OPTING FOR INNOVATION IN MOBILE APPLICATIONS

Jens H. Hosbond, Peter A. Nielsen and Ivan Aaen
Department of Computer Science, Aalborg University, Denmark

Keywords: Mobile application development, scenario planning, innovation.

Abstract: In this paper we are concerned with innovation in the development of mobile applications. In particular, we address how we may come to think systematically about innovative aspects of mobile applications. We suggest that there is not enough support for this in the mobile systems literature and we hence suggest a framework that supports the thinking about the possible innovative features of a mobile application in a systemic and systematic way. The framework is inspired by the theory on scenario planning. In this framework we see mobile social arrangements of node, dyad, and group as fundamental units of analysis. We apply the framework to a case where the mobile users are truck drivers in a long-distance haulage business. Our use of the framework illustrates how we can arrive at a consistent and systemic view of a possible scenario for innovative mobile applications. We continue with a discussion of to what extent and in which ways the framework gives rise to innovative thinking by relating to a common theory of types of innovation and innovation processes.

1 INTRODUCTION

Evolution of mobile devices in recent years has been immense. We are constantly faced with an increasing number of powerful and media-rich devices each encompassing more and more technical features. The inclusion of a yet larger amount of features – e.g. high-resolution camera, MP3 player, telephony, e-mail etc. – in mobile devices such as PDAs, Smartphones, and cell phones, are indications of a strong technical convergence. Technical convergence has previously been suggested as one fundamental driver for mobile information environments (Lyytinen and Yoo 2002). Currently, the convergence primarily takes place at the device level and mainly at the hardware level. A similar convergence at the software level (e.g., at the Symbian or the Windows mobile platform) has yet to be seen. Presently there is virtually no compatibility between devices allowing the same mobile applications to run on different devices. This makes development of mobile applications a costly and potentially risky business.

A costly development activity is acceptable as long as a basis for creating sufficient revenue is in place, however only few successful real-world cases exist. Consequently, herein lays one of the primary barriers and challenges for application development businesses.

Mass scale, is another fundamental driver proposed by Lyytinen and Yoo (2002). For the last decade, we have witnessed an immense adoption and diffusion of mobile devices especially in the Western parts of the world and in the Far East. However, widespread use of mobile data services, i.e., mobile applications, has far from been at the same level. The unsuccessful adoption of the wireless application protocol (WAP), which was supposed to kick-off intense use of the mobile internet (Helyar 2002), clearly illustrates this. However, exceptions exist; for instance the case of iMode in Japan with 26 million subscribers in 2001 (Vincent 2001) or the surprising success of the low-cost and simple SMS application (though that technology has not been well integrated with the Internet). From a population of 5 million, 6.5 billion SMS messages was sent in 2004 in Denmark (National IT and Telecom Agency 2004).

Low adoption rates are just one out of several difficulties facing mobile application developers (Mylonopoulos and Doukidis 2003; Krogstie, Lyytinen et al. 2004; van de Kar and van der Duin 2004). The question then becomes what constitutes a successful application with respect to adoption potential? The countless numbers of unsuccessful

H. Hosbond J., A. Nielsen P. and Aaen I. (2007).
OPTING FOR INNOVATION IN MOBILE APPLICATIONS.
In *Proceedings of the Ninth International Conference on Enterprise Information Systems - ISAS*, pages 23-30
DOI: 10.5220/0002377400230030

mobile applications surely indicate that something should be done differently. With this paper we opt for increased focus on innovation in mobile applications. Hence, we pose the question: How can we support innovative thinking in mobile application development?

Following Tidd, Bessant & Pavitt we see innovation as a process of turning opportunity into new ideas and of putting these into widespread practice (Tidd, Bessant et al. 2005). Outcomes from this process range from minor incremental improvements to radical changes affecting our ways of thinking about products, processes, organizations, markets, time and space or even about who we are.

