From Profiles to Patterns: A New View of Task-Technology Fit

Ilze Zigurs
University of Nebraska at Omaha, izigurs@unomaha.edu

Deepak Khazanchi
University of Nebraska at Omaha, khazanchi@unomaha.edu

UISM #277714, VOL 25, ISS 1

From Profiles to Patterns:
A New View of Task-Technology Fit

Ilze Zigurs and Deepak Khazanchi

QUERY SHEET

This page lists questions we have about your paper. The numbers displayed at left can be found in the text of the paper for reference. In addition, please review your paper as a whole for correctness.

Q1: Au: Please check RRH
Q2: Au: Please provide Keywords
Q3: Au: Check authors' names—I believed I deleted an extra "R," but you should doublecheck
Q4: Au: Update for Khazanchi & Zigurs 2007?

TABLE OF CONTENTS LISTING

The table of contents for the journal will list your paper exactly as it appears below:

From Profiles to Patterns: A New View of Task-Technology Fit
Ilze Zigurs and Deepak Khazanchi

From Profiles to Patterns: A New View of Task-Technology Fit

Ilze Zigurs and Deepak Khazanchi
College of Information Science and Technology, University of Nebraska at Omaha, Omaha, NE

Abstract *Continuing advances in the capabilities of communication and information technologies provide a wide array of interesting ways for people to collaborate across space, time, cultures, and organizational boundaries. While the use of collaboration technologies spreads, researchers seek answers to understanding how best to match different technology capabilities with the tasks that teams need to accomplish. Different theories of task-technology fit have been promoted and these theories help to identify key issues of interest to both researchers and practitioners who seek the answer to the best technology support for collaboration. We examine existing theories of fit for collaboration technology and propose a new view, using the theoretical frame of patterns. We argue that this fresh perspective is particularly relevant in the virtual contexts that are so important in the dynamic life of organizations today.*

Keywords

Technological advances for support of collaboration have the potential to redefine how we communicate and work together, especially in virtual contexts. The idea of "bundles of capabilities" suggests a world in which virtual team members can pick and choose from among available tools, techniques, and processes in support of whatever their collaborative needs are (DeSanctis & Poole, 1994). However, we are far from such an ideal world in the reality of how collaboration technologies are actually used. Even with the availability of sophisticated tools that support communication, information sharing, and process structure, many virtual teams still fall back on the lowest common denominator of e-mail.

Why is there such a gap between potential and practice? What do we know, either from research or from practical experience, about the best match of collaboration technology with the task at hand? Different theories of task-technology fit exist, and those theories have contributed significantly to identifying key issues of interest for these questions. Our purpose in this paper is to examine what is known to date about task-technology fit, including the gaps that still persist, and to propose a new view that we argue is particularly suited to virtual contexts. We use the theoretical frame of patterns as the foundation for this new view. We argue for a pattern-based approach to identifying how bundles of capabilities in collaboration technology can be combined with process, team, and task environments to define and evolve virtual team practices. The key contribution of the paper is this new way of approaching the task-technology fit issue – an approach that we argue is particularly suited to virtual teams, where dynamic change and adaptability are inherent to success.

We proceed by discussing selected theories of task-technology fit, followed by a detailed presentation of the pattern view as an alternate approach. An example of the application of the pattern approach shows how it differs from existing theory. We conclude with a discussion of issues for practitioners and researchers who desire to take advantage of the unique benefits that the pattern perspective has to offer in helping to bridge the gap that exists between potential and practice in the use of collaboration technology.

Current Views of Task-Technology Fit

Theories of task-technology fit are intended to provide guidance for and understanding of how best to match a tool with a problem, in this case, an appropriate set of collaboration technology capabilities with a particular group task and context. The theories provide explicit definitions of each construct, namely, task, technology, context, and the nature of fit, though there is variation among existing theories in these basic constructs. Table 1 provides a summary of selected theories, their key constructs, and source references. We selected these specific theories because each of them has been tested to some extent and, as a group, they offer a useful range of important ideas in this domain.

