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Understanding Task-technology Fit Evolvement: A Conceptual Framework

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ABSTRACT

The current study is about task-technology fit evolution and it suggests that feedback inquiry, individuals' proactive search for evaluative information relating to their strategy, influences the sustained performance of individuals. The study will undertake on both qualitative and quantitative methods to longitudinally examine the linkage between task-technology fit and individual performance. I theorize that computer self-efficacy interacts with technology characteristics to enhance individuals' chances to choose attractive execution sequences. Execution sequences are defined as different approaches used for addressing an underlying task (Goodhue, 2006). Once a sequence has been applied and performance effects have been experienced, there will be different kinds of feedback opportunities. Individuals that proactively search for feedback are likely to choose more attractive sequences in the future. The feedback inquiry process is iterative as the loop is theoretically indefinite. Finally, I propose that task complexity is expected to interfere with individuals' choices of execution sequences, hindering performance.

Keywords

Task-technology fit, computer self-efficacy, execution sequences, feedback inquiry

INTRODUCTION

Task-Technology Fit, the degree to which a technology assists people in performing their portfolio of tasks (Goodhue, 2006), is often used to predict individual and team performance (Dennis, Wixom & Vandenberg, 2001; Dishaw & Strong 1999; Fuller & Dennis, 2009; Goodhue, Klein & March. 2000; Mathieson & Keil 1998; Zigurs & Buchland, 1998). Given technological advances, football coaches are gradually adopting iPads as a means of increasing task-technology fit. "*Being at the forefront of technology that can help us do our jobs better and help our player learn better, while at the same time being environmentally conscious and cost effective, is part of what Stanford is all about*," said Head Coach David Shaw, as the team recently announced a plan to replace its old-fashioned playbooks with iPads (Bonagura, 2012).

Technology changes can alter the possible execution sequences available for task completion. By changing the technology—from old-fashioned playbooks to iPads—David Shaw changes Stanford's strategy for player learning development. Instead of reading playbooks, coaches advise players to watch game and practice video on their iPads. This might be considered to be a superior approach because players are able to visualize themselves in action. It might be possible that individuals learn better by watching themselves engaging in particular plays rather than studying plays statistically in a playbook.

Individuals select a particular sequence based on its attractiveness. In general, the challenge is to avoid unattractive execution sequences. As individuals invest significant resources in selecting specific strategies for approaching underlying tasks, it is important that we understand the evolution of task-technology fit—the change from old-fashioned playbook to iPads. One way to assess such evolution is to examine changes in execution sequences. For instance, how does feedback inquiry influence coaches' decision to abandon old-fashioned playbooks for iPads? When is that change most likely to occur? These are important questions that have not yet been examined within the information systems literature.

Prior research has found that individuals can increase performance by increasing task-technology fit (Goodhue & Thompson, 1995). Similarly, anecdotal evidence suggests that at any given level of utilization, a system with higher task-technology fit leads to better performance, since it more accurately meets the task needs of the individual (Goodhue, 2006). Though the focal unit of this paper is the individual, the concept of task-technology fit is also clearly applicable at the group level (Goodhue, 2006). Dennis, Wixom and Vandenberg (2001) conducted a meta-analysis of group support systems to determine whether task-technology fit could help explain inconsistencies in performance impacts. Their results show that fit (matching task type with an appropriate GSS capability) improves performance by increasing decision quality and ideation.

A more recent study examined how task-technology fit influenced performance over time (Fuller & Dennis, 2009). Their results showed that fit initially predicted performance; teams using poor-fitting technology firstly performed worse than teams with better fitting technology. However, over a short time period (two days), this initial fit no longer predicted performance. The performance of teams using better fitting technology remained constant, while teams using poor-fitting technology innovated and adapted, improving performance. The authors of this study make one significant implication. Task-technology fit can predict performance soon after technology adoption. Yet, initial assessments of fit are temporary as teams innovate and adapt (Fuller & Dennis, 2009). Thus, it is concluded that current theoretical models of fitting technology to a task are not likely to be useful beyond initial use (Fuller & Dennis, 2009).

