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Using Scenarios to Understand Individual Technology Capability Choices

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ABSTRACT

This paper reports the findings from a survey regarding technology choice. The survey sought to explore how individuals decide which technology they are going to use when there are hundreds of technologies available in today's marketplace. Subjects were presented with scenarios where they had to perform a task in which they might need multiple technology capabilities. Subjects then had to decide what collaboration technologies they would consider. Some interesting conclusions are made for individual technology choice which has implications for group technology choice and negotiation.

Keywords

Individual technology choice, group technology choice, collaboration technology, technology capabilities, scenarios.

INTRODUCTION

Virtual teams collaborate independently across space and time through the use of collaboration technologies (Dubé & Paré, 2004; Lipnack & Stamps, 1997). Understanding technology choice is especially important for virtual team work as their entire work process takes place through the use of collaboration technologies. How do virtual teams decide which technology they are going to use to work together? Do they use technologies they have experience with? Do you they use the technologies that provide the easiest access? Or do they actually choose technologies which have the best task-technology fit for the task at hand? Furthermore, who is selecting the collaboration technology? Is it the virtual team leader or manager or is there a negotiation process that takes place where team members work together to make a decision.

This research begins prior to the group negotiation process and looks at the individual level. Specifically this research asks, *how do individuals decide which technology they are going to use?* This research takes a first step in understanding how a virtual team, or group, decides what technology to use by looking at the operationalization of technology choice at the individual level. This operationalization of technology choice is useful for explaining choices about technological capabilities. The overall goal of this research is to survey and measure individual technology awareness.

In this paper, we present the results from a survey of technology awareness. Individual subjects are presented with scenarios where they have to perform a task (where they might need multiple technology capacities) and then they have to decide what collaboration technologies they would consider and what their final choice is. Subjects not only need to make technology decisions, but they also have to specify what technology capabilities they would use or need.

The following section presents a background on technology choice both from the individual and group perspective. The research design is presented in the subsequent section and is followed by the results of this research. The final section presents a research summary and provides some ideas for future research.

EXAMINATION OF RELATED TECHNOLOGY CHOICE THEORIES

Previous research on technology choice can be divided into two groups: individual technology choice and group technology choice. Prior research has studied individual technology choice (e.g., an individual might choose a technology they are familiar with or have heard about through word of mouth) (Goodhue & Thompson, 1995; Zigurs & Buckland, 1998) as well as group technology choice (e.g., groups might choose technologies they all have easy access to or they have used before) (Becker, Carte, & Chidambaram, 2006; Webster & Trevino, 1995). Based on this distinction, the following sections present what we know and do not know about technology choice from both an individual and group perspective.

Individual Technology Choice

Much of the research on technology choice has been impacted by research on task-technology fit, which is based on the idea of finding the appropriate tools or technologies for a specific task. Zigurs and Khazanchi (2008) compiled a selection of theories of task-technology fit, including media richness, channel expansion, task technology fit, adaptive structuration, and the fit appropriation model. These theories, and their relationships with one another, provide the background on individual technology choice.

Media richness theory (MRT) proposes a model to help managers choose the most appropriate form of communication in order to convey a message or other information (Daft & Lengel, 1986). Work related to media richness theory integrates the constructs of equivocality (i.e., ambiguity) and uncertainty (i.e., the absence of information) with respect to information processing (Daft & Lengel, 1986). Media richness theory posits that media have four fixed characteristics: 1) feedback, 2) number of cues and channels, 3) personal focus, and 4) language variety (Daft & Lengel, 1986). An example of the media richness hierarchy in use incorporates four media classifications, including 1) face-to-face (highest media richness), 2) telephone, 3) addressed documents, and 4) unaddressed documents (lowest media richness) based on the four fixed characteristics (Daft, Lengel, & Trevino, 1987). As this example shows, the richest form of communication, in terms of deploying the four characteristics of feedback, channels, personal focus, and language variety, is face-to-face communication (Daft & Lengel, 1986). Face-to-face communication allows for immediate feedback, multiple cues (e.g., facial expressions, hand gestures), a personal focus, and the use of a natural language. In other instances, it is the intelligence differences between people and their uses of technology that have to do with an individual's ability to recognize and deploy those four characteristics for various tasks (Daft & Lengel, 1986).

