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DEVELOPMENT OF A RESEARCH MODEL TO IMPROVE PERFORMANCE OUTCOMES USING COLLABORATION TECHNOLOGIES

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ABSTRACT

The purpose of this paper is to explore the current research focused upon collaboration technologies and propose a research model. A brief summary of the underlying theories is presented, followed by a discussion of themes and factors which are thought to influence the successful outcomes associated with technology use. A proposed model extends the current research stream on collaboration technologies by examining the constructs of trust, technology quality, and collaboration as a behavior.

Keywords

Collaboration, Collaboration Technologies, Performance Outcomes, and Trust

INTRODUCTION

Collaboration technologies are computer-based applications that support selected groups or specialized teams that work in various industries to develop new knowledge. Various industries use this new knowledge for problem solving, decision making, or developing and implementing innovative products and services. The design of the technology needs to deliver successful outcomes under both centralized and distributed team conditions. Ultimately, the goal of collaboration technology systems is to improve how teams work together to solve problems or to complete tasks (Kolfschoten, Niederman, Briggs, and de Vreede, 2012).

Some of the selected technologies identified in the collaboration technology research included email, phone, instant messaging, file transfer protocol, object-oriented development collaboration tool, bulletin board, eMeeting and Teamware, as well as various combinations of these programs and applications (Dennis, Rennecker, and Hansen 2010; Nikas and Poulymenakou, 2008; Thomas and Bostrom, 2010). Collaboration technologies have also been referred to as group support systems (GSS) or information and communication technology (ICT). Some of the collaboration technology research is specific to web-based platforms such as the use of whiteboard, data repository, and any virtual workplace that can be used for electronic information sharing (Nikas and Poulymenakou, 2008). Some researchers believe that particular features within the application or program are a foundation for collaboration technologies and collaboration behaviors. These key application software features include single user login; identity consistency; easy search and retrieval links; perceived simplicity of data retrieval and analysis; and any mechanism that evokes immediate assistance when needed by the end user (Zhang, Venkatesh, and Brown, 2011). Finally, some researchers have focused directly on the underlying system languages used to develop collaborative communications between partnering corporations. Understanding the language might lead to a better appreciation as to how these similar programming standards can promote interorganizational collaboration (Chi and Holsapple, 2005). This paper is organized as follows: First, we discuss various theories associated with adoption of collaborative technologies. Next we examine the dependent variable of Performance Outcome. We then consider the current research and relative constructs (independent variables) forged therein. Finally we will propose a research model.

THEORETICAL FRAMEWORKS

The research identified multiple theories including Adaptive Structuration Theory along with a variety of social theories including: Social Capital Theory, Socio-Culture Theory of Learning, Social Identity Theory, Social Presence Theory, and Social Exchange Theory. Adaptive Structuration Theory (AST) was described by Dittman, Hawkes, Deokar, and Sarnikar's (2010) work as a framework for understanding how social processes interact with technology use and technology implementation. AST implies that social structures with key interaction processes promote technology use and that these

social structures are understood by observing human action (Dennis et al., 2010; Nikas and Poulymenakou, 2008; Rice et al., 2007). Other scholars extended the description of AST by clarifying that technology is not a determinant of human action but rather sets a stage for social practices or interaction within a group or organization (Nikas and Poulymenakou, 2008). Where AST is defined as the theoretical framework, researchers looked directly at collaboration technology use and performance outcomes. When the targeted organization within the study designated the collaboration tools to be utilized by the selected teams, AST contends that the users of the technology will later adopt the technology only after iterative work practices (Thomas and Bostrom, 2010).

