Towards a Specific Theory of Task–Technology Fit for Mobile Information Systems

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Abstract

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Abstract

Mobile information systems hold great potential to support organizational processes. This paper addresses how to realize that potential, the issues involved, the challenges to overcome, and accordingly, the effective strategy to deploy. Based on Goodhue and Thompson’s (1995) general theory of task-technology fit and on Zigurs and Buckland’s (1998) specific theory for task-technology fit for group support systems, we propose a specific theory of task-technology fit for mobile information systems. Task-technology fit is determined as a three-way match between the profiles of managerial tasks (operationalized by difficulty, interdependence and time-criticality), mobile information systems (operationalized by functionality as notification, communication, information access, and data processing; form factors; and location-awareness), and individual use context (operationalized by distraction, movement, quality of network connection, and previous experience). The analysis shows that use situations characterized by high distraction and poor quality of network connection are particularly challenging for the design and development of mobile information systems, requiring special attention to form factors (intuitive user interfaces and simple menu structures), and verification features.

Keywords: Mobile information systems, managerial tasks, task-technology fit, media richness theory
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Motivation

In this paper, we hope to contribute to a better understanding of the requirements for mobile information systems to support organizational tasks. It is anticipated that such an understanding will help the development and deployment of mobile information systems to effectively improve organizational performance, help the identification of areas suitable for the effective deployment of mobile information systems, and help the identification of areas where the development and deployment of mobile information systems can be considered risky and needing special considerations.

Although the application of mobile technologies has received much attention and showed considerable growth, some developments have been disappointing in the United States (Ovum studies, referenced by Scudder 2002), as well as in Europe (Durlacher 1999). Many questions remain open concerning technology development, applications and business models, and global issues (Agrawal, Chari, and Sankar 2003, Smith, Kulatilaka, and Venkatraman 2002, Tarasewich, Nickerson, and Warkentin 2002, Zhang, Yuan, and Archer 2003). While much of the early focus of research and industry practice has been on the provision of mobile technologies and applications to consumers (Ovum studies, referenced by Scudder 2002, Durlacher 1999), there is some agreement that mobile technologies hold great potential to improve organizational processes as well (Balasubramaniam, Peterson, and Jarvenpaa 2002, Computerworld 2003). To

1 Throughout the development of this paper, valuable comments have been provided by Frank F. Land, London School of Economics; Joseph T. Mahoney, University of Illinois at Urbana-Champaign; Matthew L. Nelson, Illinois State University; and Gordon B. Davis and Robert J. Kauffman, University of Minnesota. In addition, we thankfully acknowledge input received at research seminars at the University of Illinois at Urbana-Champaign (National Laboratory for Tourism and eCommerce), at the University of Minnesota (Carlsson School of Business), and at the First Theory Development Workshop, sponsored by the Journal of the AIS. We also thank a number of anonymous reviewers for their constructive comments, and the participants of an empirical study on mobile information systems that provided us with the motivation and the insights necessary to develop this paper. All errors remain our own.
date, however, actual usage has been limited. With the hopes of increasing mobile usage in organizational environments, the current paper focuses on the following questions: (1) How is the application of mobile technology in organizations different from other applications of information technology? (2) What are promising areas for the deployment for mobile information systems in organizations? (3) How should mobile information systems be designed to provide appropriate support for the tasks that are typically performed in organizations?

A closer look at mobile technology and the organizational tasks it can support is in line with earlier calls to describe and assess information systems technology more explicitly, in particular when reviewing information systems from an organizational or behavioral perspective (Huber 1990, Orlikowski and Iacono 2000).

In order to obtain a better understanding about mobile information systems to support organizational tasks, the idea of task-technology fit provides a suitable starting point and will, thus, be applied in the current study. Two theories of task-technology fit have been developed independent from each other. Goodhue (1995) and Goodhue and Thompson (1995) developed a general theory of task-technology fit arguing that task-technology fit is a suitable concept to predict the usage and resulting performance impacts of information systems. Zigurs and Buckland (1998) developed a specific theory of task-technology fit for group tasks and group support systems. From the general theory of task-technology fit (Goodhue and Thompson 1995), we take away that (1) task-technology fit is a relevant concept to predict information systems success (e.g., performance impacts), and that (2) fit is determined by an appropriate interplay between tasks, technology, and individual, context-related characteristics; from Zigurs and Buckland’s (1998) specific theory of task-technology fit, we take away how to develop a theory that matches a particular kind of technology with a particular kind of tasks.

In order to develop a specific theory of task-technology fit for mobile information systems, we first review relevant streams of research, in particular regarding task-technology fit, regarding the description of organizational tasks, and regarding the application of mobile technology. We then turn to an assessment of the fit between task characteristics, individual characteristics and technology characteristics. The proposed theory allows for the identification of requirements for mobile information systems that provide a fit between tasks and technology in a mobile use context. The theory also allows for the identification of areas where a fit between tasks and technology might actually be difficult to achieve due to the mobile use context. This
result has implications for system development and can also provide an explanation for the fact that the actual usage of mobile information systems has not always met expectations.

Two Theories of Task-Technology Fit

General Theory of Task-Technology Fit

Goodhue and Thompson (1995) investigated the link between information technology and individual performance, hoping to confirm the assumption that usage and task-technology fit together can better explain the impact of information technology on performance than usage alone, in particular in situations of mandatory use. In their research study, Goodhue and Thompson (1995) first proposed a comprehensive technology-to-performance model that included the characteristics of technology, tasks and individuals as explanatory variables for technology use and individual performance. A simpler version of the model was then tested empirically, omitting individual user characteristics from the analysis. Even though the empirical study found only moderate support for the direct links between task and technology characteristics and user-perceived task-technology fit, Goodhue and Thompson (1995) found that utilization and task-technology fit together predicted performance better than each factor alone.

Goodhue (1995) developed and tested a model that determined task-technology fit based on task needs and system characteristics. Task-technology fit was viewed as the extent to which technology functionality matched task requirements and individual abilities. It was assumed that users can successfully evaluate task-technology fit and that a higher fit would eventually result in better performance. Goodhue (1995) also hoped to show that (user-perceived) task-technology fit was a better indicator of the value of an information system than other forms of user evaluation, such as satisfaction or usefulness. To test this hypothesis, Goodhue (1995) performed an empirical study and found that technology, tasks, and individual characteristics could in fact explain user-perceived task-technology fit, but that the interactions between the variables also played a role. For example, the strength of the links between system characteristics (technology) and evaluation (task-technology fit) depended on task characteristics. The relevance of the task-technology fit construct was generally confirmed and the study provided evidence for the fact that user evaluations of certain systems can be inconclusive if task characteristics are not included in the analysis. In a follow-up study, Goodhue (1998) presented an instrument to assess
task-technology fit of an information systems infrastructure (not just a single application) at the level of the organization. This assessment was based on twelve dimensions.

Goodhue, Klein, and March (2000) focused on user evaluations of task-technology fit for mandatory use systems, and developed theoretical arguments for the link to individual performance. Goodhue, Klein, and March (2000) found that evaluations of task-technology fit were linked with one of two objective performance measures (time-to-complete), but not with the other one (accuracy). Results suggested that users are not necessarily accurate reporters of key constructs related to the use of information systems, and in particular, self-reporting was a poor measure of actual utilization. Empirical evidence was found in support of the hypotheses that task-technology fit (integrated data, appropriate training) affects performance (speed, accuracy), and that users can evaluate task-technology fit (consistency of data, adequacy of training), but there was mixed evidence regarding the question of whether user-perceived task-technology fit predicts performance (user evaluation of data consistency predicted time-to-complete, but not accuracy).

Dishaw and Strong (1998) developed conceptually and tested empirically a model based on Goodhue and Thompson’s (1995) task-technology fit construct, to explain the factors that lead to the use of software maintenance support tools. In their empirical study, Dishaw and Strong (1998) showed that a fit between software maintenance tasks and available maintenance support software tools was associated with the actual use of the tools. Task-technology fit explained usage better than task and technology variables alone.

In a related research study, Dishaw and Strong (1999) presented a model that integrated Goodhue and Thompson’s (1995) task-technology fit model with Davis, Bagozzi, and Warshaw’s (1989) technology acceptance model. The integrated technology acceptance model/task-technology fit theory provided greater explanatory power (51% of variance explained) than the technology acceptance model (36% of variance explained) or task-technology fit theory alone (41%).² This research is in the realm of studies providing a basis to explain information systems

² With task-technology fit, Dishaw and Strong (1999) refer to Goodhue and Thompson's (1995) simplified model that was tested empirically. It could be argued that overall, Goodhue and Thompson’s (1995) comprehensive version of task-technology fit (the task-to-performance-chain) actually incorporates most constructs of the technology acceptance model. For example, Goodhue and Thompson’s (1995) “precursor’s of utilization” (e.g., consequences of use) can be interpreted as TAM’s perceived usefulness and attitudes.
utilization behavior. The integration of the technology acceptance model and task-technology fit is well suited to explain utilization, as both models exhibit a significant overlap.

Mathieson and Keil (1998) presented the results of a laboratory experiment to confirm that perceived ease of use is also a function of task-technology fit. The implication is that situations where users report that a system is difficult to use might in fact indicate deeper task-technology fit issues that cannot be corrected by merely changing the interface.

Goodhue and Thompson’s (1995) technology-to-performance model was recently tested by Staples and Seddon (2004) who found that for both, mandatory and voluntary use, task-technology fit could explain performance. Precursors of utilization played an important role in the study, including expected consequences of use (usefulness, personal benefits of use), affect towards use (e.g., feelings), social norms (e.g., pressures and expectations e.g., "boss says so"), and facilitating conditions (e.g., relationship with support staff).

