Synchronous Collaboration Technology Use in Teamwork

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Abstract

As project teams have become dispersed and communication technology has evolved, organizations have increasingly moved towards usage of synchronous communication technologies such as video/web/audio conferencing and instant messaging to facilitate collaboration among team members although usage of asynchronous communication technologies such as electronic mail, wikis, blogs, and social networks continue to play an important role in the exchange of information within teams. Little however is known about the relationships among a team member’s task characteristics, the member’s task outcomes, and extent of usage of such contemporary collaboration technologies.

To explore this gap in literature, this paper draws upon media richness theory to understand the impacts of a project team member’s task characteristics on the member’s task outcomes and extent of usage of synchronous collaboration technologies. This paper also has practical implications that guide the adoption and use of collaboration technologies in organizations.

1. Introduction

Both synchronous and asynchronous collaboration technologies are widely used by organizations to enhance their employees’ communication and collaboration. Synchronous collaboration technologies (e.g. video/web/audio conferencing, instant messaging, and certain group decision support systems) allow all participants from the same or different locations, time zones, or organizations to collaborate on the same tasks in real time, while asynchronous collaboration technologies (e.g. electronic mail, fax, online forums, wikis, blogs, and social networks) are utilized when participants wish to share information but simultaneous interaction is not necessary. According to media synchronicity theory by Dennis et al. (2008), media synchronicity can also be differentiated by communication processing. Collaboration technologies with high synchronicity, enabling faster message transmission, are associated with reduced cognitive effort to interpret messages, whereas collaboration technologies with low synchronicity allows participants to take more time between message in analyzing the content of messages. It is important to understand that media synchronicity can depend upon the manner in which participants use technologies. It is also important to consider that employees in organizations often use an array of collaboration technologies to interact with their cohorts. Therefore this study focuses on all kinds of synchronous collaboration technologies.

1.1. Statement of the problem

The usage of information technologies and the outcomes from such usage have for long been of interest to information systems (IS) researchers. A large number of studies have attempted to identify determinants of IS usage such as task characteristics, technology characteristics, individual and group attitudes, or situational characteristics [10], [6], [2], [22], [23], [21]. Likewise, many studies have focused on outcomes for individuals and organizations from IS usage such as knowledge sharing, satisfaction, and productivity [25], [20]. However, little empirical research to date has simultaneously examined individual task characteristics and task outcomes in the context of usage of contemporary collaboration information technologies.

Task characteristics and outcomes are critical considerations in the adoption of collaboration technologies by project teams. A recent study by Brown et al. (2010) integrated theories from collaboration as well as technology adoption research to explain the adoption and use of collaboration technologies. The results of that study showed that technology characteristics, individual and group characteristics, task types, and situational conditions influence behavioral intention and use of collaboration technologies. Brown et al. (2010) called for further investigation of the influence of task characteristics on technology use. They recommended incorporating task aspects such as uncertainty or interdependence in order
to uncover the relationship between the role of tasks and the use of collaboration technologies.

Brown et al. (2010) further suggested that synchronicity of communication was a significant characteristic that needed to be carefully examined by future research on collaboration technologies. As project teams have become more geographically dispersed, organizations have increasingly adopted synchronous collaboration technologies such as web conferencing and instant messaging to facilitate collaboration among team members [1]. However, usage of asynchronous collaboration technologies such as electronic mail, wikis and blogs continue to play an important role in the exchange of information within teams. Despite the widespread usage of collaboration technologies in teamwork, little is known about the influence of an individual team member’s task characteristics on task outcomes and usage of synchronous collaboration technologies. The results of this study are intended to bridge the gap between real world practice and research literature on collaboration technologies as recommended by many scholars [15], [5], and furthermore to help organizations ensure that the collaboration technologies deployed within their organizations are appropriate to their team members’ tasks as well as benefit the team members.

1.2. Research questions

This study seeks to answer the following two questions:
1) Which characteristics of a project team member’s task influence the team member’s task outcomes?
2) Which characteristics of a project team member’s task outcomes influence the usage of synchronous collaboration technologies?