The social-based theories referenced in the research included two recurrent theories, Social Capital Theory and Social Presence Theory. Social Capital Theory contends that inter-organizational and interpersonal relationships within an organization or group create opportunities for the firm (Chai, Das, and Rao, 2012). An opportunity, such as knowledge sharing enhances the firm's innovative capabilities (Striukova and Rayna, 2008). The Social Capital theory was linked to the IS/IT research which focused upon understanding the role of trust, collaborative behaviors, and technology use. In contrast, Social Presence Theory collaboration research looked at the social and emotional cues. Some scholars examined collaboration technologies in order to observe how the cues (social and emotional) are presented and interpreted by the system users (Brown et al., 2010; Sarker et al., 2011). Other researchers looked at specific emotions and how the collaboration technology can be developed to promote particular cues, such as trust, friendliness and goodwill (Dittman et al., 2010).

PERFORMANCE OUTCOMES

Recurring themes were identified in the research which included performance outcomes. Improved decision making, enhanced problem solving, and heightened innovation generated through knowledge creation and knowledge sharing are examples of successful outcomes that result from collaboration technologies. Global economies and corporate practitioners rely on technology to bring resources together in an effective and efficient manner to make acceptable decisions, accurate problem resolutions, and sustained innovations. In academia if researchers can understand the underlying processes within collaboration technology, they can offer empirical evidence for improving the collaboration technology in the future. The current collaboration technology research streams have examined knowledge sharing effectiveness and efficiency (Chi and Holsapple, 2005). Examining knowledge sharing within the collaboration technology research includes studies that give consideration to an organization's operational focus and then matches the appropriate collaboration technology for maximum performance outcomes (Nikas and Poulymenakou, 2008; Thomas and Bostrom, 2010).

Performance outcome as a factor of success was described as both a perception from the users, as well as a directly measurable event based on the completion of a task (Bochenek and Ragusa, 2004; Brown, Dennis, and Venkatesh, 2010; Heninger, Dennis, and Hilmer, 2006). The impact of collaboration technologies on the performance outcome assessment was studied in relation to problem solving or decision making tasks. By evaluating the effectiveness of the resolution or the quality of the decision, the researcher will have a mechanism to measure the performance of the tool. For example, consider the research of some scholars which examined improved performance outcomes based on a team's ability to effectively identify and efficiently solve software debugging conditions with or without using a customized collaboration tool (Bochenek and Ragusa, 2004).

Performance outcomes have also been thought to be influenced by social mechanisms that come into play with collaboration technology. Both group dynamics and team roles are identified as influences on the effectiveness of these features leading to improved performance outcomes. The facilitator's role within the working team is recognized as a key contributor to performance success (Kolfschoten et al., 2010). The final observation on the social mechanic attribute of performance outcomes includes an explanation on how procedures and processes support the effective and efficient use of the technology. Facilitation and group dynamics are more prominent in the research then references to collaborative and trust-building behaviors, which are not directly assessed (Chi and Holsapple, 2005; Jones and Kochtanek, 2004; Kolfschoten et al., 2012; Nikas and Poulymenakou, 2008; Thomas and Bostrom, 2010; Zhang et al., 2011).

COLLABORATION TECHNOLOGIES

Typically associated with collaboration technologies include the reference to task type relationships, system use or sustained use, and social mechanisms that appear to be attributes of improved performance outcomes. Each of these attributes is briefly reviewed below beginning with task type, followed by social mechanism, and system usage.

Some researchers propose that successful performance outcomes are based in the successful completion of a task or the resolution of a problem (Bochenek and Ragusa, 2004; Rice, Davidson, Dannenhoffer, and Gay, 2007). In the study conducted by Funke and Galster (2009), the impact of text versus oral communication collaboration technologies assessed the team's ability to effectively and efficiently complete the tasks. The study referenced the type of tasks as either doing or

thinking and each was assessed for effectiveness of use within the collaboration exchange (Funke and Galster, 2009). Not all task types require a collaboration technology to complete the work, and therefore it is important to understand if the task fits into the overall purpose of the application (Funke and Galster, 2009; Nikas and Poulymenakou, 2008).

