IT system and decreases their efforts in emotion-focused adaptation like emotional venting (Beaudry and Pinsonneault 2005). Therefore, we predict that:

\[ H_{1d}: \text{Seeking network density is negatively associated with emotional venting.} \]
Effects of Giving Network Density on User Adaptation

Giving network density shortens users’ efforts in IT adaptation, because the decreased benefit of influence and power harms the formation of positive self-sense over an IT system (Hobfoll 1989; Hobfoll 2001). Giving network density pushes the users to perform according to others’ expectations (Gargiulo et al. 2009). IT adaptation, requiring creative works in changing the IT system, is impaired when reactive helping costs users too much efforts in giving IT-related information (Bergeron 2007). Conversely, users in a spare advice giving network intrinsically strive to protect the power and influence, and they increase efforts in IT adaptation to make themselves outstanding as others’ referral (Hobfoll 2001). Therefore, we hypothesize that:

\[ H2a: \text{Giving network density is negatively associated with IT adaptation.} \]

Giving network density also weakens users’ efforts in task adaptation due to the reduced positive self-sense on an IT system (Hobfoll 1989; Hobfoll 2001). As a creative work, task adaptation is impaired when giving network density costs the users too much efforts for others’ expectation (Bergeron 2007). On the other hand, a sparse advice giving network increase users’ efforts in task adaptation to make themselves the only referral for others, in order to protect power and influence benefit (Hobfoll 2001). A spares advice giving network empowers the influential and powerful users to be knowledgeable about the working processes of the IT system via responding to different system-related requests (Venkatesh and Sykes 2013). They are more able to gain benefits from the IT systems through changing tasks to fit the IT system. Therefore, we posit that:

\[ H2b: \text{Giving network density is negatively associated with task adaptation.} \]

Negative feelings from giving network density make users to employ positive reappraisal to avoid loss of existing resources (Hobfoll 1989; Hobfoll 2001). Resource pressure from giving network density may cause anxiety toward an IT system (Bolino and Turnley 2005), and users would have negative experiences with an IT system. Thereafter they may try to see something positive in the IT system (Yi and Baumgartner 2004), presumably because IT systems are viewed at good chances to improve work performance (Sykes et al. 2009). Otherwise, users in a sparse advice giving network are with a positive self-sense in seeing the benefits of an IT system from the beginning (Sasidharan et al. 2012), and less likely to invest their efforts in positive reappraisal of the IT system (Lazarus and Folkman 1984). Therefore, we propose that:

\[ H2c: \text{Giving network density is positively associated with positive reappraisal.} \]

Resource pressure from giving network density arouses users’ anxiety and decreases their self-efficacy toward an IT system, leading to their efforts in emotional venting (Bolino and Turnley 2005). These efforts help users to reestablish emotional stability before they work on the IT system (Folkman and Lazarus 1985). Conversely, users in a sparse advice giving network have a positive self-sense toward the IT system (Hobfoll 2001). They are less likely to experience negative emotions that trigger emotional venting (Carver et al. 1989). Furthermore, to protect influence and power from acting as only referrals for others, users in a sparse advice giving network are psychologically reluctant to release negative emotions to others via emotional venting. Therefore, we predict that:

\[ H2d: \text{Giving network density is positively associated with emotional venting.} \]

Effects of User Adaptation on IT System Use

IT adaptation aims to match task requirements and user preferences with an IT system, and it is positively linked to IT system use, according to TTF (Goodhue and Thompson 1995). Furthermore, if a user invests much efforts to modify an IT system to fit personal preferences or task processes, the user is more self-motivated to utilize the IT system more in order to realize the expected benefits from his/her investment of efforts (Bhattacherjee and Harris 2009). Therefore, we predict that:

\[ H3: \text{IT adaptation is positively associated with IT system use.} \]

According to AST (DeSanctis and Poole 1994), the structures associated with how these tasks are performed will be changed and reconstituted into new task structures in order to take full advantages of an IT system (Schmitz et al. 2010). Beaudry and Pinsonneault (2005) found that users try to increase the benefits associated with a given IT system by modifying their tasks so that they better fit with the IT system.
features/functions. The efforts of task adaptation result in a better fit and compatibility between an IT system and tasks, which are positively related to IT system use (Beaudry and Pinsonneault 2010). Therefore, we hypothesize that:

**H4: Task adaptation is positively associated with IT system use.**

The aim of positive reappraisal is to manage the negative experience rather than an IT system itself, and construing an IT event in positive terms should intrinsically lead users to continue active actions toward an IT system (Carver et al. 1989). Positive reappraisal creates a positive affect toward an IT system (Folkman and Moskowitz 2000), which increases the final outcome of IT system use. Organizational research shows that users who positively reappraise a new IT system are more likely to have high levels of IT system use, because positive reappraisal increases their commitment toward it (Sonenshein and Dholakia 2012). Therefore, we propose that:

