Socio-Technical Competency: Insights into Emotional and Technical Readiness Responses to Complex Information Systems

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Large, complex information systems (IS) have become prevalent among organizations seeking the benefits of an integrated information environment, with a single datastore. These systems are costly to implement and require the full participation of users during post-adoption in order for organizations to achieve maximum value from the IS investment. Some end-users exhibit a strong negative emotional response to the technology, including anger and frustration that may lead to refusal to use the system, even in a mandatory use environment. Other end-users exhibit more positive emotional reactions, leading toward a willingness to incorporate the new IS into their work routines, even when the system is poorly designed or implemented. In this initial work, we suggest that the different end-user responses may be attributed in part to the users’ Emotional Social Competency in conjunction with their individual Technology Readiness response. We develop these ideas into a multi-dimensional construct, called Socio-Technical Competency and suggest a potential research model.

Keywords: Emotional Competence, Technical Competence, TRI, TAM.

INTRODUCTION

The application and integration of large, complex information systems (IS) has become increasingly prevalent among organizations that recognize the benefits of integrating the multiple aspects of business under a uniform information system with a common database. The implementation of these systems tends to be very costly in both time and money.
The long-term value of such an investment may only be realized through the adoption and continued post-adoption use of the system to provide information and operational control throughout the organization. Therefore, the true value of such an investment is dependent upon the adoption and the quality of the post-adoption use of the system by the organizational members (Boudreau, 2003; Jain & Kanungo, 2005; Saga & Zmud, 1994). If organizational members are unwilling or unable to fully utilize these systems, then the overall benefit to the organization as a whole will be diminished.

From an employee perspective, users face a burden when trying to learn and subsequently use these systems efficiently. If we observe general computer users who are faced with new or complex IS, on an anecdotal level, we commonly see two broad response sets, (1) patience in working through the difficulties, responding in an emotionally controlled manner, or (2) frustration toward the system, leading to active or passive refusal to use the technology.

In a voluntary-use environment the latter responses can result in limited use or non-use of the technology. In a mandatory-use environment, the strength of the negative emotions may be exacerbated and lead to incomplete use or refusal to use the technology. Since the full value of a complex IS requires a majority of organization employees to interface with the system, voluntary adoption of the technology is generally not the preferred organizational option and most employees are required to use the information system.

The environment of mandatory technology adoption is different from the large body of research focused on voluntary technology adoption. Some research has examined the positive influence of mandatory use (Agarwal & Prasad, 1997; Venkatesh & Davis, 2000a) however little research has specifically focused on the emotional reaction of individuals to the use of organization wide information systems and how this reaction impacts the post-adoption effectiveness of the system.

Given the level of resources that are invested in a large, organization-wide IS, it will be useful to try to determine what individual characteristics lead to the different responses and to develop a way to help anticipate
the responses to the system so that the positive responses are cultivated and the negative responses are diminished. In this work we suggest that there are inherent differences in the way that people respond to technology-based adversity and measuring these differences will provide guidance in assigning people to implementation teams and help identify potential and existing post-adoption difficulties. These general responses may be a result of the interactions between emotional social competencies and technology acceptance readiness or, as what we are calling, social-technical competency, a combination of both characteristics that potentially predicts technology adoption and effectiveness.

We suggest that Parasuraman’s (2000) Technology Readiness Index (TRI) combined with Boyatzis et al. (2000) Emotional Social Competency Inventory (ESCI) will provide insight into why some people react to a complex information system in a negative way while others have a positive reaction and how these reactions impact the user’s acceptance or rejection of the system and subsequent quality of system use. The combination of these two dimensions, drawn from the information systems adoption research and the emotional social competency research, suggests that a new construct, socio-technical competence, may be useful for researchers studying complex IT system implementation and for practitioners trying to identify organization members who will be most valuable to include on implementation teams.

In the following sections we will provide a short review of the technology adoption literature, including an overview of the Technology Readiness Index, a short review of the emotional social competence literature, including an overview of the Emotional Social Competency Inventory and subsequently develop Socio-Technical Competence (STC) as a theoretical construct.