As Table 1 shows, there are differences among the theories in the way they define the specific nature of collaboration technologies and tasks. The theories also differ in the nature of fit, which ranges from being treated as a straightforward contingency approach, to an emergent process of structuration, to the concept of an ideal profile. Channel expansion theory enhances media richness theory by theorizing that media does not have fixed characteristics but can be perceived differently based on experiential factors. The fit appropriation model combines task-technology fit theory with adaptive structuration theory to gain the benefit of both approaches, namely integrating fixed with emergent processes. A test of this integrated view showed the importance of malleability in task and technology, suggesting that fit "is capable of being altered or controlled by outside forces, and has a capacity for adaptive change" (Fuller & Dennis, 2004, p. 8). The malleability of collaboration technologies and tasks has an impact on the extent to which fit factors versus appropriation processes are more important in a given situation.

This brief overview shows that the theories build on each other in interesting ways, as the different concepts change and evolve. However, one consistent theme across all the theories is their underlying perspective, namely the classic approach of defining separate constructs and establishing relationships among them on the basis of specific characteristics or types. Collaboration technology is defined in terms of dimensions or features, and tasks are defined in terms of specific characteristics. Fit—whether treated as a contingency, a process, or an ideal profile—is a function of how these characteristics interact or intersect. In other words, each aspect of the environment in which collaboration takes place is treated as a discrete component that is viewed in a "taxonomic" way. Even the malleability concept is a contingency type of approach that suggests a definition of specific characteristics of the environment. Is the general perspective that underlies these theories entirely appropriate for virtual environments? Are virtual environments unique in a way that requires us to re-consider the assumptions we make in defining fit?

We argue that existing theories of task-technology fit have a view of context that promotes "taxonomic" or

Table 1. Selected Theories of Task-Technology Fit

Theory	*Key Constructs*	*Relationships*	*Source Reference*
Media richness theory (MRT)	Uncertainty, Equivocality, Media richness	Media richness characteristics (feedback, multiple cues, language variety, and personal focus) determine how well a medium processes equivocal information and thus facilitates understanding.	Daft & Lengel, 1986; Daft Lengel, & Trevino, 1987
Channel expansion theory (CET)	Perceptions of media channel richness, Experiential factors	Experiential factors (channel experience, communication partner experience) affect perception of media channel; the greater the experience, the richer the channel is perceived to be.	Carlson & Zmud, 1999
Adaptive structuration theory (AST)	Structural features, Spirit, Appropriation process	Variations in structural features (rules and resources) and spirit, along with contextual contingencies, encourage different forms of social interaction; new structures emerge during appropriation process, which is also affected by group's internal system.	DeSanctis & Poole, 1994
Task-technology fit theory (TTF)	Task type, Technology dimensions, Fit profile	Different task types based on complexity (simple, problem, decision, judgment, fuzzy) are best matched with differing levels of technology dimensions (communication support, process structuring, information processing) in a set of ideal fit profiles.	Zigurs & Buckland, 1998; Zigurs, Buckland, Connolly, & Wilson, 1999
Fit-appropriation model (FAM)	Task type, Technology structures, Fit profile, Appropriation	Task type (generation, choice, combination) and technology capabilities (communication, information processing) must have good fit (ideal profiles), but appropriation support (e.g., guidance, facilitation, training) must also be provided.	Dennis, Wixom, & Vandenberg, 2001

"separate" thinking. As noted, the theories define each factor or construct, and levels or dimensions of that factor are then combined in some way to define the contingencies or fit. We also argue that this taxonomic perspective is less suited to virtual environments because virtual environments present a different type of context. Although the theories we discussed have been tested and applied in virtual teams to some extent, especially in the case of adaptive structuration theory (e.g., Majchrzak, Rice, Malhotra, King, & Ba, 2000), we are suggesting a new perspective that is more aligned with the nature of virtual environments. To do so, we ask, what makes virtual environments different? One well-accepted definition of virtual teams argues that the difference is that virtual teams are dispersed at least geographically, and potentially on other dimensions, and rely on collaboration technologies for interaction (Dubé & Paré, 2004). If we accept this idea—and it seems eminently sensible—then the dispersed context and nature of collaboration technologies become fundamentally important. We propose that pattern theory promotes a more holistic way of thinking than a taxonomic perspective, and it is exactly that holistic approach that is needed, when considering the complex and shifting context that defines virtual environments.