**H5: Positive appraisal is positively associated with IT system use.**

Emotional venting is detrimental in IT system use by users who initially experience negative emotions associated with the consequences of an IT system (Beaudry and Pinsonneault 2005). Emotional venting makes users overly focus on the negative emotions themselves (Scheff 1979), increases users’ emotional activation (Carver et al. 1989) and amplifies adverse effects of the negative emotions (Brown et al. 2005), leading to the hindrance of IT system use. Emotional venting has been reported to result into the refusal of using a new IT system (Lapointe and Rivard 2005). Therefore, we posit that:

**H6: Emotional venting is negatively associated with IT system use.**

### Research Methodology

#### Research Setting and Data Collection

The research setting is the introduction of an Electronic Medical Record (EMR) system in a large hospital's clinic department. There are 146 EMR system users, consisting of attending doctors, associate chief of doctors, chief of doctors, and nurses who are qualified to provide clinic services for outpatients. The EMR system is implemented to replace old paper-based medical records of outpatient information, and it brings dramatic changes to the existing work processes in the department. The EMR system is officially released two month ago and it keeps on technical updating based on the feedbacks from the users. Our primarily interviews with the technical director and on-site observations reveal that the EMR system is appropriate for the present study. On the one hand, although certain training programs were given, users continue to exchange information among each other to overcome the knowledge barriers and uncertainties and learn about complex functions of the EMR system. On the other hand, users experience various levels of uncertainties and anxiety toward the EMR system, resulting in different responses to it.

We collect data primarily through a paper-based network-survey, along with supplemented qualitative and observational work. It is infeasible to capture advice networks and user adaptation through a single survey at the same time, when this study intended to explore how advice networks impacted on the post-implementation user adaptation. Therefore, a two-phase method was adopted. The first phase of survey was distributed immediately after the implementation at the end of June 2014. This survey was used to collect data on users’ advice seeking and giving networks, demographics and control variables. Although this is an ego-centric network study, we adopted a combination of ego-centric and socio-metric methods to correctly capture the users’ whole advice seeking and giving networks (Sosa 2011). First, each user was provided with the department roster. They were asked to check the names of people they seek or give EMR-related information at a typical working day. Second, the users were required to response to questions about other variables and personal demographics. Our network survey invited all of the 146 system users to participate, and we get 115 valid responses, indicating an acceptable response rate of approximate 80% for network studies (Wasserman and Faust 1994). It would be noted that in studies using primary social network data, a sample size of 115 is considered to be quite large (Borgatti and Cross 2003). The second phase of survey will be conducted three months after the first one in the last week of September 2014. This survey will be used to collect data of the four different types of user adaptation and IT system use, targeting at the 115 respondents from the first phase survey.
Measurements and Analysis Strategy

Advice seeking network captures interpersonal relationships that are developed for seeking EMR-related information from others (Ibarra and Andrews 1993; Sykes et al. 2009). It is collected by asking the participant to check the names of people in the roster from whom he/she seeks EMR-related information at a typical working day in the past two months (Sasidharan et al. 2012). Then we measure seeking network density as a proportion of the actual number of ties to the maximum possible number of ties among a participant’s direct contacts, ranging from “0” to “1” (Sykes et al. 2009). Advice giving network represents interpersonal relationships that are developed for giving EMR-related information to others (Ibarra and Andrews 1993; Sykes et al. 2009). It is collected by asking the participant to check the names of people in the roster to whom he/she gives EMR-related information at a typical working day in the past two months (Sasidharan et al. 2012). Then we measure giving network density as a proportion of the actual number of ties to the maximum possible number of ties among a participant’s direct contacts, ranging from “0” to “1” (Sykes et al. 2009).

IT adaptation is measured by four items adapted from Barki et al. (2007), with one sample of “Overall, I changed the EMR system to fit my personal preferences”. Task adaptation is measured by three items adapted from Barki et al. (2007), include one example as “I built disease models of my tasks so that they better fit the EMR system”. The four-item scale is adapted from Carver et al. (1989) to measure positive reappraisal, and one sample is “I tried to see EMR system in a different light, to make it seem to be more positive”. The three-item scale, adapted from Beaudry and Pinsonneault (2010), is used to measure emotional venting, and one sample is “I let my negative feelings of the EMR system out”. For the dependent variable, IT system use is measured by four items from Burton-Jones and Straub (2006), including one sample of “When I was using the EMR system, I used features that helped me input disease diagnostic information”. Overall, the participants are required to indicate their responses to each reflective question based on a 7-point Likert scale (with 1 = “strongly disagree” to 7 = “strongly agree”).

Demographics (i.e., gender, age, education level, job title, years of working experience, and years of computer experience), EMR system training (Amoako-Gyampah and Salam 2004), facilitating conditions (Venkatesh et al. 2008) and computer self-efficacy (Compeau and Higgins 1995) are included to control the effects of individual differences and personal capabilities.