2. Theory background and hypotheses

Media richness theory seeks to answer the question as to why organizations process information. This theory originates from several assumptions. The most basic assumption is that organizations must process information to accomplish tasks, but they have limited capacity. Due to the organizational division of labor, in order to process information in organizations, each department or subgroup must perform its tasks. The tasks must be coordinated with one another. However, employees who receive or send data within organizations may have different interpretations of the same event. Therefore organizational information processing needs to account for the diversity of each individual.

There are four related aspects in media richness theory proposed by Daft and Lengel (1986). These four aspects are uncertainty, equivocality, interdependence, and differentiation. Task uncertainty is defined as the degree to which work to be performed cannot be anticipated or forecast. According to the assumptions in Galbraith’s (1974) information processing theory, task uncertainty can cause changes in resource allocations, schedules, and priorities. When a team member deals with fluctuation in information available to perform his or her task, the task is subject to uncertain events, no procedures and practices are established for performing the task, then the member may face difficulties in planning resource allocations, task schedules, and task priorities. Therefore, when a team member’s task becomes more uncertain, the member will have difficulty in planning or making decisions about the task. As a result, the member’s task knowledge sharing, satisfaction, and productivity will likely be lower. Hence,

Hypothesis 1a: The greater the uncertainty in a team member’s task, the lower will be that member’s task knowledge sharing.

Hypothesis 1b: The greater the uncertainty in a team member’s task, the lower will be that member’s task satisfaction.

Hypothesis 1c: The greater the uncertainty in a team member’s task, the lower will be that member’s task productivity.

Task equivocality refers to the degree to which work to be performed is vague or confusing. Weick (1979) stated that the basic materials on which organizations operate are informational inputs that are equivocal, thus there are many possibilities or sets of outcomes that might occur. An organization attempts to transform such equivocal information into sensible outputs. According to Daft and Lengel (1986), high equivocality in organizational tasks leads to confusion and lack of understanding of participants. Employees are not certain about what questions to ask or what clear answers to define for the task. Thus, when a team member deals with ill-defined, ad-hoc, or non-routine business problems of a task, the member may have an ambiguity or conflicting interpretations about the task. This can cause difficulties in knowledge sharing for a team member to the rest of the team. Each day the member may not be able to make sufficient progress related to the task because his or her efforts are likely based on trial and error. In the end, the member may believe that he or she is not productive on the task. A team member’s perceptions on task knowledge sharing,
satisfaction, and productivity are expected to be decreased. Thus,

Hypothesis 2a: The greater the equivocality in a team member’s task, the lower will be that member’s task knowledge sharing.

Hypothesis 2b: The greater the equivocality in a team member’s task, the lower will be that member’s task satisfaction.

Hypothesis 2c: The greater the equivocality in a team member’s task, the lower will be that member’s task productivity.

According to Thompson (1967), the three types of interdependence: pooled, sequential, and reciprocal, contain increasingly degrees of contingency, resulting in increasing difficulty in coordination. With pooled interdependence, action in each unit can proceed without regard to action in other units so long as the overall organization remains viable. With sequential interdependence, however, each unit in the set must be readjusted if any one of them acts improperly or fails to meet expectations. With reciprocal interdependence, the actions of each unit in the set must be adjusted to the actions of one or more others in the whole set.

The theory of task interdependence in organizational structure by Thompson (1967) was applied to team task interdependence in media richness theory by Daft and Lengel (1986). Task interdependence in this study refers to the degree to which work to be performed depends on each team member to accomplish it. An action by a team member may force adaptation by others. As task interdependence embedded in a team becomes more complex, team can face significant challenges for task success, compared to a team with pooled or independent interdependence. The team member’s task outcomes are contingent upon the level of task interdependence in the way that the more complex task interdependence will relate to the lower level of team member’s perceptions on task knowledge sharing, satisfaction, and productivity.

When a task requires frequent coordination or communication with dispersed team members to get the task done, or a task relatively depends on the performance of other members in the team, causing uncertainty about the task, sharing knowledge may not be easy. To discuss problems and to get solutions related to the task with several dispersed team members will become very difficult when a team member’s task is highly interdependent. The member may not be satisfied with the task particularly if other members cannot deliver their jobs as scheduled. The member may feel that he or she is not able to work efficiently on the task if other members cannot perform their jobs well. Thus,

Hypothesis 3a: The greater the interdependence in a team member’s task, the lower will be that member’s task knowledge sharing.