I identify two main issues related to the current information systems literature on task-technology fit. As seen in previous paragraphs, one camp shows that task-technology fit is a vital predictor of individual performance—uniquely explaining 14% of its variance (Goodhue & Thompson, 1995). The other camp, however, suggests that task-technology fit can only predict team performance for an abbreviated period following new technology adoption (Fuller & Dennis, 2009). The conflicting results create a lack of consensus in the literature. Thus, we currently have limited understanding of how task-technology fit influences the performance of individuals. Moreover, prior literature has only taken a "snapshot view" of fit (Davern, 1996). A longitudinal study examining the influence of task-technology fit on individual performance, however, has not yet been undertaken. With these two issues in mind, I am conducting this study to obtain a more fine-grained understanding of the role of time in the task-technology fit—individual performance relationship. I develop the premise that the sustained performance of individuals hinges upon feedback inquiry. The construct refers to individuals' proactive search for evaluative information relating to their execution sequence. Among the general aspects of technology (Ayyagari, Grover, & Purvis, 2013), I focus on three characteristics: (1) Usefulness— the degree to which characteristics of technology enhance individual performance; (2) Complexity— the degree to which the use of technology is free of effort; and (3) Reliability—the degree to which features and capabilities provided by the technology are dependable. The main goal of this paper is to answer the following research question: How does task-technology fit evolve from changes in execution sequences to impact individual performance?

I theorize that computer self-efficacy interacts with technology characteristics to enhance individuals' abilities to choose attractive execution sequences. Computer self-efficacy refers to individuals' beliefs about their abilities to competently use computers (Compeau & Higgins, 1995). Attractive execution sequences usually increase output quality and decrease individual effort requirements at the same time. This outcome is seen in the iPad example, where players learn better and exert less effort in carrying iPads instead of old-fashioned playbooks. Thus, I theorize that attractive execution sequences are associated with higher performance. Additionally, I propose that once an execution sequence has been applied and performance effects have been experienced, there will inevitably be a number different kinds of feedback opportunities. Individuals that proactively search for feedback on their selected strategy are likely to choose more attractive execution sequences in the future. Finally, I propose that task complexity is expected to interfere with individuals' choices of execution sequences, hindering performance. "Task complexity reflects the degree to which tasks are defined, structured, and predictable and thus easily managed by means of standardized procedures" (Vashdi, Bamberger, & Erez, 2013: 951).

My study contributes to the literature by addressing the current lack of consensus in the task-technology fit research. I will resolve this lack of consensus by considering how and when individuals change execution sequences. The sports industry is the contextual domain for this study. Thus, I investigate how and when coaches replace old-fashioned playbooks for iPads. The focus is at the individual-level of analysis. Thus, the performance of coaches and players are individually assessed—rather than the team. I illustrate how feedback inquiry influences the choice of future execution sequences, and consequently, performance throughout time; thereby, providing managers with useful information. For example, feedback inquiry, if effective, should be used more frequently in the future.

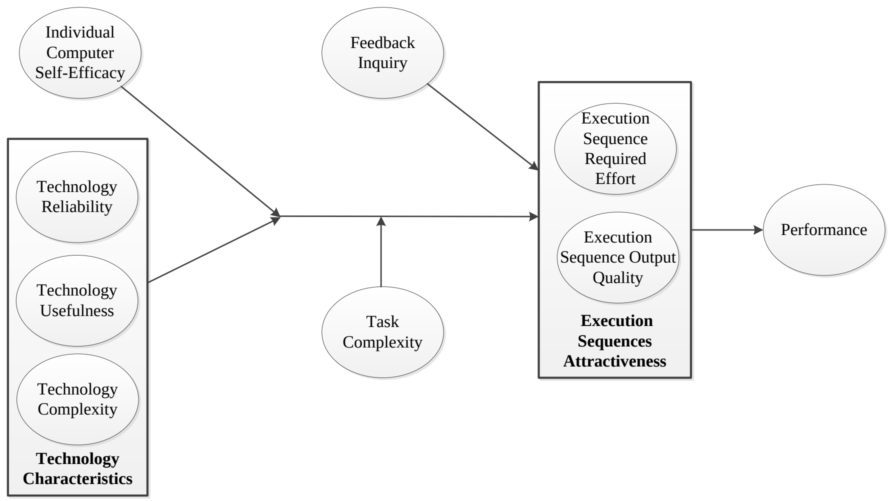

Figure 1. Conceptual Framework

CONCEPTUAL MODEL

Figure 1 shows a conceptual model that relates the antecedents and consequences of task-technology fit. In the model, task-technology fit is operationalized as the attractiveness of execution sequences. Note that choosing an execution sequence is tantamount to choosing a technology—yet, in this perspective it is not the technology that is chosen. The conceptual model specifies how computer self-efficacy impacts the choice of execution sequences, which in turn, affects performance. The model also takes into account task complexity as a context-based moderator. Finally, the influence of time is accounted for by assessing the influence of the feedback inquiry on future execution sequences, and consequently, on performance.