**Technology Adoption and User Readiness**

The adoption of technology has been a subject of a large body of research. Much of this research is grounded in the Theory of Reasoned Action (TRA) (Fishbein, 1979; Fishbein & Ajzen, 1975) followed the
by Ajzen’s Theory of Planned Behavior (TPB) (Ajzen, 1991) where attitudes, subjective norms, and perceived control contribute to the resulting adoption behavior. One of the most robust models specifically focused on technology adoption is the Technology Adoption Model (TAM) (Davis, 1989) which has been used as a basis for numerous research studies investigating the adoption of electronic shopping (Ruth, 2000; Gefen et al., 2003) the assessment of previous experience on IT usage (Taylor & Todd 1995a) the impact of gender on IT adoption (Gefen & Straub, 1997; Venkatesh & Morris, 2000; Venkatesh et al., 2000) to name just a few. The impact of individual differences has also been explored (Agarwal & Prasad, 1999; Igbaria & Iivari, 1995; Taylor & Todd, 1995b) to try to explain the differences among people who voluntarily adopt technology.

Over the time span of this research, the number of technology based products has increased to the point that much of the modern world function is based upon technology products. The technology based systems have become increasingly sophisticated and ubiquitous causing most, if not all, members of modern organizations to interact with sophisticated technology systems as a mandatory part of their job function. There has been some research pertaining to user readiness to use sophisticated technology systems in general day-to-day life (Parasuraman, 2000) and more specifically in the e-Insurance industry (Taylor et al., 2002) however the individual readiness of organization members to use sophisticated, complex information systems has received little research attention. The vast body of work on technology adoption has provided insights into many important aspects of adoption, however specific measures of individual technology readiness has been incorporated into little of the previous research.

**Technology Readiness Index**

The technology readiness index (TRI) was developed by Parasuraman (2000) to provide a way to measure consumer propensity to use electronic technologies for activities and transactions that in past times were handled by other humans. The measure is a 36-item scale that seems to
Socio-Technical Competency

indicate four distinct sub-dimensions of technology readiness: (1) optimism, (2) innovativeness, (3) discomfort and (4) insecurity. In the original work, Parasuraman was interested in the effective management of the customer-technology link; we are interested in the management of the employee-technology link within organizations investing heavily in complex technology systems. TRI has been successfully used in the e-Insurance area as a tool to guide decisions related to technology implementation (Taylor et al., 2002), we seek to expand and extend the use of this measure to provide insight into the technology readiness of organization members to accept complex technologies.

In the TRI, the first dimension, optimism includes a positive view of technology and the belief that it offers people increased control, flexibility and efficiency in their lives. The second dimension, innovativeness, is a tendency to be a technology pioneer and thought leader. The third dimension, discomfort, is a perceived lack of control over technology and a feeling of being overwhelmed by it. The final dimension, insecurity, includes a distrust of technology and skepticism about its ability to work properly. Parasuraman (2000) considers optimism and innovativeness as the positive determinants of technology readiness while discomfort and insecurity are inhibitors.

Emotional Intelligence and Emotional Social Competency

Salovey and Mayer (1990) who are frequently cited as the originators of the modern EI construct in their seminal article, ‘Emotional Intelligence’ in Imagination, Cognition & Personality (Solovey & Mayer, 1990). Salovey and Mayer (1990) based their construct on the social intelligence literature which provided the theoretical justification for the narrower EI construct and defined emotional intelligence as “the subset of social intelligence that involves the ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and actions” (p. 189). Whereas Salovey and Mayer (1990) coined the phrase “emotional intelligence”, it is Daniel Goleman in his

Emotional and social competence is the application of a person’s emotional intelligence in response to his or her environment. These constructs capture how a person uses the information about their own and others’ feelings to guide their actions. That is, emotional social competence is the “demonstration of self-efficacy in emotion-eliciting social transactions”, including whether or not the “the individual believes that he or she has the skills and capacity to achieve a desired outcome” (Saarni, 2000, p. 68). Emotional social competence may be considered to be an oscillating process whereby individuals function in either emotionally effective behaviors relative to their desired outcomes (often when faced with a familiar situation or perceived efficacy to manage the situation) or in emotionality ineffective behaviors (often when faced with an unfamiliar situation or a perceived lack of skill) demonstrating either emotional social competency or incompetence based on the outcomes (Saarni, 2000).