Hypothesis 3b: The greater the interdependence in a team member’s task, the lower will be that member’s task satisfaction.

Hypothesis 3c: The greater the interdependence in a team member’s task, the lower will be that member’s task productivity.

Lastly, Daft and Lengel (1986) adopted the assumptions related to task differentiation from Galbraith (1974) who defined another framework of the mechanistic model in the organizational information processing theory. It is assumed that an organization is large and employs a number of specialist groups and resources in providing an output. After a task has been divided into subtasks, the problem is to integrate the subtasks into a global task. This is the problem of organizational design. The behaviors that occur in one subtask are effective or ineffective depending upon the behaviors of the other subtask performers. There will be a design problem if the executors of the behaviors cannot communicate with all the roles with whom they are interdependent.

Daft and Lengel (1986) incorporated task differentiation in media richness theory. They stated that normally an organizational activity is subdivided into a group of tasks that is broken down and assigned to many positions within the organization. Because each employee or department develops his or its own specialization, experience, values, priorities, time horizon, goals, and jargon [17], [18], a task is usually assigned to an employee or department based on these factors. This phenomenon can be called task differentiation. Task differentiation refers to the degree to which work to be performed is divided into smaller segments on some reasonable basis [9]. Such differentiation influences equivocality, especially in the task that is divided into smaller subtasks and such subtasks require several team members to provide an output. Interpersonal communications thus can be complex, ambiguous, and difficult to interpret.

When a team member has a large number of tasks to perform or his or her task constitutes a small part of the overall work process, causing equivocality about the task due to complex communication with the rest of the team members, the member’s knowledge sharing may not be easy. To discuss the problems and to get
solutions related to the task with several other team members will become very difficult when a team member’s task is highly differentiated. The member may feel that he or she is not be able to work efficiently on the task if other members cannot perform their jobs well. In the end, the member may perceive that the task is not productive. Hence,

**Hypothesis 4a:** The greater the differentiation in a team member’s task, the lower will be that member’s task knowledge sharing.

**Hypothesis 4b:** The greater the differentiation in a team member’s task, the lower will be that member’s task satisfaction.

**Hypothesis 4c:** The greater the differentiation in a team member’s task, the lower will be that member’s task productivity.

In the situation that a face-to-face meeting is not an option, with using a synchronous collaboration technology which provides immediate feedback, the number of cues utilized, personalization, and language variety, the team member could alleviate uncertainty from task interdependence and release equivocality from task differentiation. With the abilities to provide high levels of information exchange, the synchronous tools instantly facilitate the precise information needed to eliminate confusion and lack of understanding of participants. The ambiguous issues can be clarified and understanding can be changed in a timely manner. The member’s satisfaction with the task will be increased. The team member may also be able to complete a large number of things related to the task by using a synchronous collaboration tool. The member can work more efficiently on the task and finally feel that the task is productive. Hence,

**Hypothesis 5a:** The greater the member’s task knowledge sharing in a team member’s task, the greater will be that member’s use of synchronous collaboration technology to work with other team members.

**Hypothesis 5b:** The greater the member’s task satisfaction in a team member’s task, the greater will be that member’s use of synchronous collaboration technology to work with other team members.

**Hypothesis 5c:** The greater the member’s task productivity in a team member’s task, the greater will be that member’s use of synchronous collaboration technology to work with other team members.

### 3. Methodology

#### 3.1. Sample

The sample was acquired from organizations in a Midwestern U.S. city. High-level executives of these organizations were contacted by an introductory e-mail letter describing the study, explaining benefits and risks involved, and eliciting the participation so that they would urge their project team members to participate in the survey. These project team members were asked to sign a consent form, understand the survey questionnaire instructions, and fill out the survey questionnaire. They self-reportedly needed to have intimate knowledge of their task in an ongoing or recently completed project that used at least one synchronous collaboration technology as a main communication tool among team members who worked in different physical spaces or at different time zones. The survey was sent to 2,162 employees. There were 249 returned responses (11.5%). After examining the responses, 160 responses (7.4%) were finally identified as valid for subsequent analysis.