Performance

Performance refers to the quality of accomplishment from a portfolio of tasks by an individual (Goodhue, 2006). Higher performance implies that individuals reached a level of improved efficiency or improved effectiveness, or both. Accordingly, I consider performance to be a construct that encompasses efficiency and effectiveness accrued from task-technology fit (execution sequences). Performance effectiveness focuses on execution sequence output quality, such as increased individual learning. Performance efficiency assesses the required effort to perform execution sequences. For instance, players exert higher effort in carrying old-fashioned playbooks given their larger weight and dimension when compared to carrying iPads.

Effects of Attractive Execution Sequences on Performance

To understand the influence of execution sequences on performance we must first recognize that different strategies have different technologies and performance outcomes. When considering the application of a new technology to an existing underlying task, we ought to consider the existing execution sequence, and the new execution sequence that the new technology will enable (Goodhue, 2006). Individuals presumably choose an execution sequence based on their perceptions that the chosen sequence will yield better performance. For instance, if we were given the choice to manually calculate 125 times 189 versus given the choice to insert it as an Excel formula—most of us would choose the latter. The situation is not much different for other types of tasks. Attractive execution sequences are considered to be attractive because they have some combination of higher effectiveness and higher efficient. This intuitively implies that attractive execution sequences are positively related to performance. Therefore:

Hypothesis 1: Attractive execution sequences will lead to better performance.

Effects of Computer Self-efficacy and Technology Characteristics on Execution Sequence Attractiveness

Computer self-efficacy refers to a judgment of one's capability to use a computer (Compeau & Higgins, 1995). According to Compeau and Higgins (1995), computer self-efficacy is not concerned with what one has done in the past, but rather with judgments of what could be achieved in the future. Moreover, it does not refer to a subgroup of skills, such as the ability to use Hudl, an Android/Apple application for smartphones and tablets. Computer self-efficacy, instead, incorporates judgments regarding one's ability to apply those skills to broader tasks (analyze a football playbook using Hudl). There are three dimensions of computer self-efficacy. *Magnitude*—reflects the level of capability expected. Individuals high in computer self-efficacy magnitude believe that they are able to accomplish more difficult computing tasks than those with lower levels of computer self-efficacy magnitude. *Strength*—refers to the level of conviction about the judgment. That is, the extent to which individuals are confident in their ability to perform a variety of tasks. Individuals with high computer self-efficacy not only believe in their ability to accomplish more difficult computing tasks, but are also more confident in their ability to "successfully" perform those variety of tasks. *Generalizability*—reflects the degree to which the judgment is limited to a particular platform. Individuals with high computer self-efficacy tend to generalize their beliefs and confidence, in accomplishing more difficult tasks, across different domains. Technologies are tools used by individuals in carrying out their tasks (Goodhue, 2006). The current study assumes that individuals voluntary adopt and use technologies. According to Ayyagari, Grover, and Purvis (2013) technologies can be useful, reliable, and easy-to-use. I propose that technology usefulness, reliability, and complexity interact with computer self-efficacy to affect the choice of execution sequence. My broad thesis is as follows.

Individuals high in computer self-efficacy enjoy using information technology (Compeau & Higgins, 1995). Prior research has also found that computer self-efficacy is strongly associated with computer use (Hsiao, Tu & Chang, 2012). Individuals that frequently use information technology are more likely to recognize when technologies are usefulness and reliable. These people possess more experience using computers/tablets. Based on the computer self-efficacy premise, individuals confident in their ability to use computer systems should be able to apply skills to broader tasks. That is, they should know which technologies are useful for which tasks. "*I think they're going to enjoy it*," said Brett Greene, the video coordinator for the University of Georgia football team (Ching, 2013). "*Obviously if you give a player a DVD, the odds are they're not going to pop it in the player and watch it. If you give it to them on their phone or their iPad, you've got a better chance. So I think that's where we're headed and hopefully it works out*" (Ching, 2013). In this case, he believes that iPads would more useful to get players to watch videos. The assumption is that Brett possesses high computer self-efficacy, given his role as a video editor. That is, he frequently uses computers.