Ferratt and Vlahos (1998) tested Goodhue and Thompson’s (1995) task-technology fit concept for managerial decision making in different cultural environments, while Kannellis, Lyckett, and Paul (1999) applied the general idea in a quest to provide a better understanding of particular information to both a researcher and a practitioner. Kanellis, Lyckett, and Paul’s (1999) study is different from most of the other empirical studies following Goodhue and Thompson (1995) that are referenced in this section, in that it applies a qualitative, action research approach, including repertory grid analysis, whereas most other studies rely more on “traditional” quantitative methods.

To summarize, Goodhue and Thompson (1995) set out to improve the prediction and management of information system success and found that task-technology fit has significant explanatory power. Three factors proved relevant to determine task-technology fit and to predict system usage and success (e.g., individual performance improvements): characteristics of the task, of the technology and of the individual user, which also included the context of use. Related work tested parts of the model (Ferratt and Vlahos 1998, Goodhue 1995, Goodhue and Thompson 1995, Goodhue, Klein, and March 2000), validated its constructs (Goodhue 1998), and linked it with other theories, such as the technology acceptance model (Dishaw and Strong 1999). This research stream has largely corroborated the relevance of the task-technology fit concept to help explain and predict information system success.
A limiting aspect to our own research objective of applying the theory of task-technology fit to mobile information systems is the fact that Goodhue and Thompson (1995) focused on the relevance of the task-technology fit concept, rather than on the systematic identification of relevant characteristics of tasks, technology and individuals, or on the development of individual profiles to match specific combinations of tasks and technologies. Tasks studied vary widely and include the use of quantitative information for management support (Goodhue 1995), research-oriented tasks (Goodhue, Littlefield, and Straub 1997), software maintenance (Dishaw and Strong 1998 and 1999), managerial decision making (Ferratt and Vlahos 1998, Goodhue 1998, Goodhue, Klein, and March 2000), day-to-day operations of library staff and course related and personal activities of university students (Staples and Seddon 2004), and quite broadly “actions carried out by individuals turning input into outputs”, operationalized empirically as decision making, responding to changed business requirements, and day-to-day business transactions (Goodhue and Thompson 1995).

The technologies included in the studies vary equally, in some cases encompassing a variety of systems that a user had access to (Ferratt and Vlahos 1998, Goodhue 1995, Goodhue 1998, Goodhue, Littlefield, and Straub 1997, Goodhue and Thompson 1995), while in some cases the systems are described more narrowly, including database environments (Goodhue, Klein, and March 2000), software maintenance tools (Dishaw and Strong 1998 and 1999), library systems and productivity tools (Staples and Seddon 2004), and work management systems (Kanellis, Lycett, and Paul 1998). The basic idea of task-technology fit has been considered in research on mobile information systems (Gebauer and Shaw 2004, Junglas and Watson 2003, Liang and Wei 2004), but has not been integrated in a systematic way.

In the current study, we apply two aspects of the general theory of task-technology fit. First, we concur that task-technology fit should be viewed as an important aspect to predict and assess the success of information systems. Our quest is to develop specific guidelines for the fit between organizational, managerial tasks and mobile applications. Second, as proposed in Goodhue and Thompson’s (1995) technology-to-performance chain, we include the characteristics of tasks, technology, and the individual use context into our analysis. In addition, we note that several of the studies applying Goodhue and Thompson’s (1995) task-technology fit concept focus on managerial decision-making, i.e., tasks that are also relevant for our purposes.
Specific Theory of Task-Technology Fit for Group Support Systems

Zigurs and Buckland (1998) proposed a specific theory of task-technology fit to support the development and deployment of group support systems to support group tasks. The theory ultimately seeks to improve group performance, whereas the focus of Goodhue and Thompson’s (1995) general theory is on the performance of individual users of information technology. Fit was derived conceptually as matching profiles of tasks and the functionalities of the supporting technology. The theory was based on the assumption that a good fit between tasks and technology would result in good performance.

Zigurs and Buckland (1998) were careful to derive a set of distinct characteristics to describe group tasks from previous literature, in particular the field of organization studies. Group tasks were defined as “the behavior requirements for accomplishing stated goals, via some process, using given information” (Zigurs and Buckland 1998, p. 316). Based on Campbell’s (1988) task circumplex to describe different levels of task complexity, five categories of tasks were distinguished: simple tasks, problem tasks, decision tasks, judgment tasks, and fuzzy tasks, according to four dimensions: outcome multiplicity, solution scheme multiplicity, conflicting interdependence, and solution scheme-outcome multiplicity. Group support systems were defined as “a set of communication, structuring, and information processing tools that are designed to work together to support the accomplishment of group tasks” (Zigurs and Buckland 1998, p. 319). Note that there are three dimensions of technology that are considered relevant: communication support, support for the structuring of meetings and workflows, and support for information processing in the context of group tasks. Fit of tasks and technology was defined as “ideal profiles composed of an internally consistent set of task contingencies and GSS elements that affect group performance.” (Zigurs and Buckland 1998, p. 323). This research then went on to propose a set of concrete fit profiles of task categories and technology dimensions (e.g., “Simple tasks should result in the best group performance … when done using a GSS configuration that emphasizes communication support”). Zigurs and Buckland’s (1998) specific theory of task-technology in the context of group support systems was later tested and largely confirmed by Zigurs, Buckland, Connolly and Wilson (1999), as they reviewed examples of published group support systems.

Compared to the task-technology fit theory proposed by Goodhue and Thompson (1995), Zigurs and Buckland’s (1998) theory of task-technology fit for group support systems has found
fewer followers (according to the ISI Web of Science). The emphasis is generally on the support and improvement of collaboration and group processes.

Murty and Kerr (2004) applied Zigurs and Buckland’s (1998) theory of task-technology fit to “examine the relative effectiveness of alternative modes of audit team communication in a task requiring the exchange and processing of uniquely held information.” The modes of communication investigated include face-to-face, bulletin board, and chat. The resulting variable is group performance (e.g., teams using the bulletin-board tool outperformed teams using the chat tool and teams communicating face-to-face).

Susman, Gray, Perry and Blair (2003) synthesized and extended existing theories of how teams adopt and adapt to collaborative technology by recognizing misalignments between technology, task, organization, and the group. Specific attention is given to differences among team members, and overall the emphasis is on the support and improvement of group processes.

Dennis, Wixom, and Vandenberg (2001) developed a fit-appropriation-model for interpreting group support systems effects on performance. Dennis, Wixom and Vandenberg (2001) argued that the performance of group support systems is affected by (1) the fit between the task and the GSS structures selected for use, and (2) by the appropriation support the group receives in the form of training, facilitation, and software restrictiveness to help them effectively incorporate the selected GSS structures into their meeting process. The empirical results show that fitting the GSS to the task had the most impact on outcome effectiveness (e.g., decision quality and ideas), while appropriation support had the most impact on the process time (e.g., time required and process satisfaction).

Barkhi (2001-2002) investigated the effect of problem structuring and modeling with a group support system on coordinated decision-making of managers in a group faced with a mixed motive production-planning task. The empirical results indicated that the groups using a group support system with a problem-modeling tool outperformed the groups using a system without a problem-modeling tool, but they were less efficient with respect to the time and number of messages it took the group to converge to a final solution.

Massey, Montoya-Weiss, Hung and Ramesh (2001) point to the relevance of cultural perceptions of task-technology fit for the formation of global virtual teams that work effectively across space and time. Massey, Montoya-Weiss, Hung, and Ramesh (2001) conducted an experiment with 150 participants located in the U.S., Japan, and Europe and found significant dif-
ferences in perceptions of communication task-technology fit. The global virtual teams used Lotus Notes for an exercise requiring the conveyance of information and convergence to a decision.

The work on task-technology fit in the context of group support systems generally seeks to improve the support of collaborative and group tasks, and has not been applied extensively to technologies outside the realm of collaborative tools. In one study in the area of electronic commerce, Jahng, Jain and Ramamurthy (2000) applied a task-technology fit like concept to a “congruence model,” stating that for an electronic commerce system environment to have a favorable impact on a consumer, the system must have a good fit with between both the product and services that are sold and/or provided and the user it supports.

To develop a specific theory of task-technology fit for mobile information systems, we take away from Zigurs and Buckland’s (1998) work the general procedure of how to develop a specific theory of task-technology fit, and we assume implicitly that a good fit between technology and the supported tasks will positively impact task performance. Similar to Zigurs and Buckland (1998), we suggest to operationalize fit as “profiles” (Venkatraman 1989), taking into account (1) the fit between task and technology, (2) the fit between individual use context and technology and (3) the resulting combination of task-technology fit and individual use context-technology fit.

Towards a Specific Theory of Task-Technology Fit for Mobile Information Systems

Our proposed specific theory of task technology fit for mobile information systems builds on Goodhue and Thompson’s (1995) general theory of task-technology fit and Zigurs and Buckland’s (1998) specific theory of task-technology fit for group support systems. In particular, we follow Goodhue and Thompson’s (1995) suggestion to consider tasks, technology, and the individual user as main constructs, which we apply to our area of focus as managerial tasks, mobile information systems and the mobile use context of the individual user. Similar to Zigurs and Buckland (1998), we consider task-technology fit as a pre-defined profile, which we develop in three steps. In the first step, an ideal fit between tasks and technology is proposed based on media-richness theory (Daft and Lengel 1984). Based on earlier research in the area of mobile information systems, the second step proposes a fit between the individual use context and the technology, and in essence addresses the feasibility of mobile information systems in situations
of mobile use. The third step combines the propositions of step one and step two and proposes a fit between task and technology that is moderated by the individual use context. In the following sections, we first take a closer look at the main constructs of managerial tasks, mobile information systems and individual use context, and then describe the three steps to derive a moderated task-technology fit for mobile information systems.