Building on media richness theory, channel expansion theory (CET) incorporates experiential factors to better explain and predict user perceptions of communication media (Carlson & Zmud, 1999). Channel expansion theory enhances media richness theory by suggesting that media does not have fixed characteristics, but instead can be perceived differently based on experiential factors (Carlson & Zmud, 1999). Carlson and Zmud (1999) conclude that evolving, knowledge based experiential factors can positively influence media richness perceptions.

Task-technology fit (TTF) posits that information technology is more likely to have a positive impact on individual performance and be used if the capabilities of the information technology match the tasks that the user must perform (Goodhue & Thompson, 1995; Zigurs & Buckland, 1998). In relation to this theory, Goodhue and Thompson (1995) present an argument that user perceptions of task-technology fit are impacted by task and technology characteristics. Additionally, their theory suggests that task-technology fit impacts performance, which is mediated by utilization.

Similarly, Zigurs and Buckland (1998) suggest that group performance is impacted by the fit profile between the task and a GSS technology. In their theory of task-technology fit, Zigurs and Buckland (1998) characterize tasks as simple, problem, decision, judgment, or fuzzy tasks, while technologies are characterized according to the degree of support for communication, process structuring, and information processing. Each type of task is then associated with a best fit technology. For example, simple tasks are associated with a single outcome and are best fit with a technology that offers high communication support, low process structuring, and low information processing so that team members can easily communicate their ideas.

Adaptive structuration theory (AST) is an approach for studying the role of advanced information technology in organizations (DeSanctis & Poole, 1994). Adaptive structuration theory begins with social structures, which are rules and resources or capabilities that provide technology and institutions as starting points (DeSanctis & Poole, 1994). The beginning social structures are then the basis for planning and accomplishing tasks, however the design of collaboration technologies impacts these social structures (DeSanctis & Poole, 1994).

Finally, the fit appropriation model (FAM) combines task-technology fit theory with adaptive structuration theory in order to benefit from both fixed and emergent processes (Dennis, Wixom, & Vandenberg, 2001). The fit appropriation model suggests that task-technology fit affects performance as it is moderated by appropriation (Dennis, et al., 2001). The fit appropriation model is about providing additional support for technology users and their ability to fit task needs with the technology.

Group Technology Choice

The second approach to technology choice is the study of technology choice in groups (Becker, et al., 2006; Webster & Trevino, 1995). Becker et al. (2006) suggest that individual models of technology adoption are inadequate when looking at group technology choice. They present a deterministic model which suggests the idea of the "realm of consideration." A team member's realm of consideration is defined as "a cognitive list of all functionalities of a given technology which the user perceives as being applicable to the task at hand" (Becker, et al., 2006, p. 1529). The deterministic model adds this construct to a model based on task-technology fit from both Goodhue and Thompson (1995) and Zigurs and Buckland (1998).

In a six-month field study of three teams, Becker et al. (2006) concluded that there is indeed a strong link between a team's realm of consideration and their performance. For example, the team with the least homogeneous realm of consideration had the lowest performance ratings. This finding suggests that technology training in groups may be an effective management tool to facilitate desired group technology choices (Becker, et al., 2006).

This research begins with the exploration and understanding of individual technology choice in order to advance to the next step of understanding how a group decides what technology they are going to use. By studying an individual's awareness of technology capabilities we will have a better understanding of the group's awareness and how that is formed or negotiated. Also in this research, when looking at technology choice the focus is on technology capabilities and not overall technologies. The capabilities approach provides a more flexible way to incorporate future and unanticipated developments in tools. It should also be noted that a technology capability is different than a technology feature. For example, while a technology feature might be text chat, the technology capability would be the ability to hold text conversations. This distinction is important as many of the collaboration technologies in the market today have overlapping capabilities and features, therefore complicating the user's choice.

RESEARCH DESIGN

Scenarios

Scenarios are stories that describe events that managers and non-specialists can understand (Gray & Hovav, 1999; Gray & Hovav, 2007). Scenarios must be 1) possible, 2) plausible, and 3) internally consistent (Gray & Hovav, 1999). Scenarios have been used in previous research to survey students about realistic situations (e.g., Petter & Vaishnavi, 2004).

