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# INFLUENCING FACTORS FOR THE INTRODUCTION OF MOBILE-INTEGRATED BUSINESS PROCESSES

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## Abstract

Although mobile information technology is introduced in business processes of enterprises for many years, many projects for integrating mobile workforces still fail to generate a business value for the company. However, reasons for a successful introduction of mobile IT have not been investigated so far. In this paper, we present the findings of a grounded theory study that focused on influencing factors for the introduction of mobile-integrated business processes. The outcome of the paper is a theoretical framework describing the decision process and the intervening conditions on the intention to introduce mobile-integrated business processes. The framework should be extended by the effects resulting from the introduction of mobile IT to get a picture as complete as possible.

**Keywords:** Mobile-integrated business processes, grounded theory, mobile information technology, theoretical framework

## Introduction

Mobile information technology (IT) is introduced in business processes of enterprises for more than 10 years now. However, many companies fail or do not even start projects for the integration of mobile workforce. The integration of mobile workforces will become more and more crucial for companies due to the rising number of mobile workers which was predicted to be 61 million only in the United States by 2009 [1]. However, many companies have lagged to support their mobile workers with mobile IT [2] so that these business processes are still not integrated into the electronically mapped value chain. In the context of this paper, we refer to mobile business processes (MBP) as any business process which is partly or completely executed mobile and thus cannot be fully supported by the use of stationary IT [3]. The term mobile-integrated business processes (MIBP) refers then to any MBP that is fully supported by mobile or ubiquitous IT [4].

Reasons for project failure or success of the introduction of mobile-integrated business processes have not been analyzed. The focus has yet been on the analysis of single companies or

industries. Examples are [5; 6] in the maintenance industry, or [7] focusing on sales force automation. A framework covering all industries and operation areas within each company is still missing. Thus, little research has been done to analyze critical success factors or intervening factors for the introduction of mobile IT.

Therefore, the research objective of this paper is to contribute to the understanding of the decision process of companies to use mobile IT. We used a grounded theory approach to derive categories as influencing factors for the introduction of mobile-integrated business processes. These findings were compared with the existing literature to validate them initially. The outcome of the paper is a theoretical framework about the intention to introduce mobile-integrated business processes.

The paper is structured as follows. Firstly, the grounded theory methodology is presented. Then, we present and discuss our results and provide afterwards implications for practice and offer suggestions for future research. In the last section, we conclude our results.

## Methodology

For this paper we apply the grounded theory approach [8]. Grounded Theory is a qualitative and empirical research method to develop a new theory. This theory is derived through systematical data collection and analysis and can therefore be preliminarily validated [9]. A grounded theory has to fit to the collected data and be relevant and able to explain the behavior [8].

The grounded theory approach is suitable for our research topic because little research has yet been done on the influencing factors for the introduction of mobile IT. The decisive strength is the empirical and explorative approach that enables the researcher to develop a model close to reality. „Generating a theory from data means that most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research.“ [8, p.6] A purposeful theory development is achieved due to the iterative approach and the continued generation of knowledge about the research area under study. The developed theory consists on the

one hand of conceptual categories and their characteristics and on the other hand of hypotheses describing the relationships between the categories [8].

Data collection and data analysis are intertwined and done in several iterations. „Theoretical sampling is the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyzes his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges.“ [10, p.36] Firstly, for the development of the model, respondents who are considered to fit to the research question had to be identified. For this reason, interviews with strategy consultants have been conducted in Germany, because they have a lot of insights into various industries and businesses and can therefore offer a wide range of information. The selection of these respondents favored the choice of guideline-interviews, because the group of respondents is relatively specific and rare [11]. During a period of four weeks in May and June 2008 data was collected in seven in-depth interviews. All interviews were audio-taped, and, as suggested by [9], transcribed verbatim as well.

The data was collected through telephone interviews. The guidelines used ensured to address all developed constructs, relationships and ideas, without establishing a rigid order. The knowledge gained from the interviews was used to update the guidelines for the next interview. At the beginning of each interview, it was important to clarify the understanding of the term “strategic” because of the innovative field of research. Subsequently, the data collection started with an open question about the assessments and observations of the respondent about the use of mobile IT in enterprises to gain as much new knowledge as possible. Finally, constructs and relationships already identified were checked for strengthening or adjusting them further. Each interview lasted on average between 30 and 60 minutes.

After the sixth interview only factors were mentioned, that were already covered by existing categories, so that, according to [8], the theoretical saturation was reached and the interviews were terminated.

## Theory Building

### Theoretical Framework

Based on the data, we developed a basic model depicting a typical decision making process for the implementation of mobile IT within the company. Figure 1 outlines this process and influencing conditions developed during the grounded theory study.