**Task Characteristics**

Our analysis focuses on tasks that are typically performed by managers, given that managers are typically among the most mobile employees in an organization, and thus, an obvious target user group for mobile information systems.\(^3\) The nature of managerial work has been a key area of study for scholars of organizations and management. Three dimensions to describe managerial tasks can be distinguished: difficulty, interdependence and time-criticality.

*Task Difficulty*

Anthony (1965) presented an early categorization scheme for managerial activity and distinguished between strategic planning, management control, and operational control. In Anthony’s (1965) model, *strategic planning* included decisions on corporate objectives and general policies, and was characterized by unstructured decision making and the application of creativity. Decisions were non-routine (e.g., one of a kind), and the quality of the decisions (performance) was difficult to assess. At the opposite end of the spectrum, Anthony (1965) put *operational control*, focusing on tasks, such as the supervision of the manufacturing process of a specific part, requiring relatively little individual judgment, and characterized by the fact that tasks, goals, and resources have been carefully defined beforehand. Anthony’s (1965) third group of managerial tasks, *managerial control* exhibited a mixture of the two other categories. Managerial control was concerned with the acquisition and allocation of resources, in order to comply with the objectives set in strategic planning. The decision-making process was characterized by interper-

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\(^3\) In a personal conversation with the authors, a manager at a large organization in the high-technology industry confirmed that about 30% of the workforce in his company was mobile, a large part of which were managers. In addition, many of the current applications of mobile technology target managers in various functions, and often at the middle level of the organizational hierarchy, including executives, project managers, company and sales representatives, and field service workers (see Computerworld 2003).
sonal interaction, occurred within the context of policies and objectives of the corporation, and was much concerned with the assurance of effective and efficient performance.

In an analysis of how humans solve problems, Simon (1960) described the difference between programmed and non-programmed decisions. According to Simon (1960), *programmed decisions* were repetitive and routine in nature. The decision making task has been structured, to the extent that procedures have been developed to solve a problem. According to Simon (1960), *non-programmed* (unstructured) decision making occurred when problems were novel and no cut and dried method to handle the problem existed. The process to solve a problem could not be programmed into a decision-making system to produce a solution automatically. Such decisions required a significant level of judgment and intelligent, adaptive, and problem-oriented action on the part of the decision-maker, as well as insights into the problem definition. Gorry and Scott Morton (1971) pointed out that structured decisions tended to occur at the lower level of management in the context of operational control, whereas non-structured decisions tend to occur at higher levels of management, during strategic planning. Management control tended to deal with semi-structured decision-making, where part of the decision could be programmed (structured), but another part required human judgment and ad-hoc processes.

In an effort to provide a comprehensive framework to compare complex organizations, Perrow (1967) conceptualized complex organizations in terms of the underlying technology, i.e., the work done on raw materials. Perrow’s (1967) distinguished organizational technologies according to the number of exceptions that must be handled and the degree to which search is an *analyzable or unanalyzable* procedure. In other words, how much can the search rely on past experience and previously developed concepts and routines vs. having to revert to intuition, chance, and guesswork. According to Perrow (1967), non-routine technology is best applied to situations with a large number of exceptions and where search is not logical or un-analytic (problem is un-analyzable), while routine technology is best applied to situations with few exceptions and analyzable search results (e.g., problem is analyzable). Two more types of technology include craft (few exceptions, un-analyzable search results) and engineering (many exceptions, un-analyzable search results).

Mintzberg (1980) analyzed the nature of managerial work and identified three types of tasks, i.e., interpersonal, informational and decisional tasks, which he grouped into ten roles: a figurehead, a leader, a liaison, a monitor, a disseminator, a spokesperson, an entrepreneur, a dis-
turbance handler, a resource allocator, and a negotiator. Mintzberg (1980) pointed out that the nature of a manager's work included a large amount of communication, meetings and tours (including travel), that tasks tended to be brief, varied, and fragmented and that managers tended to have and maintain many interpersonal contacts. According to Mintzberg (1980), managers tended to use mail, telephone, unscheduled meetings, scheduled meetings, and tours in order to perform their tasks. Overall, verbal media were preferred over written documents. The empirical findings of Mintzberg (1980) were well in line with the conceptual work of Anthony (1965), Simon (1960), and Perrow (1967).

Van de Ven and Ferry (1980) integrated a great number of diverse notions of task structure and distinguished between two dimensions: task variability (e.g., number of exceptions), and task difficulty (e.g., analyzability and predictability). In practice, however, it turned out that task variety and difficulty were correlated and difficult to distinguish, so some researchers have combined both variables into a single dimension of task-non-routineness (Daft and Macintosh 1981, Karimi, Somers and Gupta 2004, see also Gelderman 2000).

In the current paper, task difficulty encompasses the degree of “(non)-routineness” (Anthony 1965, Gorry and Scott Morton 1971), structuredness (Simon 1960), and analyzability (Perrow 1967), discussed in earlier research. Tasks of low difficulty include for example the processing of travel expenses or the procurement of standard items, while tasks of high difficulty include strategic planning, solving of unique problems, and managerial decision-making.

**Task Interdependence**

Task interdependence has been identified as a second dimension of managerial tasks, besides task difficulty (Karimi, Somers and Gupta 2004, see also Goodhue and Thompson 1995), and has been defined as an exchange of output that takes place between segments within a sub-unit and/or with other organizational units (Fry and Slocum 1984). Interdependence requires coordination, i.e., the management of interdependencies between activities (Malone and Crowston 1994) and, thus, lends itself well to support from information and communication technologies.4

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4 A link between task difficulty and interdependency has been noted by Daft and Lengel (1984), which stated that uncertainty and equivocality can increase task interdependence because action by one department can unexpectedly force adaptation by other departments in the production chain.
Research on coordination and on interdependence dates back to the work by Thompson (1967), who was concerned with different mechanisms to achieve coordination in an organization. Thompson (1967) proposed that depending on the technologies applied in an organization (e.g., long-linked, mediating and intensive), different types of interdependence (pooled, sequential, reciprocal) existed that needed to be coordinated with different coordination mechanisms (e.g., standardization, plan, and mutual adjustment). Thompson (1967) pointed out that when interdependence increased from pooled to sequential to reciprocal, coordination mechanisms should change from rules to standardization to mutual adjustment, the later requiring a greater amount of communication as a means for coordination.

We view task interdependence in a general way as the degree to which a task is related to other tasks and organizational units, and as a result the extent to which coordination with other organizational units is required (Thompson 1967). The level of interdependence determines the importance for a user to obtain access to an information system in order to perform a task as part of a larger whole. The need to access an information system as a result of interdependence tends to have a direct impact on the performance of the user as well as an indirect impact on the performance of the organizational units the user interacts with (Gebauer and Shaw 2004). Tasks with high interdependence, such as project management, generally require a significant amount of coordination.

**Time Criticality**

To depict the dynamics of current managers’ work environments, it is suggested to add time criticality as a third dimension to describe managerial tasks, defined as the importance with which a task needs to be performed promptly (urgency). Even though time criticality has not received particular attention by scholars of organization science, the ability of organizations to respond quickly to changing market requirements has been discussed in the research fields of management and strategy, for example in the context of agile organizations operating in fast-paced economic environments (D’Aveni 1994, Bradley and Nolan 1998).

The concept of time-criticality has captured the attention of scholars of mobile information systems. For example, Siau, Lim and Shen (2001) pointed out that mobile technologies are able to provide immediacy, while Junglas and Watson (2003) described time-dependency as one task characteristic that is relevant in the context of mobile commerce, and Balasubramaniam, Pe-
erson, and Jarvenpaa (2001) mentioned time criticality as an important dimension of mobile systems. Liang and Wei (2004) suggested that mobile commerce was particularly well suited for tasks that exploit the specific attributes of technology, including emergency and time-critical services (similar: Yuan and Zhang 2003). The results of an empirical study conducted by Jarvenpaa, Lang, Takeda and Tuunainen (2003) on the value of mobile handheld devices and services for users revealed a desire of users to obtain rapid feedback from communication partners and service providers.5 Venkatesh, Ramesh, and Massey (2003) concluded that time-criticality, as a trigger for the use of information systems might be more important in wireless environments than in wired environments, a conclusion that could actually explain why time-criticality of tasks has not found more consideration in the organization literature.

The academic discussion of time-criticality notwithstanding, in practice, support for urgent tasks has been among the earliest applications of mobile technologies, such as the notification of medical and maintenance staff about emergency situations (Ammenwerth, Buchauer, Bludau and Haux 2000).

Technology Characteristics


5 In Jarvenpaa, Lang, Takeda, and Tuunainen’s (2003) study, respondents also reported a certain pressure in relation with the time-critical aspect of mobile applications, in the sense that the study participants felt anxious to respond swiftly to incoming requests from others. While time-criticality matters, it is possible for mobile applications to increase anxiety and stress.

In addition, a number of studies on the adoption and usage of mobile technologies have been conducted. Compared to many conceptual studies on mobile technology and mobile business models, adoption studies have typically been based on empirical research, including surveys (Khalifa and Cheng 2002, Kim, Lee, Lee, Choi, Hong, Tam, Naruse and Maeda 2004, Kini and Thanarithiporn 2004, Liang, Xue and Byrd 2003), case studies (Scheepers and Scheepers 2004), focus groups (Jarvenpaa, Lang, Takeda and Tuunainen 2003, Sarker and Wells 2003), and lab experiments (Junglas and Watson 2003, Sarker and Wells 2003).