Four scenarios were developed for this study. The tasks for each of the scenarios were based on the task types used in task-technology fit theory, including simple, problem, decision, fuzzy (Zigurs & Buckland, 1998). Additionally, the scenarios were developed based on tasks from previous research. For example, the simple scenario described a situation where students would have to work together in a virtual team to brainstorm requirements for a business information system (Edwards & Sridhar, 2005). The problem scenario described a situation where a contract would have to be developed between two organizations in different geographic locations (Panteli & Duncan, 2004). The decision scenario presented a scenario where individuals had to work together from different organizational roles (marketing, production and operations, and human resources) in order to make various decisions (Chang, 2004). Finally, the fuzzy scenario described a situation where students were working on a global offshore development project (Davis, Germonprez, Petter, Drum, & Kolstad, 2009).

After reading the scenario which described a group situation, subjects were individually asked to explain in detail which technology capabilities they would need to complete the group task described. Subjects were then asked which specific collaboration technologies they would consider using because they offered the necessary capabilities. Finally, subjects had to report the technology they would ultimately choose to resolve the scenario and why.

A pilot test was administered with two virtual team managers currently working in industry (experts) and two students with no virtual team experience (novices). Based on the results of the pilot test, it was determined that the scenarios were realistic, and minor modifications were made to the instrument to ensure clarity.

Survey participants

Undergraduate business students, enrolled in an introductory course at a US university, were invited to participate in this research study. The instrument was distributed to the subject list via email. Overall, 99 subjects voluntary participated.

RESULTS AND DISCUSSION

This section focuses on the development of technology choice. The primary research question asked how individuals decide which technology they are going to use. The following subsections explore this question by evaluating which technology capabilities participants felt were needed for each task, which technologies they considered, and their final choices.

Technology Capabilities

This research begins by looking at technology choice focused on technology capabilities and not overall technologies, as the capabilities approach provides a more flexible way to incorporate future and unanticipated developments in tools.

In order to achieve task-technology fit, simple tasks need technologies that allow for high communication support, low process structuring, and low information processing (Zigurs, Buckland, Connolly, & Wilson, 1999). For problem and decision tasks technology should allow for low communication support, low process structuring, and high information processing. Finally, for fuzzy tasks, high communication support, medium process structuring, and high information processing is necessary from the team technology.

Our findings, with respect to technology capabilities, indicate that individuals do not know what capabilities they need to complete different types of tasks. The simple task scenario that was presented only asked that participants brainstorm with team members to come up with a list of requirements. For this task, the technology should allow for high communication support (capabilities which support the ability to communicate with one another). The capabilities needed for this task are

either the ability to hold text conversations or the ability to see everyone. Interestingly the ability to store files, visually model ideas, and combine ideas rated higher than the actual necessary capabilities (see Table 1). On the other hand, the fuzzy task, which requires the most process structuring (capabilities which support, enhance, or define the group process, e.g., agenda setting or enforcement) actually did rate the ability to track timeline process higher than in the other three scenarios.

Technology Capabilities	Simple	Problem	Decision	Fuzzy
The ability to store and organize files and data.	86	80	77	76
The ability to visually model concepts or ideas.	81	51	64	70
The ability to combine ideas.	81	63	78	70
The ability to hold text conversations.	71	65	55	68
The ability to store conversations.	70	70	71	73
The ability to hear everyone in the group.	67	66	79	65
The ability to track timeline progress.	48	57	49	68
The ability to see everyone in the group.	24	37	61	43
Other (including: work with other cultures, view work & progress simultaneously, type & listen simultaneously, no interruptions)	3	1	2	0

Note: The numbers in the table represent the number of respondents that chose a particular result.

Table 1. Results from Questions of Technology Capabilities Needed

Technology Considerations

The collaboration technologies available in the market today have overlapping capabilities and features, therefore complicating the user's choice. Once participants were able to determine what technology capabilities they needed to work on a task, it was important to see if they considered technologies which actually offered those capabilities. Interestingly, Microsoft Office Live was considered the most across all task types (see Table 2). Microsoft Office Live allows for teams to establish workspaces where files (such as Word, PowerPoint, and Excel) can be uploaded and shared across teams. This workspace tracks team modifications and allows for comments, however there is low communication support suggesting that this technology would not work for simple or fuzzy tasks. Perhaps, the survey participants planned for Skype to be a complement to Microsoft Office Live, therefore providing the necessary communication support.