Prior research suggests that individuals possessing high computer self-efficacy can better perceive task-technology fit (Vannoy & Chen, 2012). If this is correct, Brett should see that players do watch more videos when provided with iPads. It is my theory that Brett perceives that most players are comfortable using iPads, and more importantly—players enjoy using iPads. It is also plausible that he recognizes that iPads are reliable technologies. Yet, more decisively, Brett connects the two factors and predicts that players will get more video exposure if given iPads. Using iPads seems to be a more attractive strategy to get players to watch videos. Thus:

Hypothesis 2: Computer self-efficacy interacts with technology usefulness, complexity, and reliability; enhancing the likelihood that individuals choose attractive execution sequences

Moderation Effects of Task Complexity

Tasks are complex when they require an unpredictable number of distinct steps and involve the processing of multiple informational cues (Vashdi et al., 2013; Wood, 1986). "Task complexity consequently reflects the degree to which tasks are defined, structured, and predictable and thus easily managed by means of standardized procedures" (Vashdi et al., 2013: 951). Complex tasks are likely to lower the chances for individuals to identify attractive execution sequences because task complexity demands higher individual effort (Goodhue, 2006), which is negatively associated with the "attractiveness" of execution sequences. By increasing the "unattractiveness" of execution sequences, task complexity creates a blur in the available options, making it more difficult to recognize attractive sequences given the existence of too many unattractive ones. Therefore:

Hypothesis 3: Task complexity attenuates the likelihood for individuals to choose attractive execution sequences.

Effects of Feedback Inquiry on Future Execution Sequences

Feedback inquiry takes place when an individual seeks input into their execution sequence by directly asking for feedback (Stobbeleir, Ashford, and Buyens, 2011). For instance, players might deliberately select a number of acquaintances for feedback, because it may help them to gain new insights that can be helpful for selecting future execution sequences. Prior research has shown that individuals might increase overall effectiveness by engaging in feedback inquiry (Stobbeleir et al., 2013). I propose that individuals can use feedback inquiry to improve future performance by choosing more attractive execution sequences over time. Stobbeleir et al. (2013) argue that it may seem counterintuitive to argue that feedback inquiry leads to higher performance outcomes. Usually, feedback inquiry is perceived to be reactive and conservative as feedback seekers seem to worry about what others think, and therefore, are unable to think on their own. However, prior research has characterized feedback inquiry as proactive strategies (Grant & Ashford, 2008; Parker & Collins, 2010). In fact, feedback inquiry is portrayed to be a strategy people use to take control over their own destinies in organizations. Prior research has stated that feedback inquiry is a way for employees to receive more feedback on their own schedule, and on the basis of their needs. To my knowledge, there are no studies positively linking feedback inquiry with attractive execution sequences. Direct feedback, either be verbal or video, provides individuals with a clearer picture of what was done well and what was not. This facilitates successive adjustments and improvements. Moreover, people that seek for feedback will likely receive more feedback. The more feedback an individual receives, the higher the variance within the variety of feedback. This is likely to stimulate individuals to think outside the box. Thinking outside the box can be useful in increasing the number of attractive execution sequences because it triggers creativity. Thus:

Hypothesis 4: Feedback inquiry is positively related with choosing attractive execution sequence over time.

METHOD

Sample and Procedure

The sample consists of collegiate sports coaches and student-athletes of a university in the southeastern United States. Two sports are studied: football and tennis. The first stage of data collection, which will be necessary to develop my measures of task-technology fit (operationalized as execution sequence attractiveness), will begin with a semi-structured interview with the head coach or one of the assistant coaches. The purpose of the interview is to gain a better understanding of the tasks performed by the student-athletes as a member of their respective team.[1] First, I will ask the coach to categorize the players' duties on the team. Second, I will ask the coach to rate the importance and complexity of those tasks, and the frequency to which they provide players with feedback. The same process will be followed for unveiling the coaches' tasks. I will interview athletic directors for this information. They are the most appropriate individuals to interview, given that their job is to oversee the work of coaches and related staff involved in intercollegiate or interscholastic athletic programs (Jensen & Overman, 2003). The remainder of the data collection will be separated into two phases. The first part will last over a month and it will include weekly behavioral observations of team practices and matches. This will be useful for becoming familiar with the types of technology being used. Additionally, I will conduct individual interviews with all coaches and players to learn more about each team's feedback mechanisms. The coding results of interviews and behavioral observations will help me to develop measures for task-technology fit and performance. The second phase will involve the collection of quantitative data (survey) and will be spread over three time periods, each separated by a two-month gap. The longitudinal design will allow me to cross-validate the task evaluations and examine the framework's hypotheses from a quantitative perspective. Yet, the most important benefit of a longitudinal design is that I can establish temporal precedence in my hypothesized relationships while also eliminating same source bias. I will use Structural Equation Modeling to analyze the model.

