# Usable M-Commerce Systems

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## INTRODUCTION

Today, the PC is only one of many ways to access information resources. On one hand, traditional computing technology is becoming more mobile and ubiquitous and, on the other hand, traditional mass media are becoming richer. Whereas information services related to interactive TV and ubiquitous computing are projected to become prominent in a few years, mobile computing is the most important current trend within information and communication technology.

According to Siau, Lim and Shen (2001), the essence of m-commerce and mobile information systems is to reach customers, suppliers and employees regardless of where they are located and to deliver the right information to the right person(s) at the right time. So far, relatively little attention has been paid to the user side of m-commerce systems. The ability to develop and evolve usable m-commerce systems may become an even more critical success factor for enterprises in the next few years than is their ability to develop and evolve usable e-commerce systems today.

## BACKGROUND

M-commerce systems differ from more traditional information systems along several dimensions (Hirsch, Coratella, Felder, & Rodriguez, 2001; Krogstie, Brandtzæg, Heim, & Opdahl, 2003b; Siau et al., 2001). We have grouped the differences within the following three areas:

- User-orientation and personalization;
- Technological aspects including convergence and need for multi-channel support; and
- Methodology for development, evolution and operations to ensure organizational returns.

### User-Orientation and Personalization

Mobile information systems often address a wide user-group, which means that user-interface aspects should feature prominently and early in the design process and often need to be very simple. Input and output facilities may be severely restricted (no keyboard, small screen-size, etc.) or based on new modalities (speech-recognition and synthesis, etc.). This means that individualization of mobile information systems becomes increasingly important, both at the individual level where user-interface details are tailored to personal preferences and hardware, and at the work-group level, where functions are tailored to fit the user's preferred work processes.

Individualization means information systems that both automatically adapt themselves to the preferences of the user and that can be explicitly tailored by users through a specific user-interface. The main goal is to achieve usability of the applications on all possible interfaces, based on adaptation to the different physical devices. This calls for intelligent, adaptive and self-configuring services that enable automatic context-sensitivity, user profiling and personalization.

### Technological Aspects including Convergence and Multi-Channel Support

Mobile devices have limited processing, memory and communication capacities compared to other kinds of computers. Performance considerations, therefore, become increasingly important. Analytically-based predictive methods are necessary in order to assess a large number of alternatives during the design. Mobile information systems also pose new challenges to achieving information systems dependability. The new mobile devices provide integration and convergence of technologies into a wide range of innovative mobile and multimodal applications. Mobile and other new technologies provide many different ways to offer the same or similar services to customers. Novel approaches for the development and evolution of applications on and across different mobile and traditional platforms are thus needed.

### Methodology for Development and Operations to Ensure Organizational Return

Mobile information systems are often radical and, therefore, reward an increased focus on idea generation early in the requirements and design process. Understanding the mobile users requirements for new services is thus of large importance. One would need both to be able to

develop these systems and to address the major hurdles for the deployment of applications and services. Another effect of the radically new approaches is that the introduction of mobile information systems often spawns several other initiatives for changing other information systems within an organization. It is important to focus on the interoperability of services and seamless access to corporate and government resources from the mobile devices.

## STATUS FOR MODEL-DRIVEN DEVELOPMENT AND EVOLUTION OF USABLE M-COMMERCE SYSTEMS

When speaking about *model*-driven system development, we refer to models developed in languages that have the following characteristics:

- The languages are diagrammatic, with a limited vocabulary (states, classes, processes, etc).
- The languages utilize powerful abstraction mechanisms.
- The languages have a formal syntax and semantics. The formal semantics is either operational enabling, e.g., generation of other models including executable programs or mathematical enabling advanced analyses.
- The languages are meant to have general applicability across problem domains.

Although most software developers are aware of model-driven methodologies, they are seldom followed in great detail in practice, and mostly only in initial development stages.

In general, a model-driven approach to information systems development has been found to provide the following advantages (Krogstie & Sølvberg, 2003b):

- Explicit representation of goals, organizations and roles, people and skills, processes and systems;
- An efficient vehicle for communication and analysis;
- Basis for design and implementation; and
- Readily available documentation as a basis for extensions and personalization.

One striking aspect in connection to contemporary information systems development and evolution is that there is an increasing demand for shorter development time for new products and services (Pries-Heie & Baskerville, 2001). This is specifically important for m-commerce systems, where the convergence of different platforms continuously creates opportunities for new functionality. Some would argue that this highly dynamic situation would make model-based approaches impractical. To the contrary, we claim that idea generation should not be limited by currently available technologies and that systems must be developed for change.

We can identify the following areas for potentially increased utility of techniques earlier developed as part of model-driven development:

### User-Orientation and Personalization

Traditionally, support for workers performing nomadic processes has not been provided. Functions of the mobile information system should be tailored to fit the user's preferred work processes, which typically involve other persons. To support teamwork, raising awareness of the status of knowledge resources is increasingly important in a mobile setting. To enhance social mobility, organizations and industries need to develop "social ontologies", which define the significance of social roles, associated behaviors and context (Lyytinen & Yoo, 2002). Given that knowledge resources include both individuals and technology that can be mobile, one should look into interactive systems to improve group performance. Peter Wegner's interaction framework (Wegner, 1997) was triggered by the realization that machines that must interact with users in the problem solving process can solve a larger class of problems than algorithmic systems computing in isolation. The main characteristic of an interaction machine is that it can pose questions to human actors (users) during its computation. The problem solving process is no longer just a user providing input to the machine, which then processes the request and provides an answer (output), but rather is a multi-step conversation between the user and the machine, each being able to take initiative. A major research question in this area is how to specify and utilize interaction machines on a multi-channel platform. Process support technologies are a natural choice for enabling interaction machines. Such technologies are typically based on process models, which need to be available in some form for people to alter them to support their emerging goals. Thus, interactive models should be supported (Jørgensen, 2001). The outset for this thinking is that models can be useful tools in a usage situation, even if the models are changing and incomplete. The user is included as an interpreter and changer of the models. Emergent workflow systems (Colombo, Francalanci, Mecella, Pernici, & Plebani, 2002; Jørgensen, 2001) represent a different approach to static and adaptive workflow systems with respect to their use of models. They target very different kinds of processes - unique, knowledge-intensive processes where the structure emerges or processes with strong requirements for adaptation to the context during process execution