Technologies	Simple	Problem	Decision	Fuzzy
Microsoft Office Live	78	62	59	67
Skype	62	49	54	43
Google Office	61	50	41	46
Google Groups	34	21	23	23
FaceBook	32	13	10	9
iChat	31	18	21	18
FreeConferenceCall	29	22	32	31
AIM	29	20	19	16
MS-LiveMeeting	24	20	22	20
Microsoft Sharepoint	23	16	18	18
Zoho Office	21	11	11	15
Yahoo Groups	18	8	7	7
GoToMeeting	14	13	24	20
Microsoft Groove	14	12	14	15
Central Desktop	13	6	6	13
LiveJournal	9	3	6	13

Table 2. Results from Questions of Technology Considerations

Other technologies had less than ten individuals consider them, including Lotus SameTime, Blogger, YouTube, ContentCirclees, WebEx, Huddle, MySpace, Collanos Workspace, WordPress, SecondLife, Flickr, LinkedIn, ooVoo, and iTunes. In order to address the primary research question of how these technologies are chosen, it is important to understand the reasons for the technologies considerations. Table 3 presents our findings which suggest that technology reputation is the most important reason behind technology choice. Following reputation is easy access to the technology and previous use.

Reasons to Consider the Technologies	Simple	Problem	Decision	Fuzzy
I have heard from others that this technology works well.	74	65	67	62
The technology offers easy access to everyone (e.g., online).	72	51	53	49
I have used the technology before.	70	52	50	47
The technology cost is free or minimal.	70	44	42	47
The technology is user friendly.	59	43	45	40
The technology is reliable.	49	38	48	50
The technology offers a lot of space & stores info for later.	48	41	37	45
The technology is secure.	42	34	34	34
I have seen advertisements about this technology.	28	24	25	23

Table 3. Results from Question of Technology Consideration Reasons

Advertisements had the least impact on technology considerations; however cost, user friendliness, reliability, space, and security were all important considerations.

Final Technology Decisions

The final choices were not much different than the technologies that were considered (see Table 4). Microsoft Office Live again topped the results, followed by Skype and Google Office. There was a little more variation with the problem, decision, and fuzzy tasks. However, the popularity of Microsoft Office Live to address the simple task is a surprise considering the scenario asked for brainstorming and a file sharing technology was found to be the most popular.

Technology	Simple	Problem	Decision	Fuzzy
Microsoft Office Live	43	25	21	34
Skype	14	19	18	7
Google Office	12	16	9	19
MS-LiveMeeting	5	5	9	5
Microsoft Groove	2	4	1	4
Google Groups	2	2	2	5
FreeConferenceCall	1	7	5	4
GoToMeeting	1	1	9	1
Zoho Office	1	2	6	1

Table 4. Results from Questions of Technology Choice

Other technologies had three or fewer individuals select them across the various task types, including Facebook, Yahoo Groups, iChat, Microsoft Sharepoint, WebEx, SecondLife, Content Circles, Blogger, LinkedIn, Collanos Workspace, WordPress, YouTube, LiveJournal, Huddle, Central Desktop, Lotus SameTime, AIM, and ooVoo.

Table 5 summarizes the reasons behind the final technology choice. Reputation, again, is found as the most important.

Reasons to Finally Choose a Technology	Simple	Problem	Decision	Fuzzy
I have heard from others that this technology works well.	27	30	28	29
I have used the technology before.	24	19	17	17
The technology offers easy access to everyone (e.g., online).	16	12	14	10
The technology is reliable.	12	10	16	19
The technology is user friendly.	6	10	7	4
The technology offers a lot of space & stores info for later.	4	3	3	7
I have seen advertisements about this technology.	3	3	4	2
The technology cost is free or minimal.	3	7	3	5
The technology is secure.	1	3	6	4
Other (including: minimal costs and training will not be necessary due to popularity, SecondLife is my life)	3	2	1	2

Table 5. Results from Question of Technology Choice Reasons

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This paper has presented an exploratory empirical study of how individuals make technology choices. The results provide initial evidence to suggest that individuals do not know what capabilities or technologies they need to complete different types of tasks. With this exploratory understanding of the individual decision process, it is clear that decision making by the team leader, or a team negotiation process where team members work together to make a decision, is critical.