While many research studies have implicitly or explicitly focused on consumer-oriented mobile systems (Baldi and Thaung 2002, Kim, Lee, Lee, Choi, Hong, Tam, Naruse and Maeda 2004), the use of mobile technology in business settings has also received attention (Barnes 2003, Beulen and Streng 2002, Varshney, Malloy, Jain, and Ahluwalia 2002). Recently, a trend towards the convergence of business- and consumer-oriented mobile information systems has been pointed out (Scheepers and Scheepers 2004).

Our quest to provide a theory of task-technology fit for mobile information systems prompts us to review mobile information systems primarily from a user perspective. In our analysis, we consequently omit a number of topics that have found consideration by other scholars, such as strategies for system development (Kemper and Wolf 2003, Krogstie, Lyytinen, Opdahl, Pernici, Siau and Smolander 2004), development cost, and infrastructure standards (Balasubramaniam, Peterson, and Jarvenpaa 2001), given that these issues are typically transparent to the end user.

To characterize mobile technologies, we suggest using the three dimensions: functionality, portability and form factors, and location-awareness (similar: Siau and Shen 2003).
Functionality

The use of functionality as one dimension to characterize technology is well in line with earlier applications of the theories of task-technology fit. Goodhue and Thompson (1995) implicitly focused on functionality when they used information systems as one proxy for their technology construct (the other proxy was the department in which an information system was used). Dishaw and Strong (1998 and 1999) used a functional view of technology in their study of task-technology fit for software engineering tools, most evident in the statement that “a fundamental argument of our model is that software will be used if the functions available to the user support the activities of the user” (Dishaw and Strong 1998, p. 109). Similarly, Cooper and Zmud (1990) directed their attention to the functional differences between two types of production inventory and control systems. Zigurs and Buckland (1998) also used a functional view of technology, defining group support systems technology “as a set of communication, structuring, and information processing tools that are designed to work together to support the accomplishment of group tasks.”

Effectively, mobile information systems allow for a combination of the functionality provided by traditional information systems focusing on computing, with the functionality of traditional telecommunication technology, focusing on communication (Balasubramaniam, Peterson, and Jarvenpaa 2001, Krogstie, Lyytinen, Opdahl, Pernici, Siau, and Smolander 2004, Sarker and Wells 2003, Varshney, Malloy, Jain and Ahluwalia 2002, Yuan and Zhang 2003). In the following, we categorize the functionality of mobile information systems according to two dimensions, namely (1) whether the main focus of the application is on communication or on computing (data), and (2) whether the direction of the interaction between the human user and the information system can be considered one-way or reciprocal (two-way interactive) (Balasubramaniam, Peterson, and Jarvenpaa 2001). The resulting classification scheme includes four functionalities (Gebauer and Shaw 2004, similar: Yuan and Zhang 2003):

1. Notification (focus: communication, interaction: one way) includes alerts and email access and allows for reachability and immediacy.
2. Communication (focus: communication, interaction: two-way) includes phone conversations, email writing, and communication support, such as access to corporate directory, yellow pages, and white pages.
3. Information access (focus: data, interaction: one way) includes access to reports, stock quotes, news (including search functionality).

4. Data processing (focus: data, interaction: two-way) includes access to workflow-based systems, such as electronic procurement and expense reporting.

Table 1 provides an overview of typical mobile information systems, together with a classification of each application with respect to the four functionalities. The table shows that the four functionalities are not mutually exclusive, as individual applications can exhibit several functionalities. For additional overviews of mobile information systems, see Balasubramaniam, Peterson, and Jarvenpaa (2001), Barnes (2003), Computerworld (2003), Varshney, Malloy, Jain and Ahluwalia (2002), Varshney and Vetter (2001), and Yuan and Zhang (2003).

**Table 1 – Examples of Mobile Information Systems**

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert systems</td>
<td>Use of pagers and cell phones to alert medical and technical staff about events or emergencies requiring response</td>
<td>Notification, possibly communication</td>
</tr>
<tr>
<td>“Typical” use of a cell phone</td>
<td>Use of cell phones for alerts, and synchronous (voice) and asynchronous (voice mail, text messages) communication</td>
<td>Notification, communication</td>
</tr>
<tr>
<td>Courier services, deliveries</td>
<td>Use of special purpose handheld devices, some including barcode scanners and printers, by courier services (e.g., FedEx and UPS) and producers of consumer goods (Frito Lay) to provide information on delivery schedules and routes, and to log data on location (Applegate, McFarlan, and Mckenney 1996)</td>
<td>Data processing</td>
</tr>
<tr>
<td>Store management system</td>
<td>At clothing retailer Armani, stockroom workers used handheld devices to keep track of incoming merchandise (Ewalt 2002).</td>
<td>Data processing</td>
</tr>
<tr>
<td>Farming support</td>
<td>Farmers used handheld devices and laptop computers in the field to monitor growth of crops and pests, and to log harvest data (Thomas 2002).</td>
<td>Data processing</td>
</tr>
<tr>
<td>Plant maintenance</td>
<td>At a utility plant in Germany, plant maintenance engineers downloaded job information to laptops and PDAs (including information about required tools), and log job data on site with PDAs (Imhoff 2002).</td>
<td>Data processing</td>
</tr>
<tr>
<td>Restaurant ordering system in restaurant</td>
<td>At Skyline Chili waiters used tablet PCs to send orders to the kitchen directly from a guest’s table, system also includes wireless LAN (Ewalt 2002).</td>
<td>Data processing</td>
</tr>
<tr>
<td>Freight expediting</td>
<td>Transportation company TST used satellite technologies to support the internal management of a shipping fleet and to enable customer tracking; data is feed into Win-</td>
<td>Data processing</td>
</tr>
<tr>
<td>Application Area</td>
<td>Description</td>
<td>Relevant Features</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Support for hospital staff (doctors and nurses)</td>
<td>In a simulation study carried out in Germany, notebook computers and wireless modems were used by doctors and nurses for documentation purposes and to access patient data (Ammenwerth, Buchauer, Bluder, and Haux 2000).</td>
<td>Communication, information access, data processing</td>
</tr>
<tr>
<td>Electronic patient medication system</td>
<td>A hospital group in Denmark let doctors use portable computers to enter prescriptions electronically while visiting patients; nurses use PDAs with barcode scanners that are connected to wireless LANs, to identify patients before administrating medicine (Andersen et al. 2002).</td>
<td>Data processing</td>
</tr>
<tr>
<td>Mobile electronic procurement system</td>
<td>A Fortune 100 company in the United States deployed mobile electronic procurement to allow managers to request and approve purchasing requests while being out of the office (Gebauer and Shaw 2004).</td>
<td>Notification, data processing</td>
</tr>
<tr>
<td>Support of police officers</td>
<td>London Police Services in Ontario/Canada (similar to many other police departments) supported the communication of police officers with headquarters by allowing officers to access information on the police radio system via laptops directly from police cars; system also enabled direct report uploading (Smith, Kulatilaka, and Venkatraman 2002).</td>
<td>Information access, data processing</td>
</tr>
<tr>
<td>Insurance brokers, sales staff</td>
<td>Use of laptops with constant or periodic connectivity to issue quotes at customer sites.</td>
<td>Information access, data processing</td>
</tr>
</tbody>
</table>

**Portability and Form Factors**

Many researchers have pointed out differences between traditional (“wired”) information systems and mobile information systems (Balasubramaniam, Peterson, and Jarvenpaa 2001, Lee and Benbasat 2004, Siau, Lim and Shen 2001, Smith, Kulatilaka, Venkatraman 2002, Tarasewich, Nickerson and Warkentin 2002, Varshney, Malloy, Jain and Ahluwalia 2002, Varshney and Vetter 2001, Yuan and Zhang 2003). Differentiating features between mobile and traditional information systems included the user interface and technical aspects, such as limited processing, memory and communication capacities (Krogstie, Lyytinen, Opdahl, Pernici, Siau, and Smolander 2004, Smith, Kulatilaka, and Venkatraman 2002), mobile communication, personal touch, location-related and time-critical services (Yuan and Zhang 2003).

In general, mobile technologies bring back to attention the devices that are used to access and to utilize information system functionality. No longer can we assume more or less one kind
of access device, namely a stationary terminal or personal computer (PC) with a standard moni-
tor and keyboard that is utilized for a variety of applications. Devices have instead become port-
able, including cellular phones, personal digital assistants (PDAs), laptops, pocket and tablet
PCs, and one- or two-way pagers. Developments are ongoing and new devices reach the market
constantly (Durlacher 1999, Scudder 2002, Yuan and Zhang 2003). Devices differ in size,
weight, performance, storage capacity, display (screen) and input (keyboard) dimensions, and
other so-called form-factors.

As one key difference between traditional and mobile information systems, portability is
at the same time an enabling and a limiting factor. Many researchers have implicitly or explicitly
suggested taking form factors into consideration when designing mobile information systems,
and deploying intuitive user interfaces and simple menu structures (Chan, Fang, Brzezinski,

Location-Awareness

Junglas and Watson (2003) mentioned location-dependency, i.e., situations in which in-
formation about the location of a user or somebody else is important, and identity-dependency,
i.e., situations in which the identity of a user or somebody else matters, as two characteristics of
tasks that are relevant in the context of mobile commerce.

In addition to portability and form factors, the possibility to adapt a mobile application to
the physical location of use, i.e., location-awareness (often in combination with personalization),
has been mentioned as a differentiator of mobile information systems and as a key enabler for
mobile commerce business models, such as location-based marketing and services (Balasubra-
maniam, Peterson, and Jarvenpa’a’s 2001, Kini and Thararithiporn 2004, Lee and Benbasat 2004,
for location-based services. Examples of location-aware mobile information systems have been
provided in Computerworld (2003).