We see two challenges in supporting innovative thinking. One is to come up with ideas. Another is to see these ideas in the context of business strategy. For these challenges we propose a heuristic approach to promote idea generation. The approach is inspired by scenario planning, which is well-suited for thinking about organizational and business strategies in highly uncertain environments (Schoemaker 1991; Schoemaker 1995; Mylonopoulos and Doukidis 2003). We propose our framework as a heuristic approach for generating innovative ideas for future mobile applications. The framework should be of use in all phases of a development project, e.g., the initiation, development, and evaluation phases and targets managerial responsibilities in development efforts.

The paper is structured as follows. Section 2 presents the heuristic approach. In Section 3 we exemplify the use of the framework by applying it first to describe the current use of ICT in a mobile setting and then to suggest possible innovative future uses of ICT in the same setting. The purpose for a business of managing innovation is to gain a strategic advantage (Tidd, Bessant et al. 2005). The theory focuses on types of innovation and phases of innovation and in particular it attracts attention to innovative options. We find that the theory of managing innovation gives an appropriate context for understanding scenario planning and our framework. This becomes the basis of our discussion in Section 4. In Section 5 we conclude the paper.

2 FRAMEWORK

In this section we present the framework suggested to support innovative thinking in mobile application development. First we introduce theory on scenario planning serving as the theoretical foundation of the framework. Second, the theory on managing innovation will be presented briefly and taken up in more detail in Section 5. Third, the elements of the framework are presented.

2.1 Scenario Planning

Many report that software development within the mobile business is highly dynamic and uncertain (Mylonopoulos and Doukidis 2003; Krogstie, Lyytinen et al. 2004; van de Kar and van der Duin 2004). Especially, application developers in the mobile value chain (Varshney and Vetter 2002; van de Kar and van der Duin 2004) are faced with difficult conditions for developing tomorrows innovative application. This is often attributed to: lack of standardisation in software platforms, unsuccessful business models, and an escalating competitive environment. To act proactively and effectively reduce the level of uncertainty in such an environment is to think in terms of scenarios (Hogarth and Makridakis 1981; Malaska 1985; Schoemaker 1991; Schoemaker 1995; van de Kar and van der Duin 2004). We use the term ‘scenario’ as “a script-like characterization of possible future presented in considerable detail” (Schoemaker 1991, pp. 550). Schoemaker (1991) suggests using scenarios in situations where: uncertainty is high, too many costly surprises have been experienced, the industry has experienced significant change, etc. (Schoemaker 1991, pp. 550). The development of mobile applications thus seems well-suited for scenario planning.

In scenario planning we do not blindly believe in forecasting the future or charting the uncertainty concerning mobile applications, but we apply scenarios as means of explicating uncertainty (Schoemaker 1991) and to provoke innovative thinking. Scenario planning may be applied in all phases of a development project, also referred to as a multiple-scenario approach (Malaska 1985). Scenario planning supports the establishing of a foundation for decision-making (Schoemaker 1995) as scenarios in our context serve as means for charting key characteristics of the mobile application and its use, e.g., end-users, use context, business model, etc.

2.2 Innovation Management

Innovation management is about managing the process of recognizing opportunities and needs for new ideas and of implementing these ideas in widespread practical use. Tidd and colleagues

distinguish between four broad categories – dubbed the '4Ps' – of innovation (Tidd, Bessant et al. 2005).

Product innovation – new ideas relate to the products or services offered by an organization (e.g. a mobile phone used as payment device). *Process innovation* – changes in how products or services are created or delivered (e.g. supporting and coordinating homecare work via wireless PDA systems). *Position innovation* – changes related to positioning or re-positioning a product (e.g. targeting personal computer operating systems to mobile devices as in the case of Windows CE for pocket PCs). *Paradigm innovation* – changes in the mental models of the organization itself and of what it does (e.g. video phones leading mobile phone companies to change to being infotainment providers).