A few researchers included leveraging collaboration techniques and social learning techniques that promote improved communication and trust between team members as part of their studies (Dittman, Hawkes, Deokar, and Sarnikar, 2010; Holton, 2001). Consideration of social mechanics as a performance indicator included understanding the group dynamics, observing team characteristics, and assessing individual attributes as important impacting conditions on the use of the collaboration technologies (Brown et al., 2010; Dennis et al., 2010). This type of social group dynamics is different from the facilitator's role. A facilitator takes the lead for assuring the team understands the communication between the team or work group members. In group dynamics there is a natural communication between team members that develops into trust and results in team success (Sarker, Ahuja, Sarker, and Kirkeby, 2011).

Both the facilitator studies and the group dynamic studies consider the goal of the team or the intent to use as willingness for a positive outcome. Other researchers looked at the collaboration technologies' design intent and whether the design anticipates a facilitator or simple group dynamics to insure its functionality (Chi and Holsapple, 2005; Jones and Kochtanek, 2004).

TECHNOLOGY QUALITY METRICS

Technology quality metrics are the measurements of how well the technology meets the overall expectation of system and application performance. System quality metrics could be an indicator of the functionality of the technology (i.e., system response time or feature functionality). System quality metrics are different from the performance outcomes in that performance outcomes signify the collaboration technology capability. Technology studies that assess the collaboration and performance relationship consider the resources used, development time, and product output quality metrics as these are elements connected to the collaboration task completion (Rice et al., 2007). On the other hand, an example of a technology system quality metric would be system responsiveness and the functional condition of the technology which relates to ease of use (Qureshi, Briggs, and Hlupic, 2006). Technology system quality metrics promote the importance of the reliability of the technology to operate as anticipated.

The application performance outcome was intended to represent the key contributors to the assessment of collaboration technology based on the application's output. For collaboration technology, the collaborative tools are required to allow groups of individuals to share knowledge and grow new knowledge. Ease of use is a functional condition while in contrast the application's ability to support synchronous or asynchronous information sharing is more of an application quality metric. Synchronous means that the design of the technology allows for the communication exchange to occur in real time between two or more individuals who are engaged in a collaboration event without any (or minimal) time delay. Alternatively, asynchronous information sharing would indicate some delay in the exchange; the delay might be insignificant to the flow of the exchange or is actually anticipated based on the application's design intent. The technology quality metrics could be an important influence on the initial development of trust in the technology. The trust created between the users working in a group to complete a problem task, make a business decision, or generate an innovative product or services would then be impacted by the flow of the communication exchanges. By making the distinction between system functionality and the application's performance, both representing the technical quality metric, the proposed research model hopes to advance scholarly understanding of the collaboration technology used today, as well as the perceptions and expectation of use in the corporate environment.

CHARACTERISTICS OF TRUST

The construct of trust is frequently identified in the collaboration behavior research stream. Trust can be defined as an antecedent to collaborative behavior or as a resultant of the human interaction (Chai, et al., 2012; Robert, Dennis, and Hung, 2009; Ulhoi, 2009; Wei, Straub, and Poddar, 2011). Scholars provided alternate definitions of trust, one such being the reliability of one individual based upon the integrity of another individual (Striukova and Rayna, 2008). Other researchers described the construct as a perception created from a relationship of two or more individuals with a common belief and expectation from each other (Striukova and Rayna, 2008; Wei et al., 2011).

The categorization or classification of trust in the IT/IS field research included both a cognitive trust and an affective trust. The comparison between cognitive trust and affective trust is that with cognitive trust there is a confirmed human expectation that exists between two or more individuals (Striukova and Rayna, 2008). On the other hand, affective trust would require a more personal relationship to develop where shared values and increased interactions within the group are necessary for continued growth over time (Striukova and Rayna, 2008). Other scholars extend the category of cognitive trust into two types of cognitive trust, specifically swift trust and knowledge-based trust (Robert et al., 2009). Knowledge-based

trust is similar to the knowledge-creation and knowledge sharing attributes of successful performance. Qualifying trust as a "mechanism" for the underlying knowledge transfer processes that promotes value production as a performance outcome, allowed some of the researchers to explore trust from more of a functional perspective (Ulhoi, 2009).