Holding network size constant is theoretically necessary to obtain accurate estimates of the density effect, thus, we measure seeking network size as the number of direct contacts from whom the user seeks advice and giving network size as the number of direct contacts to whom the user gives advice (Gargiulo et al. 2009). Seeking network size corresponds to the user’s degree centrality in advice seeking network, and giving network size corresponds to the user’s degree centrality in advice giving network. Additionally, advice networks and friendship network are not mutually exclusive and an overlap in them can occur in organizations (Borgatti and Foster 2003). Therefore, we measure friendship network by asking the participant to identify friends who s/he saw within her/his role in the organization as well as socially outside of her/his role in the organization (Ibarra and Andrews 1993). Then we control for friendship network density, i.e., as a proportion of the actual number of ties to the maximum possible number of ties among a participant’s direct contacts in friendship network.

After data collection, we will use UCINET 6 (Borgatti et al. 2002) to visualize the networks and calculate the network variables. The theoretical model is multistage, suggesting the need for a structural equation modeling technique. Partial Least Square (PLS) (Ringle et al. 2005) will be chosen primarily for both measurement and structural models. First, as a second-generation structural equation modeling (SEM) technique, it can estimate the loadings (i.e., assessing construct validity) and the causal relationships among constructs in multistage models (Fornell and Bookstein 1982). Second, in comparison with covariance-based (CB) SEM, PLS is robust with fewer statistical identification issues. Moreover, it is most suitable for models with relatively small samples (Hair et al. 2011), which is the case in our study.

Implications for Theory and Practice

Our study has significant theoretical implications. First, understanding the dynamic process of how users adapt to changes induced by a new IT system for successful implementation is blurry. This study employs a user adaptation approach to help researchers understand IT system use by integrating theories of advice networks, CMUA and models of IT system use. Our findings show that users leverage different
combinations of user adaptation to cope with the consequences associated with a new IT system. Second, we investigate the importance of user adaptation in IT system use by opening the black box between network densities and IT system use. We specify user adaptation into four different specific types by including the richness of relationships between user, IT system and task. The lens of user adaptation can help to explain the underlying mechanisms of user-IT-task problems. Third, this research distinguishes the impacts of advice seeking and giving network densities on four types of user adaptation, and contributes to the continuing debate of network benefits between views of network closure and structural holes in the network research.

There are also significant practical implications. First, this study suggests that organizational managers could utilize users’ advice networks to help users to better adapt a new IT system, since there is always a lack of and a high cost of human capitals like training programs in organizations. We provide insights for managerial interventions of better user adaptation of a new IT system and effective constructing of user advice networks. Second, results from user adaptation provide guidelines for the system developers/designers to improve the flexibility of IT systems. This encourages users’ involvements of an IT system in terms of appropriate problem-focused and emotion-focused adaptation processes (Orlikowski 2000). For instance, adaptability design of an IT system increases user’s involvement of IT implementation, where IT adaptation or task adaptation facilitates use of a new IT system. Third, practical insights are suggested for users on constructing and sustaining useful advice seeking and giving network structures. For instance, when dealing with technological uncertainties, a user should seek advice from another user whose contacts are closely connected with each other. Finally, our study also enriches the methodological knowledge of social network research in term of measuring networks. Acknowledging the usefulness of the traditional way of measuring “network tie” by “communication frequency”, a dichotomization strategy of tie measurement could decrease non-response and increase survey quality, especially when there is a long list of network questions for certain specific samples, e.g., doctors.

**Conclusion and Future Research**

Our study identifies that there are significant different network structures between users’ advice seeking and giving networks from the perspective of network density. Furthermore, seeking network density increases users’ efforts in IT adaptation and task adaptation and decreases their efforts in positive reappraisal and emotional venting. On the contrary, giving network density reduces users’ efforts in IT adaptation and task adaptation and raises their efforts in positive reappraisal and emotional venting. Therefore, network density plays a double-edged sword on user adaptation toward IT system use. Furthermore, IT adaptation, task adaptation and positive reappraisal help improve users’ IT system use, whereas emotional venting hinders users’ IT system use.

As a research-in-progress work, the first future step is to complete our data collection and empirically test our research model. Next, the current study only focuses on individual-level network concepts, i.e., advice seeking and advice giving network densities. A further theoretical investigation is necessary to include the group-level or unit-level network concepts (e.g., internal unit closure, external group bridging, and team centralization) and also the cross-level effects of network concepts. Although there are a lot of research caring this point, Ibarra et al. (2005) still emphasizes that research should not neglect the effects of the broader unit structures within which individuals locate. Finally, to improve the robustness of our results, we need to generalize our results into contexts of general enterprise systems, considering the specific characteristics of health information systems.

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References