The innovation process involves four major activities (Tidd, Bessant et al. 2005): (1) *Searching* – scanning the internal and external environment for threats and opportunities for change, (2) *Selecting* (strategic decision on response – if any – to these threats and opportunities), (3) *Implementing* (translating and launching this response in the form of an idea for something new in an internal or external market), and (4) *Learning* (improving the ways innovation processes are managed in the organization).

In this paper we primarily address the *searching* and *selecting* activities in the innovation process. Our aim is to suggest heuristics for generating ideas for solutions targeted towards mobile applications, their technologies, their markets, and their users.

2.3 The Framework and Its Elements

The underlying idea of the framework is a heuristic and pragmatic approach to uncover essential aspects of mobile use scenarios. To foster innovative thinking among managers, developers, designers, users and customers a shared language is needed (Nonaka 1994). Thus, a scenario describing the current mobile information system is necessary. Apart from serving as a common point of departure, this scenario may also serve as a basis for forming innovative ideas for improving or radically changing the current system or its use. Furthermore, the scenario may be used as means for assessing the consequences of a proposed innovation.

The heuristic framework may be applied throughout the development cycle as a steering or evaluation mechanism to highlight the innovative prospects of the application being developed. Innovation of a mobile application is not only attached to a new technical solution, but may also be linked to new ways of use or a new business model. The framework reflects these diverse perspectives in innovative thinking via a systemic view of the mobile application being developed and a particular focus on technical, social, and economical characteristics.

The framework is two-dimensional: One dimension is the unit of analysis and the other dimension is a set of key issues. The unit of analysis spans three levels, namely *node*, *dyad*, and *group*.

These units are chosen as we find them representative of the three levels of social use of a mobile application. For example, an application such as mobile access to e-mail is located at the node level, i.e., the social interaction is limited to the user accessing her e-mail. As an example of a mobile application at the dyad level we find SMS. SMS is an asynchronous text messaging technology used as a means of creating and maintaining social interaction between two mobile phone users at a time. Mobile applications at the group level are all intended to support group work. Take for instance mobile chatting – e.g., MSN Messenger: Mobile chatting is intended for use between people (1-1 at the dyad level, but also 1-m or m-m) serving as a means of communication in a group.

The other dimension highlights seven key issues (W5H2, see Table 1) that together provide a systemic view of a mobile application under consideration. The set of issues may be changed or new issues of interest may be added if necessary. However, we find that the issues suggested here provide a set of creative viewpoints. To foster discussion and reflection the seven key issues are formulated as questions. The issues suggested for examination are: *What* is the mobile application providing? *Why* is there a need for this mobile application? *When* is the mobile application intended for use (temporal aspects)? *Where* is the mobile application to be used (location aspects)? *Who* are the intended users? *How* is the mobile application technologically being realised? *How much* is economically required for creating a successful business case (business model aspects)?

The two dimensions in the framework forms the framework in Table 1.

Table 1: Framework for support of innovative thinking.

	What	Why	When	Where	Who	How	How much
Node							
Dyad							
Group							

We suggest a two-step approach for using the framework in Table 1: (1) map the current mobile

application into the cells in the framework; and (2) use the result to orchestrate a discussion of innovative ideas for a future mobile application targeted towards the same setting (taking the changes induced by the outlined system into account).

3 CASE: CURRENT ICT USE

In this section we exemplify the use of the framework by mapping a mobile information system from a Danish middle-sized transportation company into the framework.

The company has specialized in arranging refrigerated truck transport of, e.g., fish and fresh fruit. The organization consists of a forwarding agency and 10–12 cooperating haulage contractors with approximately 25 trucks driving regularly for the forwarding agency. Four forwarding agents are responsible for coordinating and communicating transports.

The typical roundtrip for a truck is that it leaves Northern Denmark on Thursday mornings with a full load of fresh iced fish for a fish market in Southern Europe. Consignments are formal agreements between the forwarding agency and a consignee about the transport of goods. The consignments for moving goods from north to south can be planned and these transports are the core business for the organization. Somewhere in Southern Europe new consignments are found and goods are picked up to be transported north in Europe. The trucks return to Northern Denmark in time to start a new roundtrip on Thursday morning.