Knowledge creation and the sharing of knowledge are the measurements of a positive collaborative performance outcome and are validated in the scholarly research where trust, social ties and reciprocity appeared to have a positive effect on knowledge sharing (Chai et al., 2012). It follows therefore that trust helps create new relationship ties after the initial communication exchange among team members (Striukova and Rayna, 2008). Cognitive knowledge-based trust which develops through the use of an information and communication technology (ICT) is considered to be an important contributor to any future use of the knowledge sharing technology platform (Robert et al., 2009).

CHARACTERISTICS OF COLLABORATION BEHAVIOR

By defining collaboration as a behavior, an opportunity is created to better understand the construct. The collaborative behavior construct is referenced in the research with a recurring theme of the social processes that shape collaboration behaviors. As a process, collaboration behavior is recognized to have different stages in its development with varying degrees of influence upon these performance outcomes that measure successful use of the technology. The attributes that make up the definition of collaboration behavior implies that there is a flow and strength associated to its development (Robert et al., 2009). Other scholars have also described collaboration behavior as a social process combining emotions, discussions, relations, and people (Kolfschoten, Vreede, Briggs, and Sol, 2010). Collaboration has been described as a social process of participation with a beneficial outcome; therefore, the "process" characteristic is a key attribute representing the construct of collaboration and should be included as part of future collaboration technology research models (Kolfschoten et al., 2010). The process flow associated with collaboration as a behavior has been described as a combination of elements that leads to new knowledge and the expansion of understanding beyond what a single individual understands at a given point in time (Tseng, Ku, Wang, and Sun, 2009). As knowledge sharing implies, it is an exchange of information with a type of interdependence that exists between two people communicating their ideas (Robert et al., 2009; Tseng et al., 2009). It is with the idea of knowledge sharing that we might further examine collaboration as a behavior.

Although some researchers described knowledge sharing as collaboration behavior, other research would indicate that it is not enough to share information. An acceptable conclusion or a mutual goal must be reached as a result of the knowledge sharing for it to truly be collaboration (Kolfschoten et al., 2010; Qureshi et al., 2006; Tseng et al., 2009). Additional research on the topic concluded that the joint goal is reached through an individual's ability to collaborate indicating that collaboration is in itself a resultant of a predetermined skill set (Qureshi et al., 2006). As a skill, collaboration has been characterized as requiring a "genuine" conversation as opposed to something false or not trustworthy (Holton, 2001). It should be noted that collaboration as a skill needs to be cultivated implying growth over time (Dittman, et al., 2010). In summary of collaboration as a behavior, it is defined as a willingness and interest to exchange information with an individual or group with the same interest. The exchange will result in shared new knowledge by the individuals or the groups involved in the communication.

DISCUSSION

In this section, we intend to discuss the literature review and propose a research model. The variables of collaboration behavior and trust, based on the described definitions, are positioned into a proposed research model in an effort to observe and determine the maximum benefit resulting from the selected collaboration technologies**.** In the research review both the symmetries and the distinguishable differences between the constructs of trust and collaboration behavior were identified. Also identified from the research review are the performance outcomes which are typical indicators of the successful use of collaboration technology. Other independent variables that could influence the relationships with the dependent variable are technology quality metrics, time lapses between communication exchange, and task type. Further research would be needed to extend the current relationships of trust and collaborative behavior and could lead to improved overall understanding.

Scholars recognize the connection between the end user's perceptions of technology quality in relation to ease of use of a superior technology, compatibility to established routines, information appearing recent and relevant, and consistency in the system rules of governance (Jones and Kochtanek, 2004). Many of these attributes are a reflection of the functionality of the program and might cloud the perceived usefulness associated to the application (Chi and Holsapple, 2005; Jones and Kochtanek, 2004). Some researchers have considered trust to be the antecedent to successful operational use of collaboration technologies in that the systems or applications are perceived as secure platforms concluding then that the system can be trusted (Kolfschoten et al., 2010). The question remains whether or not the work team in a human partnership

is able to develop new information and knowledge via a shared system/network while being trusted to collaborate without loss to any potential benefit.