Individual Use Context

Ubiquity has been identified as a defining factor of mobile information systems, referring
to the fact that mobile information systems allow for the reaching of users anywhere and any-
time, as well as providing anywhere and anytime access to information resources (e.g., immedi-

To date, the desirable situation of ubiquity is more often than not limited in several ways (Gebauer and Shaw 2004). In order to account for such limitations, it has been suggested to include the individual use-context into the design of mobile information systems (Siau, Lim and Shen 2001, Tarasewich 2003). Generally, the use-context in a mobile environment tends to be less stable than a home or office environment (Tarasewich 2003).

We identified four factors as relevant in describing the individual use context for mobile information systems: distraction, mobility, connection quality, and previous experience.

**Distraction**

Distraction has been mentioned as a key factor characterizing the use-situations of mobile information systems (Lee and Benbasat 2004). Lee and Benbasat (2004) found that users tended to be multi-tasking when using mobile commerce applications, while Tarasewich (2003) stated that compared to a typical office environment, mobile users tended to be distracted more often because many activities competed for their attention, and that more people and activities were involved than in a regular office environment. Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) found that users had limited time and cognitive resources to spare for performing tasks in mobile environments. Tarasewich (2003) pointed out that the use-context tends to change frequently when users are mobile, leading to a situation where a user’s attention and priorities can change rapidly and unpredictably. In addition, safety issues can play a role and limit the attention that a user can devote to a mobile information system, such as when they are driving a car (Tarasewich 2003).

**Mobility**

As the term indicates, mobile information systems include mobility of at least one participating party (Balasubramaniam, Peterson, and Jarvenpaa 2001). Several different types of mobility were identified by Krogstie, Lyytinen, Opdahl, Pernici, Siau, and Smolander (2004), including spatial mobility, temporal and contextual mobility (e.g., including environment, per-
sonal traits and tasks, social aspects, and available information). Sarker and Wells (2003) used the modality of mobility (type and extent) in a framework to assess adoption and use of mobile services. Mobility becomes an important description in the individual use context, because as a user moves between locations, breaking connections and the quality of the network connection can become an issue in usage (Chan, Fang, Brzezinski, Zhou, Xu, and Lam 2002, Tarasewich, Nickerson and Warkentin 2002).

In our model, mobility relates to the fact that a mobile information system is being used at different geographic locations. Mobility is related to the fact that a user attempts to use a mobile information system while being in motion, for example while traveling by car, train or airplane, as well as to the fact that a user moves from one location to another, for example from an outside location, e.g., a construction site, to a room in a building, e.g., on-site office, and so forth.

**Connection Quality**

Several research studies have mentioned the role of network connectivity as an issue critical to the success of mobile information systems and mobile commerce. Varshney and Vetter (2001) identified network reliability as a technical requirement that needs to be in place for mobile applications to work properly. Kini and Thanaritiporn (2004) found access speed and availability to be two drivers for the adoption of mobile commerce, while Balasubramaniam, Peterson, and Jarvenpaa (2001) and Varshney, Malloy, Jain and Ahluwalia (2002) found that coverage and reliability of networks impacted the usefulness and feasibility of mobile information systems. Kim and Steinfield (2004) found that connection quality had an impact on user satisfaction and continuing intention to use mobile services.

Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) and Siau, Lim and Shen (2001) pointed out that network connections in wireless use settings tend to provide less bandwidth than network connections in wired use settings; in addition, network connections tend to be less stable and less predictable. In our study, connection quality includes factors such as network coverage (whether network access can be established at all at the location of use), bandwidth, and stability of a network connection.

**Previous Experience**

The relevance of previous experience with mobile information systems (applications and devices) to system success has been mentioned in several studies (Gebauer and Shaw 2004).
Beulen and Streng (2002) found that familiarity with mobile applications had an impact on the success of mobile information systems. After monitoring users of mobile information systems over a period of several weeks, Beulen and Streng (2002) found that perceived usefulness (a construct close to task-technology fit) increased during the time period. Khalifa and Cheng (2002) presented an empirical study on the adoption of mobile internet, focusing on the role of exposure and extending well-established behavioral theories (the theory of planned behavior, the theory of reasoned action) with new constructs representing various forms of exposure, such as trial, communication (e.g., of individual with others regarding technology) and observation (e.g., individual observing others using the technology). Khalifa and Cheng (2002) found significant effects of exposure on the intention of adopting mobile commerce.

Schwarz, Junglas, and Krotov (2004) proposed a research study to assess the role of experience and compatibility in adapting mobile technologies. In the proposed research model, prior experience included individual and vicarious exposure, and accumulated experience. It was suggested that the compatibility of prior experience with prior expertise played a role to determine overall compatibility of the technology, which again determined perceived ease of use.

Fit

To assess the fit between tasks and technologies, earlier studies have used a variety of measures, among them user perceptions, computation as a result of matching characteristics, and pre-defined profiles. In the following, we first review several fit measures that have been used by earlier, and then introduce our own measure.

In an attempt to address the extent to which information systems “support the identification, access, and interpretation of data for decision making,” Goodhue and Thompson (1995) identified eight dimensions of fit as perceived by the users, including several measures for the quality and accessibility of data in an information system, ease of system use, system reliability, and the relationship between the information systems group and system users. The model measured separately the influences of task and of technology on the perceived fit. In addition, Goodhue and Thompson’s (1995) model also assessed how performance was impacted by the perceived task-technology fit and by actual system utilization.

Dishaw and Strong (1999) computed task-technology fit “by matching characteristics of a maintenance task to supporting functionality in a software maintenance tool.” The fit was as-
sessed by comparing the functionality actually available in a tool with the anticipation of users regarding the functionality required to complete various tasks. The higher the number of anticipated functionalities that was available in an actual tool, the better the fit was determined to be.

Zigurs and Buckland (1998) viewed fit as “ideal profiles composed of an internally consistent set of task contingencies and GSS elements that affect group performance,” where ideal profiles were seen as viable alignments of task and technology. The assessment of task-technology fit was done in several steps, including identification of task environments, specification of ideal technological support for each task environment, and testing the performance effects of the task-technology alignments. In other words, Zigurs and Buckland (1998) hypothesized task-technology fit up front, as part of the proposed theory of task-technology fit. The impact of task-technology fit on the performance of group processes was later verified empirically (Zigurs, Buckland, Connolly, and Wilson 1999).

Several research studies on mobile information systems have acknowledged the relevance of the task context for the development and deployment of mobile information systems (Beulen and Streng 2002, Chan, Fang, Brzezinski, Zhou, Xu, and Lam 2002, Krogstie, Lyytinen, Opdahl, Pernici, Siau, and Smolander 2004). The general concept of task-technology fit has been applied to mobile information systems by Gebauer and Shaw (2004), Junglas and Watson (2003), and Liang and Wei (2004).

Krogstie, Lyytinen, Opdahl, Pernici, Siau, and Smolander (2004) mention message and task characteristics (e.g., number of interacting participants, immediacy of responses, volume of communication and communication objectives) as elements of a framework to help identify key factors affecting the use and adoption of handheld hybrid mobile services. Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) studied the usability of wireless web-sites on different platforms (e.g., WAP, Palm, pocket PC) and examined the interaction of user tasks, form factors, and purposes of application and effects on usability. The results of Chan, Fang, Brzezinski, Zhou, Xu, and Lam’s (2002) study indicate a significant role of matching tasks with the mobile environment. Beulen and Streng (2002) presented a field experiment in the information technology services sector on the impact of mobile office-applications on the effectiveness and efficiency of office workers. The results of the experiment pointed to differences of perceived usefulness of the applications between tasks (e.g., tasks of relationship managers versus tasks of technicians).
In addition, differences between tasks were recorded regarding the impacts of the applications (e.g., impact on efficiency versus effectiveness).

Similar to Zigurs and Buckland (1998), Junglas and Watson (2003) determined task-technology fit as a pre-defined profile between two technology characteristics: ubiquity (composed of reachability and accessibility) and uniqueness (composed of identity and location), and three task characteristics: dependency on time, on location, and on identity. Depending on the matches between the task and technology characteristics, Junglas and Watson (2003) pre-determined situations of ideal fit, over-fit, and under-fit, and assessed the impact of technology use. Junglas and Watson’s (2002) empirical study largely confirmed the hypotheses and showed an impact of task-technology fit on use, as well as some impact of use on performance.

Gebauer and Shaw (2004) applied the theories of task-technology fit to assess the success factors and impacts of mobile information systems and determined task-technology fit largely as user-perceived usefulness. Gebauer and Shaw’s (2004) exploratory case study on a mobile e-procurement system pointed to preliminary evidence for the applicability of the proposed research model.

Similar to Zigurs and Buckland (1998), we propose to determine task-technology fit as predefined profiles (Venkatraman 1989), assuming that a good fit between tasks and technology has a positive impact on task performance and, consequently, on information system success. The construction of task-technology fit presented in the following sections represents the core part of our specific theory of task-technology fit for mobile information systems. The proposed relationships are stated as propositions that require testing by subsequent research. While Zigurs and Buckland (1998) provided matching profiles of task and technology, we consider three independent constructs, namely task, technology, and individual use context. We, thus, suggest three steps to determine task-technology fit of mobile information systems (Figure 1).
First, an ideal fit is determined between task and technology, based on the application of media richness theory. In a second step, the individual use context is matched with the available technology based on earlier research on mobile technology, to determine an individual use context-technology fit. It is in this step that the specifics of mobile technology are most evident. In the third step, the ideal task-technology fit and the individual use context-technology fit are mapped against each other to determine a moderated task-technology fit. In the proposed theory, the individual use context has a moderating effect on task-technology and effectively limits the possibility of the technology to provide task support, to the degree that the individual use context differs from an ideal situation as a result of the mobility of the user. One of the results of the analysis is the conclusion that the less ideal the individual use context, the more limiting the way technology can support a task. In other words, the fit of task and technology is moderated by the fact that the user is mobile and that, overall, fit is more difficult to achieve.