A New View through Patterns

In studying virtual environments in the specific context of effective project management practices, we have found that different dimensions of virtual projects (in this case, scope, complexity, and virtuality) together create a unique context in which team members operate. Virtual team members tend to utilize practices that have been effective for them in the past, and they use collaboration technologies in ways that address their dominant concerns at a given point in time (Khazanchi & Zigurs, 2005, 2006). Particularly interesting was the finding that the communication dimension of technology had the greatest priority—more so than process structure or information processing (referring back to the concepts used in the fit theories). This seemed to be true regardless of the complexity and scope of the project and in fact resulted in very limited reported usage of distributed collaboration tools (*ibid*). Indeed, there was generally low use for all of the technologies that we would categorize as providing support for process structure or information processing. In cases where the scope, complexity, and virtuality of a project were extremely high, participants reported success in generating shared understanding and effective coordination and control by communicating face-to-face and by using colocated team members rather than using high-end collaboration technologies. In our research, it appears that participants did not view the technology as separate from the task they needed to perform. Clearly, our understanding of task-technology fit as described by traditional theories does not apply very well here.

Based on the above anecdotal discussion, we believe that virtual team members tend to utilize capabilities in collaboration technology in a way that is embedded within process, team, and task environments in the form of generic effective practices that transcend context. Team members look at the world in surprisingly abstract and simple terms: "what is the problem" and "how do I solve it?" This is exactly how pattern theory works. Patterns provide an intuitively attractive way of understanding the world around us by dealing with its complexity in terms of practices that address problems and by suggesting solutions in specific contexts, rather than by taxonomies that define separate elements of the context. Patterns provide a means of communicating insights—our implicit knowledge—about a problem domain to others. Thus, they are holistic "abstractions of experiences" that are profound in some way and can be implemented to solve problems in a specific context. Patterns are not prescriptions or "cookbook" approaches to solving problems in a specific situation, but instead they are generic and more akin to what we call universal laws (Khazanchi & Zigurs, 2007).

Pattern theory arose in architecture and the work of Alexander (Alexander, 1965; Alexander, Ishikawa, Silverstein, Jacobson, Fiksdahl-King, & Angel, 1977; Alexander, 1978), who developed patterns for common architectural problems, e.g., "bathing room" or "bed cluster." Formally, a *pattern* is defined as a three-part rule that expresses a relationship among a specific **context**, a **problem**, and a **solution** (*op. cit*). The problem is a set of forces that occur repeatedly in that context. The solution is a certain "spatial configuration" that allows the set of forces to resolve themselves. The pattern itself describes how the solution can be used whenever the problem occurs in that particular context. A collection of patterns represents a pattern language, defined as a system of patterns that combine to produce a variety of important outcomes (*op. cit*). Alexander's work was carried over into software engineering and popularized in object-oriented design (Gamma, Helm, Johnson, & Vlissides, 1994). There are many ways to document specific patterns, but common practice is to include the key elements of the context, problem, and solution.

In terms of **task-technology fit**, *patterns would be representations of specific management and team member practices that contribute to the effectiveness or ineffectiveness of virtual teams. These practices would include individual behaviors, processes, technologies, and tools.* To write a pattern, we would start with a solution that would be abstracted from attributes, artifacts, experiences and/or archetypes of things we do well in virtual teams (Khazanchi & Zigurs, 2007). According to Alexander (1965, p. 255), patterns should abstract what we do well (or not so well) by asking ourselves "what is it about this that makes it good? Why is it good? What are its essential qualities that will allow us to build something completely different but which is good in the same way?" Table 2 shows an example of a simple but interesting pattern that was abstracted from an "effective" set of solutions to a problem of developing shared meaning in highly complex virtual tasks (Khazanchi & Zigurs, 2005; 2006). Similarly, Table 3 shows another pattern that relates to addressing concerns about role coordination in virtual teams that deal with moderately complex tasks (*op. cit*). Both these patterns are derived from focus group discussions involving virtual project participants in global organizations (*op. cit*).