Social processes are influenced by both time and frequency of the communication exchange. Trust and collaborative behavior are defined, in part, as social processes. Collaboration technologies should enhance the technology from the user's experience that reduces the time lag impeding collaboration behaviors and promoting the synchronous messaging required for trust to develop so that a simple knowledge transaction becomes knowledge creation (Robert et al., 2009; Striukova and Rayna, 2008). There appears to be a balance related to time in that enough time must pass for cognitive knowledge-based trust to develop from recurring exchanges, but with limited or less time in between the exchanges so not to negatively impact collaboration as a behavior (Robert et al., 2009; Wei et al., 2011).

Research scholars recognize the need to differentiate the coordinated effort required for information sharing as a real collaboration event versus a simple exchange of communication (Robert et al., 2009). Tasks without common goals do not require coordination of effort. The proposed model will control the attribute of task type where common goals are a condition of task type. A secondary condition of task type will be task dependencies where dependent tasks exist between team members. The research on collaboration technology which included studies of the modification of collaborative technologies recognized the importance of making the technology more useful to resources working on dependent tasks (Nikas and Poulymenakou, 2008). The proposed model responds to the concerns related to task type, as well as the trust and technology quality variables as an influence on collaborative behaviors and the associated performance outcomes.

PROPOSED MODEL

Included in the proposed model is the opportunity for understanding collaboration technology design intent and technology use through the extended variables as an influence on performance outcomes. Based on the more recent research work stream in the area of collaboration technologies only assumed relationships between trust and collaboration technologies are thought to impact collaboration behavior resulting in improved performance outcomes.

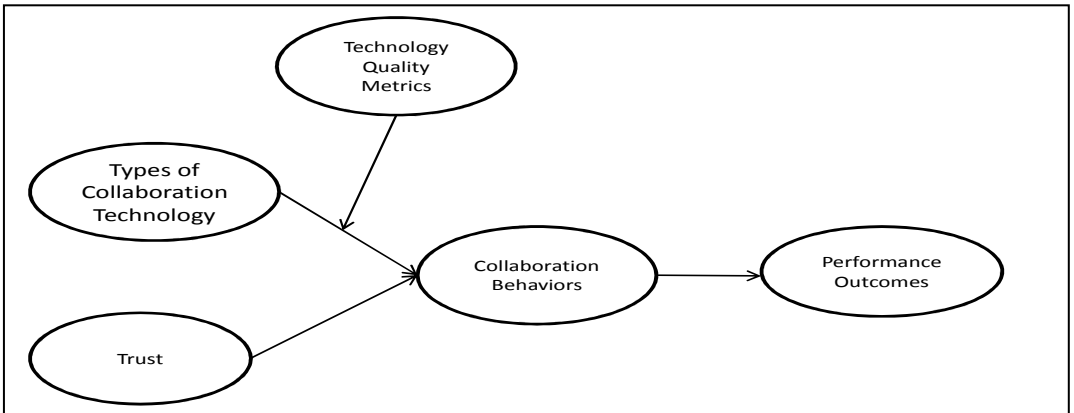

Figure 1. Proposed Model for Improving Performance Outcomes

CONCLUSION

The purpose of the proposed model is to better understand collaboration tools and set expectations on what can be achieved from the technology when used in a manner that produces improved performance outcomes. Future studies might include comparing current management perceptions of potential performance outcomes and how various work activities can impact successful utilization of the collaboration technologies. The collaboration technology studies found in this research review focused more on some of the standard tools that are found in most corporate settings, such as Instant Messaging, Virtual Conference Rooms, and Web-based document repository. Future research should look to develop new and improved technological mechanisms that could be embedded in the design of the collaboration technology and will support the further development of this growing and expanding research stream.

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