**Fit 1: Ideal Task-Technology Fit**

To determine an ideal fit of task and technology, we review the requirements of tasks in terms of difficulty, interdependence and time-criticality with respect to the mobile technology. At this point, we focus on functionality only, including notification, communication, information access and data processing.
Task-difficulty: In order to propose an ideal support for tasks depending on the task difficulty, we apply media-richness theory. Introduced by Daft and Lengel (1984) the concept of media richness allows linking managerial tasks with different types of information and communication technology best suited to provide task support. Daft and Lengel (1984) described the range of managerial tasks from simple (i.e., mechanical, routine, predictable, well understood) to complex (i.e., no objective computational routine tells the manager how to respond, decision situations tend to be difficult, hard to analyze, and unpredictable). To solve complex decisions, Daft and Lengel (1984) suggested that managers spend time analyzing the situation, thinking about what to do, and searching for information and solutions outside normal procedures. Simple problems tend to occur at the lower management levels, whereas more complex problems tend to occur for higher-level managers.

Daft and Lengel (1984) proposed that rich media, including the telephone and face-to-face meetings were needed to process complex situations, such as setting organizational goals, strategies, communicate managerial intentions, and manage employee motivation. Media low in information richness, such as written information sources, technical manuals and mathematical formula, were best to deal with simple topics, such as inventory control. Overall, Daft and Lengel (1984) found that managers especially those at higher levels of management prefer rich media for communication and information processing, a finding that is consistent with Mintzberg’s (1980) observations that managers spend over eighty percent of their time communicating. Rich media might also be preferred for complex situations because they can be adapted more easily to fit a particular situation, whereas the more formal, information-poor media tend to have a narrower area of application (see also Gorry and Scott Morton (1971).

Daft and Lengel’s (1984) media richness theory has been applied to information and communication systems and has been largely confirmed. For example, Leonard, Brands, Edmonson, and Fenwick (1998) conducted a study among members of virtual development teams and found the premises of media-richness theory confirmed, as respondents generally preferred and used richer media for more complex tasks.

Lim and Benbasat (2000) used Daft and Lengel’s (1984) work as the basis to study the question of whether or not a rich representation of information (multimedia) can better support the information processing needs of decision makers compared to less rich representation (e.g., text), and in what contexts and under what conditions such benefits are expected to occur. Lim
and Benbasat (2000) found that task analyzability (Perrow 1967) influenced the type of information representation (in terms of information richness) that was most appropriate for equivocality reduction (Daft and Lengel 1984) and perceived usefulness of an information system (from the technology acceptance model). In particular, it was shown that multimedia helps to cope with less analyzable tasks.

Returning to our characterization of technology provided earlier, we view information systems that provide communication and information access as information rich, whereas information systems that provide (structured) data processing functionality are perceived as information poor. Consequently, we propose the following:

**Proposition 1a:** Tasks of low difficulty should result in best performance when done using an information system that emphasizes data processing.

**Proposition 1b:** Tasks of high difficulty should result in best performance when done using an information system that emphasizes communication and information processing.

**Task-Interdependence:** Straus and McGrath (1994) investigated the hypothesis that as group tasks pose greater requirements for member interdependence, communication media that transmit more social cues will foster group performance and satisfaction. In an empirical investigation, Straus and McGrath (1994) noted that increased levels of task interdependence required greater instances of information exchange needed to clarify task assignments, project requirements, and progress and found that the productivity of groups in particular was higher for groups using face-to-face meetings, rather than computer-mediated meetings. Andres and Zmud (2002) used interdependence in a research study on software development processes and found that in general, highly interdependent tasks required more data and a richer information exchange to clarify task assignment, develop effective task performance strategies, make decisions, and obtain performance feedback. The recent results are in line with Thompson’s (1967) suggestion that the higher the level of interdependence, the more difficult and less standardized the suggested form of coordination (see also Daft and Lengel 1984).

We conclude that communication is better suited to support situations of high interdependence than data processing given the higher degree of media-richness exhibited by communication compared to standardized data processing (information access is somewhat in the middle).
In addition, we propose that notification is well suited to support a situation of high interdependence, as this functionality can help alert a team member of a waiting task and prompt its completion. Consequently, we propose the following:

**Proposition 2:** Tasks of high interdependence should result in best performance when done using an information system that emphasizes notification and communication.

**Time Criticality:** For time-critical tasks, the use of notification applications has long been a standard practice. For example, the use of numeric pagers to alert medical personnel and technology maintenance staff about emergencies and urgent situations were among the earliest applications of mobile information systems. In an exploratory case study, Gebauer and Shaw (2004) found that notification was a good way to help management users cope with immediacy requirements.

We propose that in cases where a task needs to be performed promptly, notification of the team members about the waiting task is particular critical and useful. Thus, we propose:

**Proposition 3:** Tasks that are highly time-critical should result in best performance when done using an information system that emphasizes notification.

Table 2 summarizes the proposed ideal fit between task and technology characteristics. The shaded cells in Table 2 (marked with “X”) indicate the functionalities of the technology that fit best with the different task-characteristics as outlined above; the corresponding propositions are indicated in parentheses.

**Table 2 – Fit 1: Ideal Task-Technology Fit**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Notification</th>
<th>Communication</th>
<th>Info access</th>
<th>Data processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdependence high</td>
<td>X (P2)</td>
<td>X (P2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time criticality high</td>
<td>X (P3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

30
Fit 2: Individual Use Context-Technology Fit

Earlier, we identified four conditions associated with the typical use context of mobile information systems. In the following, we revisit the four conditions and focus on the impacts of each of the conditions on the feasibility mobile information systems. In addition to functionality, we now consider form factors (requirement to provide simple and intuitive applications and user interfaces), and ask whether location-awareness of the information system seems to be a useful feature.

Our analysis is based as much as possible on earlier concepts and empirical studies, such as Beulen and Streng (2002), Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002), Lim and Benbasat (2002), Tarasewich, Bhimdi and Dideles (2004), and Tarasewich (2003). At present, however, only a very limited number of published studies are available to provide direct insights on the relationship between the characteristics of the individual use context and feasible specifications of mobile information systems. As a result of the limited research results, the propositions put forward in the current section are based to a significant extent on intuition and our own experience with mobile information systems, and, thus, require careful testing in future studies.

The focus of the following analysis is on “non-ideal” work situations characterized by various combinations of high levels of distraction and of mobility, and low levels of network quality and of experience. The underlying assumption is that non-ideal work situations pose restrictions on the feasibility of mobile systems as compared to the corresponding ideal work situations, which consist of low levels of distraction and mobility, and high levels of network quality and experience with the applications and devices.

In an experimental study to assess the usability of mobile web-access on different platforms (e.g., WAP, Palm, and pocket PC, Chan, Fang, Brzezinski, Zhou, Xu, and Lam 2002, examined the interaction of user tasks, form factors, and purposes of an application. Chan, Fang, Brzezinski, Zhou, Xu, and Lam’s (2002) experiment included transactional tasks (e.g., booking a flight, buying a book, bidding on an item) and information retrieval tasks (e.g., searching for a movie, checking a stock quote, check a flight schedule, searching for a book or item, searching for news items). A total of six participating graduate students used several devices in different environments, such as bus, train, home, and office to access a number of web sites to perform a number of different tasks. Usability problems were recorded in Chan, Fang, Brzezinski, Zhou, Xu, and Lam’s (2002) study provided results regarding several factors used in the current study.
to characterize the individual use context, including distraction, mobility and poor quality of network connections. For example, problems were reported with content presentation, including long downloads and broken connections, vertical and horizontal scrolling, information overload, and depth of site structures. Recommended guidelines included: avoidance of scrolling (esp. horizontal scrolling), use of flat hierarchies, use of design navigation system that is consistent with regular browser, use of a back button similar to regular browser, use of history list, indication signal strength and downloading progress, users not required to remember items, limited search scope. Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) concluded that tasks needed to be suitable to the environment. For example, the context of use needed to be considered, such as the fact that users had a limited attention span and time to spare in a mobile environment. In addition, Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) recommended that transactions should not be too complicated and long due to the fact that mobile connections were susceptible to breaking.

Tarasewich, Bhimdi, and Dideles (2004) focused on the design of notification features for mobile applications, with the objective to design notification cues that allow fast, efficient, and unobtrusive information communication. Tarasewich, Bhimdi, and Dideles (2004) tested the use and effectiveness of a set of user-customized visual notification cues (e.g., three-colored lights) on pocket PCs, where notification was viewed as meta-information about a waiting task, message, or event. The experiment proved to be successful as most users correctly related the notification cues with the appropriate the message and thought the system to be useful, even though an initial learning curve was evident.

Level of distraction high: In a research study that applied and extended an earlier framework on electronic commerce business models to mobile commerce, Lim and Benbasat (2004) identified two characteristics to distinguish both mobile commerce from electronic commerce: mobile setting (e.g., context, spatiality, and temporality) and mobile devices. According to Lim and Benbasat (2004), it was the mobile setting in particular that limited a user’s attention and as a result posed specific requirements for the design of mobile user interfaces (e.g., form factors).

Other studies support the notion that situations of distraction require careful consideration of form factors, in particular the design of applications and user interfaces. In Chan, Fang, Brzezinski, Zhou, Xu, and Lam’s (2002) study, a frequent problem with using the mobile information system was that inappropriate design caused information overloading as too much demand was
placed on the user’s memory and that users often had write down information because the use of multiple windows was not allowed. Tarasewich, Bhimdi, and Dideles (2004) proposed an improved design of notification cues that can prove helpful to support distracted users. Tarasewich (2003) proposed the design of a "minimal attention user interface."

Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) found that transactions could not be too complicated and long if users were distracted, and if connections could break. For tasks that required much time for decision making and extensive information exchange (e.g., trip planning), desktop-computers were the most appropriate platform. We conclude that in addition to carefully designed form factors, simple applications (notification, communication) can help make up for the limited attention span of a user in mobile settings.

Proposition 4a: A use context characterized by high user-distraction should result in improved performance of a task when supported by notification functionality in combination with verification, or by communication functionality.

Proposition 4b: A use context characterized by high user-distraction should result in limited improvement of performance of a task when supported by information access functionality or by data processing functionality.

Proposition 4c: A use context characterized by high user-distraction should result in improved performance of a task when supported by applications with user-friendly form factors.

User Mobility: The fact that a user is moving does not necessarily prevent the user from performing a task and from conducting business; on the contrary, a user sitting in a train or even airplane might find quite favorable work conditions. In such a situation, however, the availability and stability of network connection and the ability to maintain contact with the user can become a (technical) problem (Balasubramaniam, Peterson, and Jarvenpaa 2001, Tarasewich, Nickerson and Warkentin 2002).

In addition, location-awareness of the application could be helpful for the appropriate support of varying use-locations and situations where users are locating to (Liang and Wei 2004, Rao and Minakakis 2003). Chan, Fang, Brzezinski, Zhou, Xu, and Lam (2002) found that users on the move were not always aware when their signal strength was weakening or when it was too low for connections. The users received server error messages when connections were lost. Lo-
cognition-awareness of an information system could provide for changing ring-mechanisms, depending on whether the user is outside or inside, automatically adjustment to local time, and for location-based services, e.g., help to find a hotel, plus allowing others to locate the moving user.

**Proposition 5a:** A use context characterized by high user-mobility should result in improved performance of a task when supported by mobile applications (of any functionality), as long as connectivity can be provided.

**Proposition 5b:** A use context characterized by high user-mobility should result in improved performance of a task when supported by applications that provide location-awareness.

**Quality of network connection low:** The quality of a wireless network connection can be low or even non-existent because of limited overall coverage, limited available bandwidth, or because of instability of the network coverage. A situation of poor network quality is problematic as it is the network connection in particular that allows the user to access the regular corporate information infrastructure. Poor network connections can hinder the usefulness, feasibility and success of mobile information systems (Beulen and Streng 2002, Chan et al 2004, Gebauer and Shaw 2004, Varshney, Malloy, Jain and Ahluwalia 2002).

Of all functionalities, notification is probably the easiest to provide, in particular in combination with an indication to the sender whether a message (SMS etc.) has been received by the mobile user. Providing more complex information access and data processing functionalities as well as communication functionality is more difficult (Chan, Fang, Brzezinski, Zhou, Xu, and Lam 2002). Requirements in terms of form factors include limitations of required up- and download-times and bandwidth, as well as mechanisms to continue a disrupted transaction as soon as the connection is re-established. In this context security issues also play a role (Ghosh and Swaminatha 2001).

**Proposition 6a:** A use context characterized by low quality of network connection should result in improved performance of a task when supported by notification functionality in combination with verification.
Proposition 6b: A use context characterized by low quality of network connection should result in limited improvements of performance of a task when supported by communication, information access and data processing functionalities.

Proposition 6c: A use context characterized by low quality of network connection should result in improved performance of a task when supported by applications with user-friendly form factors (e.g., short downloads, continuance of interrupted communication and transactions!).

Level of previous experience with mobile information system low: We have found little research on the issue of feasibility of mobile information systems for users who had either little previous experience with a particular application (e.g. electronic procurement) or with a particular mobile device (e.g., PDA). Khalifa and Cheng (2002) found that exposure to mobile information technology had an impact on the intention to use the technology.

We propose that all functionalities of mobile information systems could in principle be provided to an inexperienced user, but that the usability of the applications and devices need to receive appropriate consideration. Limiting form factors of mobile devices tend to make the usage of mobile information systems even more difficult for inexperienced users than regular, familiar, PC-based applications. As a result, we suggest that a carefully designed user interface is even more critical for a novice user in a mobile environment than it would be in a wired environment.

Proposition 7: A use context characterized by a low level of experience with mobile information systems should result in improved performance (of task) when supported by applications (any functionality!) with user-friendly form factors.

Table 3 summarizes the proposed fit of and technology with the individual use context. In Table 3, propositions are indicated in parentheses, while the three grades of shading indicate the level of feasibility, including feasible (light shade), feasible under certain conditions (medium shade), and difficult (dark shade). Table 4 provides an overview of the propositions.

Table 3 – Fit2: Individual use context-technology fit

<table>
<thead>
<tr>
<th>Feasibility of Functionality</th>
<th>Form factors</th>
<th>Location-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

35
### Table 4 - Propositions regarding ideal task-mobile technology fit and individual use context-technology fit

**Propositions regarding ideal task-mobile technology fit**

<table>
<thead>
<tr>
<th></th>
<th>1a</th>
<th>Tasks of low difficulty should result in best performance when done using an information system that emphasizes data processing.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1b</td>
<td>Tasks of high difficulty should result in best performance when done using an information system that emphasizes communication and information processing.</td>
</tr>
<tr>
<td>2</td>
<td>Tasks of high interdependence should result in best performance when done using an information system that emphasizes notification and communication.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Tasks that are highly time-critical should result in best performance when done using an information system that emphasizes notification</td>
</tr>
</tbody>
</table>

**Propositions regarding individual use context-mobile technology fit**

<table>
<thead>
<tr>
<th></th>
<th>4a</th>
<th>A use context characterized by high user-distraction should result in improved performance of a task when supported by notification functionality in combination with verification, or by communication functionality.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4b</td>
<td>A use context characterized by high user-distraction should result in limited improvement of performance of a task when supported by information access functionality or by data processing functionality.</td>
</tr>
<tr>
<td></td>
<td>4c</td>
<td>A use context characterized by high user-distraction should result in improved performance of a task when supported by applications with user-friendly form factors.</td>
</tr>
<tr>
<td>5a</td>
<td>A use context characterized by high user-mobility should result in improved performance of a task when supported by mobile applications (of any functionality), as long as connectivity can be provided.</td>
<td></td>
</tr>
<tr>
<td>5b</td>
<td>A use context characterized by high user-mobility should result in improved performance of a task when supported by applications that provide location-awareness.</td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td>A use context characterized by low quality of network connection should result in improved performance of a task when supported by notification functionality in combination with verification.</td>
<td></td>
</tr>
</tbody>
</table>
A use context characterized by low quality of network connection should result in limited improvements of performance of a task when supported by communication, information access and data processing functionalities.

A use context characterized by low quality of network connection should result in improved performance of a task when supported by applications with user-friendly form factors (short downloads, continuance of interrupted communication and transactions!)

A use context characterized by a low level of experience with mobile information systems should result in improved performance of a task when supported by applications (any functionality!) with user-friendly form factors (intuitive user interface, simple menu structures).

**Fit 3: Moderated Task-Technology Fit**

After having proposed several conditions for an ideal task-technology based on media richness theory (fit 1), and after having assessed the impact of the individual use context on the feasibility of mobile information systems (individual use context-technology fit, fit 2), we are now ready to combine the propositions of fit 1 and of fit 2 in order to determine a moderated, overall task-technology fit. As has been pointed out above, mobile use settings tend to limit the scope of feasible mobile information systems as compared to information systems that are used in stationary, wired office environments. Consequently, the requirements for system development increase. Table 3 summarizes the proposed three-way fit between the characteristics of tasks, individual use context and technology (moderated task-technology fit, fit 3).

**Table 5 – Fit 3: Moderated task-technology fit (combining ideal task-technology fit and individual use-context technology fit)**

<table>
<thead>
<tr>
<th>Ideal task-technology fit (fit 1)</th>
<th>Individual use-context technology fit (fit 2)</th>
<th>Task difficulty low</th>
<th>Task difficulty high</th>
<th>Interdependence high</th>
<th>Time criticality high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calls for data processing (P1a)</td>
<td>Calls for communication and info access (P1b)</td>
<td>Calls for notification and communication (P2)</td>
<td>Calls for notification (P3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdependence high</td>
<td>Time criticality high</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of distraction high</td>
<td>Level of distraction high</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Allows for notification plus</td>
<td>- Fit quite difficult to</td>
<td>- Fit feasible, verification use-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Fit quite difficult to achieve</td>
<td>- Fit possibly difficult to</td>
<td>- Fit feasible, verification use-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Also to be considered: workarounds with notification plus communication (e.g., delegation), i.e., changing the way a task is accomplished.*
| User mobility high | | | |
|-------------------|-----------------|----------------|-----------------|-----------------|
| Allows for all functionalities, if network connectivity available (P5a) | Fit feasible, network access required | Fit feasible, network access required | Fit feasible, network access required | Fit feasible, network access required |
| Location awareness useful (P5b) | Location awareness useful | Location awareness useful | Location awareness useful | Location awareness useful |

| Quality of network connection low | | | |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Allows for notification plus verification (P6a) | Fit problematic | Fit somewhat problematic | Fit probably feasible (notification plus verification) | Fit probably feasible (notification plus verification) |
| Limits feasibility of communication, info access, and data processing (P6b) | Form factors! (limited loading times, management of interrupted transactions) | Form factors! (limited loading times, management of interrupted transactions) | | |
| Form factors important (P6c) | | | | |

| Level of previous experience low | | | |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Allows for all functionality (P7) | Fit feasible | Fit feasible | Fit feasible | Fit feasible |
| Form factors! (P7) | Form factors! | Form factors! | Form factors!! | Form factors!! |

**Discussion**

The goal of the current study is to develop a specific theory of task-technology fit for an emerging type of technology to support organizational processes, namely mobile information systems. We hope the theory contributes to a better understanding of the requirements of managerial tasks regarding the support with mobile information systems, and of the feasibility of information systems for the deployment in a mobile use context.
The specific theory of task-technology fit proposed in the current paper determines a moderated fit of task and technology in three steps, taking into account the characteristics of managerial tasks (operationalized by difficulty, interdependence, time criticality), technology (operationalized by functionality, form factors, location-awareness), and individual use-context (operationalized by distraction, mobility, network connection and experience). In the first step, we proposed an ideal fit between tasks and technology based on media richness theory (fit 1). In the second step, we assessed the feasibility of technology characteristics in a given individual use-context (fit 2). In the third and final step, we combined the ideal task-technology fit and individual use context-technology fit into an overall, moderated task-technology fit (fit 3).