The majority of respondents’ ages ranged from 30-39 years (43.4%) and 40-49 years (28.9%). There were 40.9% women and 59.1% men. Most respondents were highly educated (52.8% Masters Degree and 32.7% Undergraduate Degree). Their job tenures ranged from less than 1 to 32 years (mean = 7.7 and standard deviation = 6.5). The number of project team members ranged from 2 to 200 members (mean = 16 and standard deviation = 23). The project tenures ranged from less than 1 month to 5 years (mean = 10.2 months and standard deviation = 10.7 months). About one third of the projects (34.8%) were completed, while the rest (65.2%) were on-going. To collaborate with other team members, the respondents used a variety of synchronous collaborations tools, including audio conferencing (22.59%), video conferencing (7.22%), web conferencing (22%), instant messaging (22.59%), and telephone (24.07%). They rated their ability with these tools fairly high (60% good and 23.1% excellent).

#### 3.2. Research design

In order to answer the research questions pertaining to task characteristics, synchronous collaboration technology usage, and task outcomes, a cross-sectional research design was deemed appropriate. A survey questionnaire was used to collect perceptual data from employees on their team tasks, collaboration technology usage, and task outcomes to empirically examine the relationships of the constructs.
in the research model. This enabled the research to accomplish the purpose of the study in observing a population of samples and basing the overall findings from the sample group, assuming it to be representative of the whole population. All measures of the constructs in this study were operationalized based on prior research to the greatest extent possible in order to enhance validity.

3.3. Measures

All measures of the constructs in this study were operationalized based on prior research to the greatest extent possible in order to enhance validity. The words in the questions were modified to suit the context of this study. The items in task characteristics and task outcomes were measured using a five-point scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The items in collaboration technology usage were also measured using a five-point scale that ranged from 1 (never) to 5 (almost always). If the items of the construct reversely measured the construct (e.g. task uncertainty, task interdependence, and task differentiation), the interpretation of the survey results for such construct needed to be evaluated in the opposite way.

3.4. Data collection

This study aims to understand the behavior of the individual team members on their project team task, collaboration technology use for the task, and task outcomes. Thus, the unit of analysis in this study was the individual. Even though the study on a macro level spanned multiple technologies and types of users in organizations, the targeted respondents had to employ at least one synchronous collaboration technology in their communication with the team members. The scope of the collaboration technologies was defined by providing respondents a definition of software and the manner in which participants used software to ensure their common understanding of the types of software that typically fell under the domain of synchronous collaboration technology. In addition, the selected team projects were required to have electronic interaction to exclusive virtuality to avoid bias from face-to-face interaction. Data were collected directly from project team members. Each participating team member was surveyed during an ongoing project or after the completion of a recent project.

3.5. Pretest and pilot test

A pretest was conducted for a preliminary trial of the psychometric aspects of the instrument to ensure that there were no unanticipated difficulties at the time of data collection. For the pretest of this study, the questionnaire was administered in face-to-face interviews to 19 voluntary participants at the research sites. These participants had on average 10 years of experience on their current role. They were asked to fill out an online questionnaire and provided the opportunity to comment on any aspect of the questionnaire. Feedback was obtained about the length and layout of the questionnaire, format of the scales, content validity, and question ambiguity. In addition, the respondents were asked to identify any important factors that did not or should appear on the questionnaire. Changes were made to the questionnaire after each interview. The pretest had been conducted over a period of 6 months. It was ended when no more concerns were found by the participants. The results of the pretest indicated high content validity of the instrument.

Next, a pilot test was conducted using a convenience sample at a professional MBA class in a public university in a Midwest metropolitan city. A total of 15 respondents participated in the pilot study. The data obtained from the pilot study were examined for completeness of responses, reliability, and construct validity. Subsequently, some minor changes were made to the questionnaire.

4. Results

A partial least squares (PLS) approach to structural equation modeling (SEM) using PLS-Graph (Version 3.0) was used to validate the measure and test hypotheses in the research framework. The PLS approach was preferred to LISREL in this study since its interest was to assess the predictive validity of constructs, making a focus on the paths rather than the model appropriateness [7], [4]. The stability of the estimates was tested using a bootstrap re-sampling procedure (1,000 samples).