The forwarding agents find north-bound consignments and plans which haulage contractors should transport the found consignments. Finding consignments is a complex task which is usually performed as a search for consignments in the region where a truck is empty or will be empty shortly. The planning is an even more complex task and the forwarding agents use several strategies and have invented various paper-based artefacts to support this. The forwarding agency competes for consignments with other agencies, but there is a kind of trust-based informal network between one of the forwarding agents and around 10 forwarding agents in other agencies. In this network it is possible, relatively freely to discuss rumours and ask for help to find consignments. This is referred to as the friends' network.

There is substantial coordination between the forwarding agency and the truck drivers during each roundtrip. When driving south the communication concerns details of delivery of the south-bound goods and the details of the consignments. It also concerns the possible and later the committed consignments for the north-bound trip. When driving north the communication concerns details of delivery of goods and the consignments. The coordination of which drivers shall transport which consignments is usually performed directly between the forwarding agent and the involved drivers.

The current use of ICT encompasses communication through satellite and wired as well as wireless, mobile phones. During a roundtrip the drivers will also communicate extensively with the forwarding agency on the phone. The more formal part of the communication is by satellite messages as most trucks have satellite communication equipment for text messaging and GPS positioning. The current technology does not include GPS-based navigation as the terminals in the trucks are very simple. The formal communication usually contains consignment notes and loading lists. On a weekly basis around 30 trips are planned, 75–100 consignment notes are filled in, 300–350 satellite messages are exchanged, and the phone rings constantly. The coordination is distributed by the nature of the field and is rather complex for the involved forwarding agents.

Apart from the communication between the forwarding agency and the drivers, the drivers en route somewhere in Europe have ephemeral drivers' networks where they communicate on many issues to pass time and effectively maintain a social network. This communication is on radio with a limited distance, CB – Citizen Band Radio.

The current situation in the case is described by answering the seven key issues in the framework, see Figure 1. In describing the current situation we have focused on the actors in the mobile information system; emphasizing the different users and use contexts taking place. Here we apply W5H2 as means of analysis and synopsis generator of the current situation.

For the current system, the following system definition may be formulated: The system provides communication between truck drivers and a forwarding agency with the overall purpose of managing a fleet of trucks and their routes when transporting goods in Europe. The system mediates consignments as formal contracts between forwarding agencies, consignees, and drivers. The system also mediates truck drivers' social interaction while driving. The system utilises several technologies (phone, satellite messaging, wired phone, wireless phone, CB) that are not integrated and the total operational cost is medium.

	What	Why	When	Where	Who	How	How much
Node	[T] 1) Geographical position of truck [FA] 2) Geographical positions – Location of trucks	[T] 1) No reason [FA] 2) Overview and tracking of trucks in fleet	[T] 1) Continuous when driving [FA] 2) When at work	[T] 1) On the road [FA] 2) In office	[T] 1) Truck driver [FA] 2) Forwarding agency	[T] 1) GPS display (small terminal) [FA] 2) Monitor movement on map (PC)	[T] 1) Invest-ment is low Operational expenses are low (SMS and GPS) [FA] 2) Invest-ment is medium Operational expenses are low
Dyad	[T]-[FA] 1) Talk on phone 2) Asynch. text messaging [FA]-[FA] 3) Talk on phone 4) Email / telex confirmation of consignments	[T]-[FA] 1) & 2) Negotiate consignments with drivers [FA]-[FA] 3) & 4) Negotiate consign-ments with other FAs	[T]-[FA] 1) Exceptional 2) Episodic when driving [FA]-[FA] 3) & 4) Episodic	[T]-[FA] 1) & 2) & 3) En route / in office [FA]-[FA] 3) & 4) In office	[T]-[FA] 1) & 2) & 3) Truck driver and forwarding agency 3) & 4) Forwarding agency	[T]-[FA] 1) Fixed line telephony from phone booth 2) Satellite text msg [FA]-[FA] 3) Fixed line telephony 4) Telex and email	[T] - [FA] 1) & 2) Investment is high Operational expenses are low [FA]-[FA] 3) & 4) Investment is medium Operational expenses are low
Group	[T]*-[T]* 1) Talk with colleagues nearby	[T]*-[T]* 1) Creating social awareness and coordination	[T]*-[T]* 1) Episodic	[T]*-[T]* 1) En route	[T]*-[T]* 1) Truck drivers	[T]*-[T]* 1) Through CB	[T]*-[T]* 1) Invest-ment is high Operational expenses are low