Our theory suggests that in general, the less the individual use context of the mobile user resembled a “regular” office work environment with (assumed) low levels of distraction and mobility and high levels of network connection quality and familiarity with the information system (experience), the more difficult it is to provide adequate support with a mobile information system. In particular, situations of high distraction and of low quality of network connection restrict the achievement of fit between tasks and technology (see also Nicholson, Nicholson, Parboteeah, and Valacich 2005). In both cases, the requirements of the task in terms of information system functionality are difficult to provide given the restrictions of the individual use setting.

We proposed that user distraction required simple functionality of the information systems, allowing for notification and communication but limiting the applicability of information access and data processing. These feasibility considerations, however, are in contrast with the requirements of managerial tasks, be they of low difficulty to be supported with data processing functionality or be they of high difficulty to be supported with communication and information access. A carefully designed user interface with simple, intuitive menu structures, advanced notification cues and minimal attention requirements becomes critical to provide acceptable support to a distracted user. In cases where a task is in addition characterized by interdependence and time-criticality, additional requirements have to be met, for example verification in order to ensure that a message has actually reached the distracted user.

The situation is similarly difficult in a situation of low quality network connections, be it because of low bandwidth, unstable connections or a complete lack of network coverage at the user’s location. The individual use context allows for an information system that provides notification, but limits the feasibility of applications with more complex functionality, such as com-
munication, information access and data processing. If such functionality is to be provided as required by tasks of high and low difficulty, requirements on form factors are critical, including limited data volumes for uploading and downloading, and mechanisms to ensure the continuance of interrupted transactions, for example with temporary information storage. In cases where a task is additionally characterized by interdependence and time-criticality, the need to ensure that a message has actually reached the mobile user poses additional requirements (similar to situations where the user is distracted).

The actual requirements on mobile information systems however, can become even more complex, considering that the conditions of the individual use context are not stable but tend to change quite frequently over time as the user moves between locations. System development will have to make a decision on how many and which ones of the (possibly unfavorable) characteristics of the individual use-context are to be included in the design of a mobile information system, given that every one of the conditions is probably of relevance at some point in time.

As Table 3 reveals, certain combinations of a task and individual use context make it quite difficult to conceive of a mobile information system that provides a perfect task-technology fit. With Beulen and Streng (2002) it can be argued that the ability of mobile information systems, to bring the office environment to the managerial-professional’s location can compensate for the technical deficiencies realized while using the technology. We suggest, however, that a fit between task and technology can actually be achieved even if a technical solution is not feasible, by either changing some characteristics of the individual use context or of the task itself.

For example, let us assume a manager travels to locations where the preferred mobile carrier does not provide adequate network coverage (low quality of network connection). Let us also assume the manager is expected to receive and approve purchasing requests from her staff (difficulty low, interdependence high, time-criticality possibly high). For situations of low quality of network connection and tasks of low difficulty, our theory indicates difficulties with achieving task-technology fit. One strategy for system development could be to provide the manager with a mobile electronic procurement system (data processing functionality), thus supporting the task, but providing a poor fit with the individual use context. A better solution could be found in a change of the individual use context or of the way the task is actually accomplished. For example, the organization might decide to allow the manager to use a different wireless provider at the location of travel, even if such a provider is not on the list of preferred providers and
therefore more expensive. In that case the “condition” of low quality of network connection has been eliminated and a fit between task and technology can in fact be achieved. Similarly, in some cases it may be possible to adapt the task to the individual use context. For example, instead of providing the manager with a complete application to perform data processing (e.g., approval of purchasing request), it might be feasible to merely notify the traveling manager of a waiting task and subsequently provide for the delegation of the task to a staff-member with more favorable use conditions (e.g., better network connection).

More research is required to develop such strategies in more detail and to assess the potential for success and impacts. Our specific theory of task-technology fit for mobile information systems, however, can provide a starting point and help identify situations in which an ideal fit between tasks and technology is difficult to achieve, given the particular use context.

**Conclusions**

Siau and Shen (2003) found that mobile technologies provide only limited support for complex transactions and that the usage of mobile devices is limited in complicated environments. The analysis provided in the current paper can help draw a more sophisticated picture. Taking into consideration task characteristics as well as limiting factors of the individual use context allowed us to analyze why mobile technology might or might not be useful and successful in particular situations.

Earlier, we stipulated three questions, namely: (1) how is the application of mobile technology in organizations different from other applications of information technology? (2) What are promising areas for the deployment of mobile information systems in organizations? (3) How should mobile information systems be designed to provide appropriate support for the tasks that are typically performed in organizations? We are now ready to provide responses to the three questions.

In the proposed specific theory of task-technology fit for mobile information systems, the difference between a traditional information system and a mobile information system originates

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7 Venkatesh, Ramesh, and Massey (2003) found that a task may actually change depending on whether it is performed in a regular working environment or in a mobile environment. An analysis of such a condition, however, even though promising, is outside the scope of this article.
in the individual use-context. In our analysis, we identified four conditions that limit the technical feasibility of mobile information systems or pose particular requirements: distraction, mobility, network connection quality and previous experience. In cases where none of the four conditions is met, i.e., the user is not distracted, is stationary, has good network connectivity and is familiar with the mobile information system we suggest that task-technology fit can be achieved in much the same way as in a “regular” work environment, and an ideal task-technology fit (fit 1) is feasible. The more the individual use conditions differ from the ideal case, however, the more difficult is it to achieve adequate task-technology fit. Our theory proposes that a use context where users are distracted and the quality of network connection is poor is particularly difficult to address. In general, form factors (intuitive user interface and simple menu structures) and verification features (in addition to notification) become more important as the use context becomes less ideal.

We suggest that promising areas for the deployment of mobile information systems are to be found where a match between the characteristics of tasks, technology and individual use context can be achieved, be it by improving the technology (e.g., better form factors), be it by adjusting the individual use-context (e.g., by subscribing to a more expensive, high-quality network provider), or be it by reorganizing the way a task is to be completed (e.g., notification and delegation instead of direct completion). The proposed theory can help analyze a situation in terms of the characteristics of tasks, technology and individual use context and thus provide a starting point to achieve fit, assumingly a pre-condition for system success and performance.

The proposed theory of task-technology fit can be applied both to identify promising areas for the application of available mobile information systems, i.e., the fit between task and technology is natural, or can be achieved easily, and to design information systems that are a good fit for the tasks at hand in a given use context.

The proposed theory can also be applied to analyze successful and unsuccessful mobile information system retroactively. For example, and as described by Gebauer and Shaw (2004), a global Fortune 100 company implemented a mobile electronic procurement system to support various tasks of low difficulty in relation with the procurement process (e.g., requisitioning, approval, receiving). The conditions of the use context included a mix of poor network connections at locations of travel and limited experience with the mobile technology (WAP-phones) and the electronic procurement application. Our theory proposes difficulties with achieving a fit between
the task requirement and feasible functionality of the technology, and points to the importance of
carefully designed form factors. The actual application, however, did not meet these require-
ments and in particular exhibited deficiencies with respect to the form factors as the system was
difficult to set up and to use and as system access and transaction times were considered too
long. The success of the mobile electronic procurement system was very limited. Another applica-
tion, however, deployed later had better success, namely mobile email and directory access to
help managers stay in touch and keep managing while being out of the office. According to our
proposed theory of task-technology fit for mobile information systems such situations of high
tasks difficulty and high task interdependence require support with notification and communica-
tion functionality, which the application did in fact successfully provide.

The proposed theory needs to be tested before it can become a practical and applicable
tool to evaluate and design mobile information systems. To this extent it is necessary to validate
the proposed instrument, in particular the dimensions that we used to characterize mobile informa-
tion systems and to describe the individual use context. So far these dimensions have not been
tested empirically, even thought they have been stipulated by a number of scholars of mobile in-
formation systems. In addition, we found little direct support for our quest to match mobile tech-
nologies with user tasks and with individual use context. While media richness theory provided
us with a good framework to address the first point, we relied on conceptual work and our own
considerations to address the second point. All of the propositions should be tested rigorously in
the future.

Furthermore, we suggest taking a critical look at the implications of the proposed task-
technology fit on the success of mobile information systems including task performance and
utilization. In this regard, an analysis of the costs and benefits in relation with the achievement of
task-technology fit promises to answer the question of “Is it really worth it?” and can also hold a
key to the overall success of mobile information systems.

Finally, the task-technology fit of mobile information systems could become part of a
broader analysis to include the actual viability of the systems in question, as proposed by Liang
and Wei (2004) in the context of mobile commerce, and ultimately lead to mobile information
systems that not only provide a good fit with managerial tasks but that also promise managerial
and financial success.
References