4.1. Reliability

The internal consistency of multi-item scales was assessed by composite reliability measure as suggested by Fornell and Larcker (1981), and the results were interpreted following Nunnally’s (1978) minimum level of 0.7 guideline. All variables exhibited high reliability after dropping the following items:
- TE1 from task equivocality
- TI1, TI6, TI7, and TI9 from task interdependence
- TK2 for task knowledge sharing
- SU4, SU7, and SU8 from synchronous collaboration technology usage

4.2. Content validity

Content validity was established by ensuring consistency between the measurement items and the extant literature. The support for content validity in this study was provided by the theoretical basis for the development of items and through evaluation of the content by the 19 voluntary participants during the pretest.

4.3. Construct validity

Construct validity is the extent to which an operationalization measures the concepts that it purports to measure [8]. Apart from the internal consistency, PLS was also employed to assess two types of construct validity: convergent and discriminant validity.

4.3.1. Convergent validity

Convergent validity refers to the extent to which a measure is similar to other measures assessing the same phenomenon. Assessing the CFA in PLS is done by verifying that the average variance extracted (AVE) of each reflective construct is larger than its correlations with the other constructs and that each item loading in the factor analysis is much higher on its assigned construct (factor) than on the other constructs [4].

While there are no overall model fit statistics produced by PLS, all item loadings between an indicator and its posited underlying reflective construct factor should be greater than 0.70, and all multi-item reflective constructs should have an AVE of at least 0.50 [3], adequately demonstrating convergent validity. The analysis results showed that the AVE for every variable exceeded 0.5 and item loading were at least 0.7 or greater. These results supported the convergent validity of the constructs.

4.3.2. Discriminant validity

Discriminant validity describes the extent to which a measure is different from other measures assessing the different phenomenon. In component-based SEM, the square root of AVE for each multi-item reflective construct is compared with the correlations between the construct and other constructs. The square root of the AVE of diagonal elements should be found to be larger than the correlations of off-diagonal elements between constructs, adequately demonstrating discriminant validity of the scales. As a rule of thumb, the square root of the AVE of each reflective construct should be much larger than the correlation of the specific construct with any of the other constructs in the model [26] and should be at least .50 [3]. The square root of the AVE for each pair of constructs in this study exceeded the correlation between them. Moreover, each observed variable had a higher correlation with its own construct compared to its correlation with other variables thus establishing discriminant validity.

4.4. Common method bias

Several methods were employed in this study to assess whether common-methods bias was a serious issue in the study. Firstly, Harman’s one-factor statistical test was conducted in SPSS after an exploratory factor analysis had been performed with all the items used to measure the constructs in the research framework. The results of factor analysis generated neither a single factor nor a general factor (11.92% of the variance). Furthermore, the first factor that emerged from the exploratory factor analysis did not account for a large percent of the variance (14.8%), suggesting that common-methods bias was not a threat in the study.

A common latent factor (CLF) was another method used to capture the common variance among all observed variables in the research model. A latent factor was added to the AMOS CFA model and connected to all observed items in the model. There were no large differences (< 0.2) between the standardized regression weights of the research model with CLF and without CLF, confirming that common-methods bias did not influence the responses.

Lindell and Whitney’s (2001) method was also used to assess common-method bias in the study. This method employed a theoretically unrelated construct, called a marker variable, to adjust the correlations among the principal or focal constructs by assuming the low correlation in a correlation matrix. In this study, fashion consciousness, a variable in a motivation research study by Wells and Tigert (1971) was utilized as the marker variable. A high correlation between the marker variable and the principal constructs in this research framework did not emerge in PLS-Graph, confirming that common-method variance did not post a risk in the study.
4.5. Statistical power

Assessing power has now become a routine part of establishing the statistical validity of an estimated model [26]. A recent approach for assessing the power of an SEM model uses the root mean square error of approximation to calculate power to achieve the recommended level of .80. Thus, the question of the appropriate sample size depends to a large extent on the power analysis. However, MIS research has typically had small to medium effect sizes (0.35 approximately) [11], based on the standard effect size values: small = 0.20, medium = 0.50, and large = 0.80.