Measures

Wherever possible, existing scales will be adapted for the context of this study. Careful consideration will be given to the construct validity of the measures with newly developed scales. I plan to operationalize the key variables of the newly created scales using multi-item reflective measures. Reflective indicators are caused by the latent construct, necessarily covary, and are interchangeable (Im & Rai, 2008). I will need to develop scales for variables that are dependent on the aspects of the task. Therefore, I will create measures for execution sequence required effort, execution sequence output quality, and performance. ***Task Complexity.*** I will assess task complexity in relativist terms as perceived by the team's coach (when it comes to players' tasks) and as perceived by the team's athletic director (when it comes to coaches' tasks). At the end of the semi-structured interview, I will ask a coach and the athletic director, "Relative to the tasks typically performed by you and the coaches on your team, how complex would you rate (X) task?" (1 = "less complex," 2 = "average," and 3 = "more complex"). To assess the inter-rater reliability of this measure, I will ask the head coach and other assistant coaches to respond to this question independently. This procedure follows the work of Vashdi et al. (2013) on task complexity. ***Computer Self-Efficacy.*** I will use the 10-item computer self-efficacy scale developed by Compeau & Higgins (1995). Sample items include: "I could complete the job using (e.g., an iPad) if there was no one around to tell me what to do as I go," and "I could complete the job using (e.g., an iPad) if I had never used a package like it before." Thatcher and Perrewe (2002) provide a composite reliability score of .93. ***Technology Reliability.*** I will use the three-item scale developed by DeLone and McLean (1992). Sample items include: "The features provided by (e.g., iPads) are dependable," and "(iPads) behave in a highly consistent way." Ayyagari et al. (2013) provides factor loadings above .84 for all items and a coefficient alpha of .86. ***Technology Usefulness.*** I will use the four-item scale developed by Moore and Benbasat (1991). Sample items include: "Use of (e.g., iPads) improves the quality of my work," and "Use of (iPads) makes it easier to do my job." Ayyagari et al. (2013) provides factor loadings above .86 for all items and a coefficient alpha of .94. ***Technology Complexity.*** I will use the three-item scale developed by Moore and Benbasat (1991). Sample items include: "Learning to use (e.g., an iPad) is easy for me.," and "(iPads) are easy to use." Ayyagari et al. (2013) provides factor loadings above .76 for all items, and a coefficient alpha of .90. ***Frequency of Feedback Inquiry.*** According to Stobbeleir et al. (2011), the scale adapted by

[1] Either the head coach or an assistant coach is adequately able to provide this information because their job includes core responsibilities—instructing players in practice sessions and overseeing performance on the field and in the classroom.

Callister, Kramer, and Turban (1999) distinguishes between supervisor feedback inquiry and coworker feedback inquiry. Because I want to assess feedback seeking that goes beyond coaches and other players, I will further adapt the scale to capture a broader network range of feedback inquiry. Using a scale ranging from 1 ("never") to 5 ("very frequently"), I will ask coaches and players to indicate the extent to which the statements in the survey relate to their own behavior. Sample items include "How frequently do you directly ask your coach for feedback on your game?" and "How frequently do you directly ask your coach for an informal appraisal of your training session." I will follow the work of Stobbeleir et al. (2011) and borrow their formula for calculating the breath of feedback inquiry. The coefficient alpha for the frequency of feedback inquiry is .84. ***Control Variables.*** I will also include variables that are conceptually and practically controlled. For example, individual athletic talent will be controlled in analyses regressing performance onto its antecedents. Athletic talent is an individual characteristic that captures the natural aptitude or skill of an individual. Thus, it is logical to assume that talented individuals perform better. I will control for demographic variables such as gender and age.