**Emotional Social Competency Inventory**

Emotional Social Competency Inventory (ESCI) is designed to assess the emotional and social competencies of individuals. The measure consists of 72 items, providing a score for each of 12 emotional social competencies divided into four broad cluster scores of: (1) self-awareness; (2) self-management; (3) social awareness; and 4) relationship management. Each competency is measured by six questions ranked on a 5-point Likert type scale as to frequency of behavior (5 = consistently shown to 1 = never shown). The ESCI instrument is a paper and pencil instrument that allows participants to self-report their responses.

In the ESCI, the first cluster, *self-awareness* includes knowing one’s internal states, preferences, resources, and intuitions. The second cluster, *self-management*, includes managing one’s internal states, impulses, and resources. The third cluster, *social awareness* includes handling
relationships and awareness of others’ feelings, needs and concerns. The fourth and final cluster, *social skills*, includes skills or adeptness at inducing desirable responses in others. Boyatzis and Goleman (2002) considers the emotional competency model to be additive, in order for a person to demonstrate emotional social competency responses must by utilized “at appropriate times and ways in sufficient frequency to be effective in the situation” (Boyatzis & Goleman, p. 344).

**Socio-Technical Competency**

A key aspect of emotional social competence is the interaction between the individual and external environmental stimulus, in this case, the interaction between the individual and the technology system. When IS users interface with the system, they engage in a flow of emotions toward the system with an interaction resulting in the user’s ‘emotional response’ reflected in how the user ‘uses’ the complex information system. We define this flow of emotional-social competence from technology user toward the information system as *Socio-Technical Competence, the ability of a person to function in an emotionally and technically effective manner when faced with the challenge of incorporating technological innovations into routine activities*. We are proposing that Socio-Technical Competence (STC) is a multidimensional construct that incorporates both a user’s Emotional Social Competence with their Individual Technology Readiness to capture the technical and emotional capacity of the individual to moderate complex IS use. A visual representation of this concept is presented in Figure 1.

**Perceived System Performance**

An important dimension of STC is that the user response can occur when the person is faced with the challenge of adopting a new technology innovation. One of the most accepted models of technology acceptance is the TAM proposed by Davis (Davis, 1989). Within TAM ease of use and perceived usefulness are the primary determinants of attitude and ultimately
the use of the system. Recently, Liu and Ma (2006) explored the impact of perceived system performance (PSP) on technology acceptance. They found that when perceived system performance is included, the ease of user factor becomes insignificant, which suggests that the performance of the overall system appears to be very important to the complete acceptance and use of an information system. In our definition of STC, we are capturing a user’s ability to function effectively even when faced with the challenge presented by a new technology. Since Liu and Ma have already found that PSP is an important determinant of technology acceptance, we suggest that STC will interact with PSP to yield different levels of complex information system use. For example, a person low in STC, forced to work with a system with low PSP, would probably exhibit low system use. Likewise a user with higher STC in the same situation may use the system more efficiently and effectively because they do not get as frustrated and annoyed with the poorly performing system and may have better technical and emotional coping skills that lead to more effective performance with the information system.
SYSTEM USE

The installation of a large, organization wide complex information system is expensive and the key to the organization receiving a return on this investment is for the system to be effectively used after the initial implementation is complete. Much of the research that has considered IS Use as a variable has captured the self-report of number of hours a technology is used (Thompson et al., 1991; Venkatesh & Morris 2000) a more robust measure is necessary in the mandatory use environment of a complex IS. In addition, the differences among people in the use of an IS has been minimally addressed by well established technology adoption models that have been developed and tested in voluntary use environments using single purpose applications (Davis, 1989; Gefen et al., 2003; Taylor & Todd, 1995a).