In this study, the results of statistical power calculation demonstrated a large effect size (>0.80) for most relationships in the research model, given the observed probability level of 0.05, the number of predictors of each dependent variable, the observed R-squared value of each dependent variable, and the total number of valid cases used in the analysis.

4.6. Hypotheses testing

To test whether the hypotheses were supported, the significance of the structural paths among variables was observed. At this stage, the items TU3, TU4, and TP4 were dropped to make the model more rigorous. The results of hypothesis testing are shown in Figure 1.

To assess the amount of variation accounted for the independent variables and dependent variables, the magnitude of the R-square was observed for the dependent variables which ranged from 0.08 to 0.23.

5. Discussion

The results of the data analysis provided support for H1b, H2a, H2c, H3a, H3b, H5a, and H5c. However, the results of H1b, H2a H2c, and H3a were in the opposite direction than predicted.

The support for H2a (reversed effect) and H3a (reversed effect) in conjunction with the lack of support for H1a and H4a informed us that team members tended to exchange or share their knowledge when they faced ambiguity in their tasks or when they had to rely on other team members to perform their tasks. In their decision to share or not share their knowledge, team members tended to ignore whether the task was unknown or whether the task was broken down into smaller tasks and assigned to many other team members. This might be because a team member started seeking more information about a task from other team members when such information could affect their decision or performance. In communicating with others, the team member seemed not to pay much attention to the task that was still uncertain or not related to them.

The support for H1b (reversed effect) and H3b in conjunction with the lack of support for H2b and H4b suggested that team members were satisfied by the task that could not be anticipated or forecast, and the task that did not have to depend on other team members to accomplish it. Whether the task was confusing or the task was divided into smaller segments from the whole project did not impact the employee satisfaction. Perhaps this was because employees did not put their focus on the task that might have different meanings or the task that was complicated. They believed in their capability to perform their task. As long as they had opportunities to work on a challenging assignment, employees were satisfied.

The support for H2c (reversed effect) suggested that team members believed that they were more productive when performing ambiguous tasks. The members were likely to put extra efforts on trial and error to make sufficient progress related to the task. Moreover, from the results of non-supported H1c, H3c, and H4c, it could be gleaned that team members did not perceive their low productivity from uncertain, interdependent, or differentiated tasks. They believed in their ability to perform their own tasks and believed that the tasks relied on or assigned to other team members could not affect their productivity.

There were some interesting findings regarding to the synchronous collaboration technology usage from the structural model. Two relationships between (1) task knowledge sharing and synchronous collaboration technology use; and (2) task productivity and synchronous collaboration technology use were found supported, whereas there were no correlations between task satisfaction and synchronous collaboration technology use. These findings demonstrated correlations between task outcomes and technology use. When team members shared more knowledge or when they perceived that their productivity was improved, they tended to use synchronous collaboration technologies more. In other words, the more team members used synchronous collaboration technologies, the more they shared knowledge or the better productivity they perceived.

5.1. Implications to practitioners

Employee satisfaction came from known task assignments. They refrained from unknown or unexpected tasks. Managers should provide their employees thorough guidance, mentor, or training when they have to explore a new or different task from their day-to-day responsibilities. This could help employees fulfill their confidence to perform the task.
Moreover, employees did not prefer the task that needed to rely on other team members or supervisors in order to complete it. Managers could empower their employees to instantly take actions or make good decisions on their tasks by fostering an open and instant communication with other team members through synchronous collaboration tools. We found a relationship between the increased usage of synchronous collaboration technologies and the enhanced perception on knowledge sharing and productivity. This may imply us that employees will be grateful to promptly learn or share the task knowledge with other team members in order to strengthen their ability to perform their day-to-day jobs. An employee who clearly understands the purpose, direction, and value of the project and the role of each team member can take appropriate action and easily make decisions. As collaboration continues globally, organizations should increasingly seek emerging tools to ensure that their employees can effectively and efficiently communicate and exchange information to solve their problems.

5.2. Implications to researchers

Media richness theory was originally developed to evaluate communication media in organizations. The premise of the theory is that the more uncertain and ambiguous a task is, the richer of media that suits it. In other words, richer communication means are generally more effective for communication of unexpected or equivocal issues than leaner media.