REFERENCES

1. Ayyagari, R., Grover, V., & Purvis, R. 2011. Technostress: Technological antecedents and implications. *MIS Quarterly*, 35: 831–858.
2. Bonagura, K. 2012. Stanford football debuts ipad playbooks. The full title of the work it is part of http://www.nbcbayarea.com/news/local/Stanford-Football-Debuts-iPad-Playbooks-165022226.html. Retrieved 12/12, 2013.
3. Callister, R. R., Kramer, M. W., & Turban, D. B. 1999. Feedback seeking following career transitions. *Academy of Management Journal*, 42: 429–438.
4. Chin, D. 2013. Bulldogs going digital with playbook. The full title of the work it is part of http://espn.go.com/blog/colleges/georgia/post/_/id/18879/bulldogs-going-digital-with-playbook. Retrieved 12/12, 2013.
5. Compeau, D. R., & Higgins, C. A. 1995. Computer self-efficacy: Development of a measure and initial test. *MIS Quarterl*y, 19: 189–211.
6. Davern, M. J. 1996. When good fit is bad: The dynamics of perceived fit. Paper presented at the proceedings of the International Conference on Information Systems, United States.
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: 167–193.
8. Dishaw, M. T., & Strong, D. M. 1999. Extending the technology acceptance model with task-technology fit constructs. *Information & Management*, 36(1): 9–21.
9. Fuller, R. M., & Dennis, A. R. 2009. Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. *Information Systems Research*, 20(1): 2–17.
10. Goodhue, D. 2006. Task technology fit: A critical (but often missing!) construct in models of information systems and performance. In P. Zhang & D. Galletta (Eds.), Human-Computer Interaction and Management Information Systems: Applications: 184–204. Armonk: M.E. Sharpe.
11. Goodhue, D. L., Klein, B. D., & March, S. T. 2000. User evaluations of IS as surrogates for objective performance. *Information & Management*, 38: 87–101.
12. Goodhue, D. L., & Thompson, R. L. 1995. Task-technology fit and individual performance. *MIS Quarterly*, 19: 213–236.
13. Grant, A. M., & Ashford, S. J. 2008. The dynamics of proactivity at work. In A. P. Brief & B.M. Staw (Eds.), Research in organizational behavior, vol. 28: 3–34. Greenwich, CT: JAI
14. Hsiao, H.-C., Tu, Y.-L., & Chung, H.-N. 2012. Perceived social supports, computer self-efficacy, and computer use among high school students. Turkish Online *Journal of Educational Technology* - TOJET, 11: 167–177.
15. Im, G., & Rai, A. 2008. Knowledge sharing ambidexterity in long-term interorganizational relationships. *Management Science*, 54: 1281–1296.
16. Jensen, C. R., & Overman, S. J. 2003. The school athletics program. In C. R. Jensen, S. J. Overman (Eds.), Administration and management of physical education and athletic programs. Prospect Heights, IL: Waveland Press.
17. Mathieson, K., & Keil, M. 1998. Beyond the interface: Ease of use and task/technology fit. *Information & Management*, 34: 221–230.

18. Moore, G. C., & Benbasat, I. 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2: 192–222.
19. Parker, S. K., & Collins, C. G. 2010. Taking stock: Integrating and differentiating multiple proactive behaviors. *Journal of Management*, 36: 633–662.
20. Petter, S., DeLone, W., & McLean, E. R. 2013. Information systems success: The quest for the independent variables. *Journal of Management Information Systems*, 29: 7–62.
21. Smith, J. F., Mitchell, T. R., & Beach, L. R. 1982. A cost-benefit mechanism for selecting problem-solving strategies: Some extensions and empirical tests. Organizational Behavior and Human Performance, 29: 370–396.
22. Stobbeleir, K. E., Ashford, S. J., & Buyens, D. 2011. Self-regulation of creativity at work: The role of feedback-seeking behavior in creative performance. *Academy of Management Journal*, 54: 811–831.
23. Vashdi, D. R., Bamberger, P. A., & Erez, M. 2013. Can surgical teams ever learn? The role of coordination, complexity, and transitivity in action team learning. *Academy of Management Journal*, 56: 945–971.
24. Vannoy, S. A., & Chen, C. C. 2012. Intercultural communication competence via ip services applications: A modified task-technology fit perspective. *Journal of Global Information Technology Management*, 15: 55–80.
25. Wood, R. E. 1986. Task complexity: Definition of the construct. Organizational Behavior & Human Decision Processes, 37(1): 60–82.
26. Zigurs, I., & Buckland, B. K. 1998. A theory of task/technology fit and group support systems effectiveness. *MIS Quarterly*, 22: 313–334.