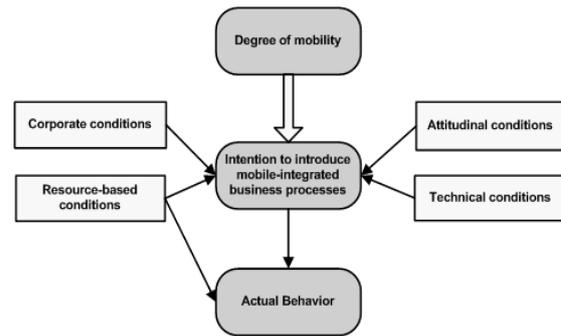


Fig. 1 Theoretical framework

The first step to start the process is the question about the degree of mobility within the company. If there is mobility the intention to use mobile IT is originated to support these parts of the company. Four different kinds of conditions have an effect on the intention to introduce mobile-integrated business processes which influence the actual behavior to implement or not to implement them.

In the following sections we will use this basic model to describe the motivations and conditions for this decision making process.

### Core category

Since the intention to use mobile IT was seen as the primary issue, this category was chosen as core category. According to [12], a behavioral intention can best be interpreted as the strength of intention to try performing a certain behavior. In accordance with the theory of reasoned action [13], we propose that the intention has a direct effect on actual behavior.

### Causal condition

The causal condition is the degree of mobility within the company. The consideration whether mobile IT may be useful for the company is only relevant if the company’s work is in some way conducted mobilely [14; 15]. The degree of mobility within companies can be analyzed regarding whether employees or products and machines are mobile. Pousttchi and Thurnher [2] use the following categorization: firstly the mobility of employees, secondly the mobility of equipment for example machines and specialized tools, and thirdly the mobility of goods like products, parts or materials. Mobile employees are further distinguished by [16] into four groups according to their responsibilities. These are skilled personnel being mobile on the premises, the other ones being mobile outside the premises, skilled personnel with management functions working in a company with a mobile core business, and the top

management. Due to the interviews we know that the support of the top management with mobile IT has no strategic aspect for the company. One reason given in the interviews is that the top management is not bound to rigid processes so that no process optimization or redesign with strategic impacts can be done. The three attributes for describing the degree of mobility will be described in the following.

Companies whose core business is conducted mobile render services at different places so that the value adding tasks could not be supported by stationary IT. In this case, all three categories mentioned by [2] are typically applicable, like for example in logistics or construction industry [17].

The second degree of mobility covers companies whose core business is not mobile but an important functional area. Based on the interviews, there are two approaches for claiming a functional area is important. The first one focuses on the importance for rendering the service or the product. An example for this approach is maintenance and emergency interference suppression for a machine manufacturer [2]. The other approach focuses on the number of employees working in the functional area like for example the field service or sales force. An interviewee stated this fact as follows: "It's important if a major part of the workforce is mobile."

The third degree of mobility focuses on the mobility of goods and equipment as described in [16]. One of the interviewees said about it: "Mobile IT is important if goods need to be tracked or monitored".

It can be stated that mobility in companies differs in the degree of mobility. All companies with some degree of mobility may generate a strategic impact by using mobile IT. Due to that, the degree of mobility is the causal condition for the intention to use mobile IT.

### **Corporate conditions**

Corporate conditions describe the company-related aspects about the interaction with the market and include the response time and the information intensity of the company.

In respect of a better interaction with the market a shorter response time may offer new strategic options. This could for example be a better service level agreement due to process optimization with a faster response time. Therefore, the response time is crucial in some industries, because cost reductions and sales increases can be achieved [18; 19]. If no strategic option can be achieved, the process changes have no further effect on the company. An interviewee explained it: "If there is no difference between a response time

of 17 or 9 minutes, a process optimization has been achieved, but no strategic competitive advantage". If considering a time critical industry mobile IT offers the opportunity to increase these positive effects due to a shorter response time than with stationary IT [17].

The aspect of information intensity relates to the volume of information and the availability of information at the time it is needed to provide services or products. Porter and Millar [20] distinguish the information intensity between the information intensity of the value chain and of the product which could each be low or high. With this matrix industries could be described according to the necessity of information processing and therefore IT support. [21, p.43] defines information intensity according to [22] as "the degree to which a firm's products and operations are based on the information collected and processed as part of the exchanges along the value chain". Mobile IT further enables companies to collect and to process information faster or to even collect new information. One of the interviewees described it like follows: "It is important for knowledge worker who need real-time information while being mobile".

It can be stated that the impact may be higher in information intense industries than in industries with low information intensity of the value chain or of the product and for companies for whom a short response time is crucial.

### **Attitudinal conditions**

Attitudinal conditions describe the attitude of the project participants and describe the business process focus of the company and the top management support.

Project participants have often focused on technical aspects rather than business aspects for the introduction of IT. This leads to a lack of understanding of the business processes by the CIO [23]. The customer does not notice the concrete IT implementation and therefore, a business process focus is necessary to fulfill the customers' expectations [24]. An interviewee said about this aspect: "Technology is an enabler for business value and can change the business processes to gain competitive advantage."