Figure 1: Current situation ([T]: Trucker, [FA]: Forwarding Agency).

4 CASE: NEW OPPORTUNITIES

For exploring new opportunities and ideas we again use W5H2 for structuring the brainstorm on future uses of mobile ICT in the case.

Based on the current case description in Figure 1 we develop a scenario for a future mobile information system in Figure 2 - a future scenario characterised by a high level of technology convergence and integration; lowering the number of technologies required for a truck driver to master while driving. In addition, we suggest mature and well-known technologies that are cheap to operate and relatively low-cost to implement in a truck.

Notice, that we here apply W5H2 for idea generation and exploration of future uses. The outcome is a synthesis of an innovative future scenario for the investigated case.

To summarise, the possible future scenario presented through the framework in Figure 2, we provide a system definition, encapsulating the essentials of the scenario. Hence, the scenario in Figure 2 may be summarised as: The system provides integrated communication between truck drivers and a forwarding agency with the overall purpose of managing a fleet of trucks and their routes when transporting goods in Europe. The system mediates consignments as formal contracts between forwarding agencies, consignees, and drivers. The system also mediates truck drivers' social interaction while driving. The system utilises one main set of technologies (GSM/SMS-based communication between PDAs) supplemented by CB. The investment is medium and significantly less than for the current system. Total operational costs are low.

The future scenario in Figure 2 is just one possible outcome of our brainstorm. W5H2 has many interpretations and foci as the framework resembles generic questions. Repeated brainstorms may therefore result in several new and innovative future scenarios.

	What	Why	When	Where	Who	How	How much
Node	[T] 1) Navigation 2) Route and consignment management **[FA]** 3) Fleet and consignment management	**[T]** 1) & 2) Effective work and route planning **[FA]** 3) Efficient consignment planning	**[T]** 1) & 2) Continuous when driving and in spare time **[FA]** 3) When at work	**[T]** 1) & 2) On the road **[FA]** 3) In office	**[T]** 1) Truck driver **[FA]** 3) Forwarding agency	**[T]** 1) PDA/ GSM/ GPS enabled device with 3rd party navigation software **[T] & [FA]** 2) & 3) Client software integration of navigation and consignments	**[T] & [FA]** 1) & 2) & 3) Invest- ment is low Operational expenses are low (SMS and GPS)
Dyad	**[T]–[FA]** 1) Talk on phone 2) Sending & receiving text messages 3) Protocol for consignments negotiation **[FA]–[FA]** 4) Talk on phone 5) Template for email correspond- dence of consignments	**[T]–[FA]** 1) & 2) & 3) Negotiate consignments with drivers **[FA]–[FA]** Negotiate consign- ments with other FAs	**[T]–FA]** 1) Exceptional 2) & 3) Continuous when driving **[FA]–[FA]** 4) & 5) Episodic	**[T]–FA]** 1) & 2) & 3) On route / in office **[FA]-[FA]** 4) & 5) In office	**[T]–FA]** 1) & 2) & 3) Truck driver and forwarding agency 4) & 5) Forwarding agency	**[T]–FA]** 1) GSM enabled PDA 2) Use SMS technology to send consignment in the XML standard **[FA]-[FA]** 4) Fixed line or wireless GSM enabled telephony	**[T]-[T] & FA]-[FA]** 1) & 2) & 3) & 4) & 5) Invest- ment is medium (was high) Operational expenses are low (GSM telephony and SMS)
Group	**[T]*–[T]*** 1) Talk with colleagues nearby 2) Commu- nication in virtual groups 3) Who is in the neighbour- hood?	**[T]*–[T]*** 1) & 2) & 3) Through social interaction in virtual groups, create an improved perception of the work environment	**[T]*–[T]*** 1) Continuous when driving 2) & 3) Episodic	**[T]*–[T]*** 1) & 2) & 3) On route	**[T]*–[T]*** 1) Truck drivers	**[T]*–[T]*** 1) Through CB or PDA w/ GSM telephony 2) & 3) PDA with integrated GPS and GSM facilities, offering a software integration of group chat and GPS location of colleagues	**[T]*–[T]*** 1) & 2) & 3) Invest- ment is medium (was high) Operational expenses are low (GSM telephony and SMS)