Table 2. Pattern Example: Manage Shared Understanding

Manage Shared Understanding
Context
Team members do not feel that they are a unified whole. People feel they are working independently rather than together.
Problem
How do you create synergy in your team and a shared understanding of project goals?
Solution
Use face-to-face or video conferencing to introduce and socialize team members at the inception of a project. Communicate clearly and often on project goals and individuals' roles in the project. Create a culture that encourages sharing of issues, sharing of all project-related information, discussion of solutions, and flexibility to accept differences.

Table 3. Pattern Example: Role Coordination

Role Coordination
Context
Your team members are unclear about their roles and responsibilities in the project. This is causing misunderstandings about project goals and resulting in a delayed project.
Problem
How do you provide team members with a clear understanding of their individual roles and responsibilities in the project?
Solution
Cleary define team members' roles and responsibilities and work processes at the outset. If new members are added, clearly communicate revised roles and responsibilities along with timelines and tasks to all the team members. Ensure that they all understand their assignment and provide them with the tools to deliver. Communicate roles, responsibilities, and work processes to all stakeholders and team members. If feasible, consider rotating members through different roles. Use technologies with a high process structure (such as virtual collaboration systems and knowledge management tools) to share information on the team's work processes and roles/responsibilities of team members. Include team members in designing work processes and delineating roles/responsibilities. This will increase team ownership.

Inherent in the intuitive simplicity of the illustrative patterns is the fact that an examination of any pattern allows us to visualize a good feature or aspect of virtual team environments that "just feels right instinctively" (Alexander, 1978). This conclusion is true of patterns in general. The patterns demonstrate how in their very essence they include various characteristics of fit alluded to in extant theories. In this view, fit is the description of an abstract narrative that can be adjusted and adapted to particular contexts. Thus, although we can discern traditional notions of fit, such as collaboration technology features and descriptions of adaptive and evolutionary processes for managing the task/technology intersection, what the patterns describe are practices that are intellectually appealing, easy to comprehend, and easy to apply to specific tasks in specific contexts. We believe that a collection of patterns of virtual collaboration could be stored in a pattern library within an organization and selected patterns could then be used by managers to develop and design processes and to choose technologies and structures for a given task and context.

Implications and Conclusions

We have argued for a new view of task-technology fit that is based in the theoretical frame of patterns. While we recognize the great value and significance of prior theorizing, we propose that the pattern approach is particularly suited to virtual contexts. Several implications for research and practice arise from this argument.

The first issue is one of validating the effectiveness of the approach. Theories of fit that rely on contingencies or ideal profiles can be tested through appropriate statistical analysis (Venkatraman, 1989). Pattern theory, on the other hand, is not amenable to statistical analysis; instead, validation is through continued use and evolution of the patterns in actual practice. This issue is particularly challenging for researchers, who need access to field sites and on-going virtual teams.

What are the implications for technology design and choices? Today's marketplace is expanding with choices for collaboration technologies, most of which emphasize communication and connectivity. Examples of these product categories include instant messaging, videoconferencing, mobile devices, Internet telephony, and "e-rooms," all of which focus primarily on getting people connected in a variety of increasingly flexible ways. Recent developments in three-dimensional immersion environments for virtual collaboration extend basic connectivity to include "presence" and "persistent" imagery and scenes that can potentially enhance the richness of communication. Our research on patterns in virtual projects showed the importance of communication, but the pattern concept implies going beyond that one capability to offering a flexible bundle of capabilities.

Finally, what should managers and virtual team members do differently and how can they use the pattern approach? The pattern view is inherently integrative, that is, technology and team process are treated as a holistic part of a virtual team's interaction. Computer users have long been urged to see business process and information technology support as related, rather than separate, phenomena. We argue that same idea for collaboration. Practically, this means that both managers and team members need a different kind of awareness of the "bundle of capabilities" that is available to them. Think first from a problem solving orientation, assess collaboration needs, and then ensure that technology capabilities address these needs by intuitively embedding them within the narrative that describes the practices needed to make collaboration work. The pattern approach is one way of beginning to think from this point of view.