Another aspect is the top management support for the introduction of mobile IT. Sohal and Ng [25] analyzed IT projects and identified typical reasons for project failure. One main reason is the missing understanding of the potential of IT by senior management. This top-down approach is most appropriate for IT projects due to necessary changes in the business processes [24]. Pousttchi and Thurnher [26] discovered a relationship between decision making done directly by the top

management and the likelihood of the introduction of mobile IT. This relationship was mentioned during the interviews as well: "To successfully introduce mobile IT, the project has to be initiated by the top management". Brodt and Verburg [27] support these findings within their case studies as well.

Due to the literature these attitudinal conditions are often critical success factors for the introduction of IT so that they have an influence on the intention to use mobile IT.

### **Technical conditions**

The technical conditions cover two aspects: the maturity of the mobile market and the appropriateness of the mobile solution for mobile-integrated business processes.

The first aspect that could be identified describes the maturity of the mobile market. The more mature the market is, the more opportunities exist for the implementation of mobile solutions. For that purpose the available bandwidth and the available applications have to be taken into account [28]. The bandwidth is important if great volumes of data shall be transmitted via the mobile network. These characteristics describe the mobile market and the aspects that have an influence on the intention to use mobile IT [4].

The other aspect describes the mobile application. Jain [17, p.1984] emphasizes on the fit between the application and the chosen mobile device in terms of the functionality and design. The interface characteristic is important within the literature as seen for example in [28]. A reason for that was given in the interviews: "If the application is easy to understand and to use and it really helps conducting his or her work, than it will be adopted really fast." The aim is a mobile application that is easy to use with a high usability and that helps doing the job.

It can be stated that the maturity of the mobile market and the implementation of the mobile application are important factors for the intention to use mobile IT.

### **Resource-based conditions**

The resource-based conditions of the implementation of mobile IT consists of the profitability for such a project and the anticipated competitive advantages. This construct has an influence on the intention to use mobile IT and, in addition, a direct influence on the action/interaction strategies.

Profitability is defined as: "the difference between economic returns resulting from adoption of an innovation and the innovation's economic costs" [29, p.136]. The profitability here includes on the one hand project planning and

implementation costs of the solution as well as the organizational and process-related changes that are necessary for the introduction of mobile-integrated business processes in the enterprise. On the other hand, the introduction of mobile IT typically causes not only costs but also leads to monetary value and indirectly assessable monetary benefits. An interviewee said about it: "It all comes down to the question how strong the business case is." Gump and Pousttchi [3] have, for example, developed the Mobility-M framework which provides an analysis and evaluation of projects that include the introduction of mobile technology. Direct monetary benefits may include here any cost savings that can be calculated, such as shorter trips and less overtime work.

A company has a competitive advantage "when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors" [30, p.102]. This definition is used according to the resource-based view of the firm. The degree of competitive advantage is often expressed in monetary terms, but it can be measured in other ways, too [29]. Indirect monetary value describes a value that can not be expressed in monetary units, because it is not measurable, such as customer satisfaction. These may represent specific competitive advantages for the company. Due to the lack of measurability of these factors, we consider here the anticipated competitive advantages, regardless of whether they can be realized in the end.

This benefit from the introduction of mobile-integrated business processes has a positive effect on the intention and also affects the actual behavior. The cost of implementation and the resulting benefits can thus be offset against each other which leads to the profitability of the project.

### **Actual Behavior**

In terms of [9] actual behavior can be interpreted as action/interaction strategy. Therefore, the actual behavior could be to use or not to use mobile IT to support mobile business processes. "As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance." [31, p.181]

### **Implications**

The findings of our study have implications for both practitioners and researchers. By providing practitioners with some insight into the influencing factors on the decision process to introduce mobile-integrated business processes. This framework serves as a basis for the decision about the introduction of mobile IT what is typically a complex situation that has been tried to solve unsystematically up to now. Based on this

framework, practitioners could estimate the project success and, if necessary, try to influence important factors like the support of top management.

From a theoretical viewpoint, this paper contributes to the existing literature in some ways. First, it provides insights about the influencing factors on the intention to introduce mobile IT in the business environment. Moreover, the results show that existing theories like the resource-based view of the firm and the diffusion of innovation theory can be applied to and are suitable for the analysis of mobile-integrated business processes.

Further research is necessary at some points of contact with these findings. Firstly, the resulting consequences deriving from the introduction of mobile-integrated business processes should be evaluated. This enables the development of a complete framework describing influencing factors on and effects of the introduction of mobile IT. Secondly, the theoretical framework should be proved by quantitative research.

### Conclusions

Starting point for our consideration was the fact that understanding the influencing factors is necessary to successfully introduce mobile-integrated business processes. For that purpose a theoretical framework is developed by following the grounded theory methodology. The contribution of this paper is twofold. Firstly, the grounded theory was used to investigate an almost unexplored research field like the one of mobile-integrated business processes. Due to that fact, the grounded theory methodology is the only appropriate approach. Secondly, a general framework for mobile-integrated business processes was developed. This general framework is not bound to any industry or operational area. In further research the framework should be extended with the effects resulting from the introduction of mobile integrated business processes to gain a picture as complete as possible.

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