Quality of Use has been proposed as a measure of use in complex systems (Auer, 1998; Boudreau, 2003) because of the complexity and variety of tasks involved with an information system of this size. More recently Jain and Kanungo (2005) investigated the Nature of IS use (NU) and the relationship between the actual IS use, the nature of IS use and individual productivity. Jain and Kanungo (2005) define the nature of IS use as “the degree to which a person differs from other in they way they use the IS” (Jain & Kanungo, 2005, p. 115) and this construct captures the differences between ‘surface’ or casual use to more in-depth, value added use (Agarwal, 2000). Jain and Kanungo found that overall IS use is not related to the nature of use of simple applications, however they found a positive relationship between overall IS use and the nature of the use for more complex and multidimensional applications. Doll and Torkzadeh (1998) have proposed a multidimensional measure of system use which captures the use of IS for decision support, work integration and/or customer service. Large, organization-wide IS are complex and multidimensional, therefore we suggest that the Quality of Use of such a system involves both the nature of the use as well as the type of use. This more robust measure will capture both the effectiveness of the IS use in addition to overall IS use and will
yield a dependent variable that will capture the wide range of individual responses from ‘refusal to use’ to ‘complete and in-depth’ use of the information technology system. The Quality of Use construct will provide a more complete picture of the results of the interaction between STC and PSP.

**Theoretical Model**

Expanding on the conceptual model presented in Figure 1, the theoretical model is developed from the four dimensions of TRI combined with the four dimensions of the Emotional-Social Competence Index (ESCI). The TRI devised by Parasuraman (2000) measures people’s propensity to embrace and use new technology for accomplishing tasks at work and at home. The four dimensions are:

- **Optimism**: A positive view of technology and the belief that it offers people increased control, flexibility and efficiency in their lives. This dimension functions as a technology adoption facilitator.
- **Innovativeness**: A tendency to be a technology pioneer and thought leader. This dimension functions as a technology adoption facilitator.
- **Discomfort**: A perceived lack of control over technology and a feeling of being overwhelmed by it. This dimension functions as a technology adoption inhibitor.
- **Insecurity**: Distrust of technology and skepticism about its ability to work properly. This dimension functions as a technology adoption inhibitor.

The ESCI developed by Boyatzis *et al.* (2000) to assess individual emotional and social competencies that lead to superior performance. The four clusters can be summarized as:

- **Self-awareness** includes knowing one’s internal states, preferences, resources, and intuitions and includes the competency of emotional self-awareness.
• **Self-management** includes managing one’s internal states, impulses, and resources and includes the competencies of achievement orientation, adaptability, emotional self-control, and positive outlook.

• **Social awareness** includes handling relationships and awareness of others’ feelings, needs and concerns and includes the competencies of empathy and organizational awareness.

• **Social skills** include skills or adeptness at inducing desirable responses in others and include the competencies of conflict management, coach and mentor, influence, inspirational leadership, and teamwork.

The theoretical model of STC is presented in Figure 2. The individual dimensions of Emotional-Social Competence and Technology Readiness are blended to form STC. The relationship between STC and IS System Use is moderated by Perceived System Performance as a poor performing system may enhance a negative emotional reaction to an IS

**Figure 2.** Theoretical Socio-Technical Competence Model.
while a well performing IS may enhance a positive emotional reaction to an information system.

**SUMMARY & CONCLUSIONS**

Little of the existing literature has considered the emotional response that technology elicits from users. When we observe a group of users faced with a new system or encountering revised software, a range of responses from patience to outright frustration can be seen. Even after training, there are still differences in how people react to and accept new and/or changed systems—the purpose of this paper is to suggest a new theoretical construct to capture these differences. Socio-Technical Competence (STC) is a new theoretical concept that addresses an area of technology adoption that has not been considered previously. This construct expands the existing research on technology adoption by incorporating dimensions of the human response to technology. Individual emotional responses to new or changed technology can impact both the adoption and post-adoption use of information systems. The development of this new construct extends the research on systems adoption by adding a ‘human factor.’

The further development of this theory will be useful to IS practitioners involved in the installation and adoption of complex systems by providing guidance in adding users to implementation teams as compared to selecting users who will be included after the system is fully operational and training is complete. Insights from this new construct will also guide managers in overcoming problems that develop with system-wide users during and after technology changes.
REFERENCES


Socio-Technical Competency