This study applied the theory to understand the behavior of project team members in using collaboration technologies to perform their project tasks through the effects from their task outcomes. The results of the study implied us that employees used real-time media in their communication to achieve a high level of task confidence by mitigating task equivocality among employees and to collaborate on the task that relatively depended on the performance of other members in the team. With using a synchronous collaboration technology that allowed immediate feedback, the number of cues utilized, personalization, and language variety, the team member could easily share knowledge with their dispersed team members and complete a large number of things related to the task. The member could be able to work more efficiently on the task and felt that the task was productive.

However, task satisfaction was unexpectedly found unrelated to synchronous collaboration technology usage. This findings suggested that synchronicity of communication was still a significant characteristic that needed to be carefully examined in the future research on collaboration technologies.

5.3. Limitations

As an exploratory study, many relationships in the designed research model were found insignificant. Future study in this domain might need to limit choices of collaboration technologies to completely control the degree of synchronicity of the tools. Even though, the field study with survey questionnaire could provide a high level of general capability in representing a large population in real settings, the responses to the collaboration technology usage were aggregated from all tools used. Some tools might be utilized much more or less than others. Their degrees of synchronicity were also different.

In addition, some factors such as resource availability and cultural bias in choosing the media choice in team collaboration were not controlled in this study. This might lessen the utility of findings in this study. In the future, the control of the media choices might help eliminating cultural bias on media selection.

5.4. Directions for future research

The synchronicity of communication introduced in this study provides a guide for future research. As noted by prior researchers, this new domain of differential synchronicity of collaboration technology use has not received much attention. This study has uncovered the relationships between the project team task outcomes and synchronous collaboration technology use. Future studies might consider extending the scope of the current study by including the differential usage of synchronous versus asynchronous collaboration technologies as dependent variables of the task characteristics or outcomes. The results could strengthen the current study.

Future research can also extend existing knowledge by utilizing laboratory studies to manipulate the study environment such as media choices that might influence the results of the study. This study provided initial information on which tools were most frequently used in project team tasks. However, the study had not clarified how differential synchronicity of the collaboration tools would impact the project teams. Such an understanding requires that we have a good grasp on how collaboration tools should be chosen, and how the tools can be effectively used by the team members.

In addition, a longitudinal study could provide a new insight to how the media usage or task perceptions
changed over time as the employees adjusted to the project environment and other team members. The current study was a one-time snapshot of employee experience. It included both on-going and completed projects. Moreover, the on-going projects could be at any stages from beginning until end of the project. The benefit of this cross-sectional study allowed us to compare many different variables from all kinds of team projects at the same time. However, the study did not consider other impacts that might occur before or after the taken snapshot. Thus, we cannot know for sure that once team members become more familiar to the project tasks or to other team members as the project goes, their collaboration technology use may switch from synchronous to asynchronous type as the task is less uncertain, equivocal, or interdependent. Future research could be conducted at the different phases of an assigned project to see any significant changes in media use.

6. Conclusion

The influence of an individual team member’s task characteristics on task outcomes in the context of usage of synchronous collaboration technologies was examined in this study to bridge the gap between real world practice and research literature on collaboration technologies. Several assumptions were drawn from media richness theory to predict, explain, and understand the impacts of a project team member’s task characteristics and extent of usage of contemporary collaboration technologies on the member’s task outcomes. A cross-sectional research design with a quantitative empirical approach by using a survey questionnaire was conducted to collect data from project team members who employed at least one synchronous collaboration technology in their communication with the team members.

The results from data analysis demonstrated the robustness of the research model. The results also told us that project team member’s task uncertainty, equivocality, and interdependence were associated with task knowledge sharing, satisfaction, and productivity. The usage of synchronous collaboration technologies was also found to be associated with task knowledge sharing and productivity.

Researchers still need to further examine the synchronicity of communication as a significant characteristic of collaboration technologies to completely understand how the tools can be effectively used by the project team members. Nevertheless, managers can learn from this study that their employees readily communicate to each other and exchange information to solve their project problems through the synchronous collaboration tools available to them. Therefore, managers should continue to provide such resources to meet their collaboration needs.

7. References


Figure 1: Structural model