Figure 2: A future scenario.

5 DISCUSSION

The framework provides a search space made up of uses and needs paired with possibilities. These possibilities may lead to product, process, position, or paradigm innovations for an organization.

The framework is generic and can be used in conjunction with specific searches for charting the strengths, weaknesses, opportunities, and threats (SWOT) all of which add to the understanding of the kind of innovation (product, process, position, or paradigm) that is necessary for an organization to stay or become a competitive.

In our scenario development we used the framework to analyze the immediate process needs for a forwarding agency. We did not focus on threats but solely on opportunities for innovations in the current process. We focused on immediate and incremental improvements based on mature technologies already in use or easily available to the forwarding agency. We believe that the same framework does scale up to form part of a more extensive search process addressing for example the strengths, weaknesses, opportunities, and threats - all relevant aspects in an innovation process.

The organization in our case study was a service provider. As our focus was on incremental innovations it comes as no surprise that our scenario for the future contains process innovations only.

On the node level we suggest navigation and route and consignment management for the trucker, and for the forwarding agency we suggest fleet and consignment management. These affordable improvements aim for fleet utilization optimization, improved quality of service, and better working conditions for the driver. All in all these changes should lead to productivity and quality improvements and thereby to enhanced competitiveness for the forwarding agency.

On the dyad level we suggest a protocol for consignment negotiation between a trucker and the forwarding agency, and support for email correspondence between forwarding agencies. These improvements should enhance aligning local and central information and assessments, provide a central overview and thereby enhance the benefits of cooperation among forwarding agencies in the 'friends network'.

The group level deals in our case only with truckers. Unless the forwarding agency is significantly reorganized via more radical innovations it will maintain one central coordinating office engaged only in dyadic relations. For the group of truckers we suggest support for communication with truckers nearby as well as communication in virtual groups. In order to enhance local cooperation and cater for social needs we suggest access to see whether there are colleagues in the vicinity. Beyond providing social benefits to the drivers such support will enhance employee identification with the agency and promote building communities of practice among drivers. This in turn should lead to improvements and greater uniformity in service and strengthen the drivers' abilities to cope with problems.

In our scenario development our main focus was on searching for ideas, and we did not directly deal with the implementation of these ideas. We believe that implementation will be partially supported by the framework as ideas are viewed in a context where individual parts of a mobile application are seen in combination with other parts by virtue of the three levels of analysis. This way implementation issues are supported via economies of scale or economies of scope suggesting more economically viable solutions with effective uses across nodes, dyads, and groups.

We believe that the scenario developed for this case offers strategic process advantages with promises for increases in speed (due to faster negotiations and improved coordination), lower costs (due to better fleet utilization), increased robustness in process (due to communities of practice and easier access to support from colleagues for solving acute problems), and improved quality of service (greater punctuality and precision).