Overall, the data shows that individuals tend to rely on technology reputation as the primary reason for considering or choosing technologies. Easy technology access and previous use follow as two other important reasons to consider or choose technologies. These conclusions are subject to the limitation of our research design, specifically with regard to the sample

size and the fact that student subjects were used who may not have the technology awareness of practitioners. However, because this research relied on scenarios, the results of the study are similar to what is experienced in practice.

Future research needs to be conducted to identify what forms of training can be used to increase collaboration technology familiarity. Research can be done to determine who should administer this training (teachers, team leaders, or technology driven interventions) as well as whether this training should be face-to-face or virtual.

REFERENCES

1. Becker, A., Carte, T., & Chidambaram, L. (2006, August 4-6). *Shared realms of consideration in virtual teams: Some field-based experiences.* Paper presented at the 12th Americas Conference on Information Systems (AMCIS-12), Acapulco, Mexico.
2. Carlson, J. R., & Zmud, R. W. (1999). Channel Expansion Theory and the Experiential Nature of Media Richness Perceptions. *The Academy of Management Journal, 42*(2), 153-170.
3. Chang, K. T. (2004, December). *Transactive memory and trust networks in computer-supported teams.* Paper presented at the 1st iKMS International Conference on Knowledge Management.
4. Daft, R., & Lengel, R. (1986). Organizational information requirements, media richness, and structural design. *Management Science, 32*(5), 554-571.
5. Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems. *MIS Quarterly, 11*(3), 355-366.
6. Davis, A., Germonprez, M., Petter, S., Drum, D., & Kolstad, J. (2009). A case study of offshore development across IS courses: Lessons learned from a global student project. *Communications of the Association for Information Systems, 24*(21), 351-372.
7. Dennis, A. R., Wixom, B. H., & Vandenberg, R. J. (2001). Understanding fit and appropriation effects in group support systems via meta-analysis. *MIS Quarterly, 25*(2).
8. DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science, 5*(2), 121-147.
9. Dubé, L., & Paré, G. (2004). The multi-faceted nature of virtual teams. In D. J. Pauleen (Ed.), *Virtual teams: Projects, protocols, and processes*: Idea Group Publishing.
10. Edwards, H. K., & Sridhar, V. (2005). Analysis of Software Requirements Engineering Exercises in a Global Virtual Team Setup. *Journal of Global Information Management, 13*(2), 21-42.
11. Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly, 19*(2), 213-236.
12. Gray, P., & Hovav, A. (1999). Using Scenarios to Understand the Frontiers of IS. *Information Systems Frontiers, 1*(1), 15-24.
13. Gray, P., & Hovav, A. Z. (2007). The IS Organization of the Future: Four Scenarios for 2020. *Information Systems Management, 24*(2), 113-120.
14. Lipnack, J., & Stamps, J. (1997). *Virtual teams: Reaching across space, time, and organizations with technology*. New York: John Wiley and Sons.
15. Panteli, N., & Duncan, E. (2004). Trust and temporary virtual teams: Alternative explanations and dramaturgical relationships. *Information Technology & People, 17*(4), 423-441.
16. Petter, S., & Vaishnavi, V. (2004, August). *Towards a model to support knowledge transfer among software project managers.* Paper presented at the 10th Americas Conference on Information Systems (AMCIS-10), New York, New York.
17. Webster, J., & Trevino, L. K. (1995). Rational and social theories as complementary explanations of communication media choices: Two policy capturing studies. *Academy of Management Journal, 38*(6), 1544.
18. Zigurs, I., & Buckland, B. K. (1998). A theory of task/technology fit and group support systems effectiveness. *MIS Quarterly, 22*(3), 313-334.
19. Zigurs, I., Buckland, B. K., Connolly, J. R., & Wilson, E. V. (1999). A test of task-technology fit theory for group support systems. *The Data Base for Advances in Information Systems, 30*(3/4), 34-50.
20. Zigurs, I., & Khazanchi, D. (2008). From profiles to patterns: A new view of task-technology fit. *Information Systems Management, 25*(1), 8-13.