Author Bios

Dr. Ilze Zigurs is a Professor and the Mutual of Omaha Distinguished Chair of Information Science and Technology, in the College of Information Science and Technology at the University of Nebraska at Omaha, where she also serves as department chair. Her Ph.D. is from the University of Minnesota. Professor Zigurs' research examines design, implementation, and use of collaboration technology, particularly in virtual teams and projects. She has published in such journals as *MIS Quarterly*, *Journal of Management Information Systems*, *Journal of Organizational Computing and Electronic Commerce*, and *Group Decision and Negotiation*, among others. She is co-editor with Laku Chidambaram of a book, *Our Virtual World*, which examines both positive and negative impacts of the Internet on individuals, organizations, and society in their work and personal lives. Ilze serves as Editor-in-Chief of *e-Service Journal*, and was formerly a Senior Editor for the *MIS Quarterly* and Department Editor for the *IEEE Transactions on Engineering Management*.

Dr. Deepak Khazanchi is Associate Dean for Academic Affairs and Professor of Information Systems & Quantitative Analysis in The Peter Kiewit Institute's College of Information Science & Technology at the University of Nebraska at Omaha (UNO). His current research and teaching interests are focused in the areas of virtual project management, B2B assurance services and risk analysis in extended enterprise environments, mutual knowledge in virtual teams, and the application of Philosophy of Science in the IS/IT discipline. His research has been published in various peer-reviewed journals, including *Communications of the Association of Information Systems (CAIS)*, *Journal of the Association of Information Systems (JAIS)*, *Decision Support Systems*, *Information Systems Management*, *Journal of Information Technology Management*, *ACM's DATA BASE for Advances in Information Systems*, *Journal of Computer Information Systems*, and *Information Processing and Management*. Deepak currently serves as the President of the Midwest United States Association for Information Systems and Founding Chair of the AIS Special Interest Group for IT Project Management (http://www.SIGITProjMgmt.org).

References

Alexander, C. (1965). *Notes on the Synthesis of Form.* Cambridge, MA: Harvard University Press.

Alexander, C. (1978). *Timeless Way of Building.* New York: Oxford University Press.

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press.

Carlson, J. R., & Zmud, R. W. (1999). Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, *42*(2), 153–170.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness, and structural design. *Management Science*, *32*(5), 554–571.

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.

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.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science, 5*(2), 121–147.

Dubé, L., & Paré, G. (2004). The multi-faceted nature of virtual teams. In D. J. Pauleen (Ed.), *Virtual Teams: Projects, Protocols, and Processes*(pp. 1–39). Hershey, PA: Idea Group Publishing.

Fuller, M., & Dennis, A. (2004). Does fit matter? The impact of fit on collaboration technology effectiveness over time. In *Proceedings of the 37th Hawaii International Conference on System Sciences,* (10 pp.), Hawaii, IEEE Digital Library.

Gamma, E., Helm, R. Johnson, & Vlissides, J. (1994). *Design Patterns: Elements of Reusable Object-Oriented Software.* Reading, MA: Q3
Addison-Wesley.

Khazanchi, D., & Zigurs, I. (2005). *Patterns of Effective Management of Virtual Projects: An Exploratory Study*. Newtown Square, PA: Project Management Institute.

Khazanchi, D. & Zigurs, I. (2006). Patterns for effective management of virtual projects: Theory and evidence. *International Journal of e-Collaboration, 2*(3), 25–49.

Khazanchi, D. & Zigurs, I. (2007). A systematic method for discovering effective patterns of virtual project management, *Unpublished Working Paper,* University of Nebraska at
Omaha. Q4

Majchrzak, A., Rice, R. E., Malhotra, A., King, N., & Ba, S. (2000). Technology adaptation: The case of a computer-supported inter-organizational virtual team. *MIS Quarterly, 24*(4), 569–600.

Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of Management Review, 14*(3), 423–444.

Zigurs, I., & Buckland, B. (1998). A theory of task/technology fit and group support systems effectiveness. *MIS Quarterly, 22*(3), 313–334.

Zigurs, I., Buckland, B., Connolly, J., & Wilson, E. V. (1999). A test of task-technology fit theory for group support systems. *Data Base for Advances in Information Systems, 30*(3,4), 34–50.