The framework with three levels of analysis was helpful by allowing for a narrow focus on particular issues without sacrificing an overview of the problem setting as a whole. The W5H2 questions were useful for eliciting ideas. In our scenario these questions were far from exhausted. We settled for only a few interpretations of e.g. "what?" at the node level. There are many relevant aspects of every question and working with the framework for a while will likely elicit an abundance of ideas for the selection activity in the innovation process. The combined part-whole perspective offered by the three units of analysis also provides some insights on implementation issues for a given scenario and thereby also some input to the decision on a particular scenario.

6 CONCLUSION

In this paper we address the issue of mobile application development. Development of mobile applications is surrounded by much uncertainty and especially lacking end-user adoption is a barrier for obtaining success in the mobile application industry. To proactively confront these challenges, we opt for innovative thinking in the development process. Specifically, we suggest a framework inspired by the theory on scenario planning for use by decision-makers in a development project. We argue that the framework aids in describing current and future scenarios of a mobile information system. For sake of illustration the framework is applied on a case of a middle-sized Danish road haulage firm where the current situation and a possible future scenario are proposed. To link the framework to theory on innovation we discuss the different types of innovation resulting from use of the framework and the phases of innovation relevant in which the framework may be used. We find the framework useful for fostering innovative thinking in mobile application development and in particular the framework supports the searching, selecting, and implementation phases of innovation. Next, the applicability and potential of the framework is to be tested in projects of mobile application development. Use of the framework in different development contexts will add credibility to the relevance of the framework in general, but also serves as a basis for exploring and evaluating the consequences resulting from applying the framework in mobile application development.

REFERENCES

Helyar, V. (2002). Usability of portable devices: The case of WAP. Wireless World: Social and Interactional Aspects of the Mobile Age. B. Brown, N. Green and R. Harper. London, Springer-Verlag**:** pp. 195-206.

Hogarth, R. M. and S. Makridakis (1981). "Forecasting and Planning: An Evaluation." Management Science 27(2): pp. 115-138.

Krogstie, J., K. Lyytinen, et al. (2004). "Research areas and challenges for mobile information systems." International Journal of Mobile Communications 2(3): 220-234.

Lyytinen, K. and Y. Yoo (2002). "Research Commentary: The Next Wave of Nomadic Computing." Information Systems Research **13**(4): pp. 377-388.

Malaska, P. (1985). "Multiple Scenario Approach and Strategic Behaviour in European Countries." Strategic Management Journal **6**(4): pp. 339-355.

Mylonopoulos, N. A. and G. I. Doukidis (2003). "Introduction to the special issue: Mobile business: Technological pluralism, social assimilation, and growth." International Journal of Electronic Commerce **8**(1): pp. 5-22.

National IT and Telecom Agency, D. (2004). Tele Yearbook 2004. D. National IT and Telecom Agency, National IT and Telecom Agency, Denmark**:** pp. 48.

Nonaka, I. (1994). "A dynamic theory of organizational knowledge creation." Organization Science 5(1): 14-37.

Schoemaker, P. J. H. (1991). "When and How to Use Scenario Planning: A Heuristic Approach With Illustration." Journal of Forecasting 10(6): pp. 549-564.

Schoemaker, P. J. H. (1995). "Scenario Planning: A Tool for Strategic Thinking." Sloan Management Review 36(2): pp. 25-40.

Tidd, J., J. Bessant, et al. (2005). Managing Innovation. West Sussex, England, Jown Wiley & Sons Ltd.

van de Kar, E. and P. van der Duin (2004). Dealing with uncertainties in building scenarios for the development of mobile services. Proceedings of the 37th Hawaii International Conference on System Sciences, Hawaii, IEEE.

Varshney, U. and R. Vetter (2002). "Mobile Commerce: Framework, Applications and Networking Support." Mobile Networks and Applications **7**: pp. 185-198.

Vincent, G. (2001). "Learning from i-mode." IEE Review 47(6): pp. 13-18.