December 2005

A Case Study on Mobilizing Business Process

Vaida Kadyte
Åbo Akademi University, Turku Centre for Computer Science, IAMSR

18th Bled eConference

eIntegration in Action

Bled, Slovenia, June 6 - 8, 2005

A Case Study on Mobilizing Business Process

Vaida Kadytė

Åbo Akademi University, Turku Centre for Computer Science, IAMSR, Finland
vkadyte@abo.fi

Abstract

Nomadic information environments have a strong potential to convert e-business into mobile business (m-business). A number of research articles have been published in the literature on mobile commerce and wireless technologies, but very limited research has been reported on actual applications of m-business. The inadequate knowledge of managers and inexperience with mobile applications often characterized by third party opinions are among major factors inhibiting m-business development. In this paper we explore the opportunities for utilizing mobile technology in customer care operations, specifically focusing on cross-boundary process improvement. Our argument is that business process redesign and changes in supporting infrastructure are necessary first steps to unsure successful transition of e-business applications that is to be potentially enhanced by the capabilities provided by mobile technology. Our paper contributes to this by presenting results of an exploratory single-case study. We document and explain a new customer care mechanism - mobile web-based system - piloted within fine paper supply chain of the case organization, one of the leading fine paper producers in Europe. Results demonstrate that both customers can benefit from it and that paper producing company will achieve significant performance improvements.

1. Introduction

Organisations today operate in nomadic information environments, as a result of high levels of physical and social *mobility*, technology *convergence* in several areas including IP (Internet Protocol) networks and mobile devices, consequent *large scale* services and infrastructures (Lyytinen and Yoo, 2002). New opportunities and challenges posed by the nomadic information environments are open for yet another business transformation. With the increasing interest in mobile business applications, companies across industries are promised huge productivity benefits, faster business reporting for decision-making,

reduced operational costs and increased customer satisfaction. As business always seeks ways to enhance productivity and profits, mobile technology seems to be the next logical step forward when considering IT investment decisions. Intelligent firms are considering the possible implications of m-commerce to boost productivity across many areas of their business by deploying both internal (M-workforce) and external (M-CRM, M-Supply Chain Management) applications for enterprise systems. However, most predictions about the impact of mobile commerce in business look either uncertain or are over-hyped by consulting bodies and most companies are holding back on investing in mobile technology until it is stable and the benefits are obvious. No organisation should consider implementing mobile applications just because they are becoming widely popular (Paavilainen, 2002). A clear expectation that the technology will be of great importance in the coming years is not enough. The inadequate knowledge of managers who do not have a clear idea of how to use the opportunities presented by mobile technology is one major factor inhibiting mobile business (Lehmann et al., 2004). But what are the core issues involved in developing value-added services in the business domain?

Designing mobile solutions for business customers is a complex undertaking because it requires at least two organisations, including their multiple actors, to balance different working needs. It requires maintaining a balance between a variety of existing corporate standards in industry and the innovativeness offered by modern technology. The ability to successfully implement modern technologies in organisations also needs a continuous upgrade of software and the adoption of new hardware where required skills and knowledge are not easily available (Bendeck, 2001). It is difficult to minimise the uncertainty and manage the risks involved in implementing mobile business solutions because the technology is immature and developing rapidly and the user base is inexperienced. To facilitate an understanding of the potential of mobile technology for industrial use, we share believe that the ability to divert the business value of mobile technologies to the overall performance of the company depends to a large extent on and varies within different industries. What interests us in this paper is improved inter-organisational performance via mobile technology investment in the fine-paper industry. The research reported in this paper was designed to help industrial organisations realise the locked up value of mobile technology in the complaints handling process that clearly lies at the boundaries of different organisations.

After positioning our work with respect to mobile commerce research, we discuss upon the interplay between mobile technologies and business process. This will be followed by an in-depth analysis of the industrial case study, which involved three organisations where actual implementations of mobile technologies were designed and piloted to enhance customer service.

2. Role of Mobile Technologies in Business Domain

Before we present a construct developed and piloted within industrial context, it is important to define several terms and concepts related to the mobile business domain that are often used in an ambiguous way in practice. Mobile applications are the most modern form of IT investment in business practice and also a new discipline in IS research. Many definitions characterizing the business application area of mobile commerce focus on enabling business transaction through wireless devices, confusing mobile commerce and mobile business (e.g. see Müller-Veerse, 1999). Rather than looking for similarities between e-commerce and m-commerce, it is more useful to identify existing differences and avoid a misleading interpretation of definitions. The fact is that m-commerce also has the potential to be transactional, but not necessarily. According to Stafford (2003), a primary distinction between m-commerce and e-commerce lies in the differences between transaction and the facilitation of enhanced information network access. This seems to be

the case with business applications, where most of the m-commerce-related applications are expected to be data-driven. We are already experiencing growth in two major application areas in the m-commerce business domain. One is business-to-business (B2B) applications, which aim to improve the effectiveness and productivity of inter-business interaction between corporations, companies, business units, etc and create new solutions for production processes with mobile technologies (Carlsson et al., 2004). The second is defined by Carlsson et al. as the business-to-employee (B2E) applications area. Here the same effectiveness and productivity-related value propositions can be applied to groups/teams and individuals and mobile technologies can be realised by boosting distance working, simplifying administrative procedures and enhancing the effectiveness of team-work. Consequently, we prefer to adopt a broader definition of mobile business (Ritz and Stender, 2003, pp. 885), which is to be understood as *"the general use of mobile applications by employees at the organisational interface to the customer for providing value added service"*. But what are the core issues involved in developing value-added services in the business domain? In order to understand this it is important to note that an application is a collection of software components that implement business tasks or processes. The value-added of mobile applications depends of course on the particular context of business use. We assume that a particular business environment is the subject of an evaluation regarding the value of mobile business applications. An application is enhanced with a context-dependent content, which inherits its own distinguishing value and brings it into the form of a service. Consequently, we define *mobile service* as a value-added service that is based on a mobile network and consists of a user-specific content and applications that enable access to the content on a mobile device. The common wisdom that mobile applications and services should bring value-adding solutions for the users that really outweigh conventional alternatives has been widely acknowledged but little conceptual elaboration has been done. However two major approaches emerged on how to implement mobile applications for corporate use by offering business value (Paavilainen, 2002).

One way to capture the value of mobile technologies is to look at some of its features, such as customer ownership, ubiquity, reachability, security, convenience, localisation, instant connectivity, personalisation and Web access (Durlacher Research 2002, Chae et al. 2002, Kannan et al. 2001). These things are important when it comes to designing time-sensitive, personalised business applications that enable real-time access to corporate databases. When this approach is utilised, mobile extensions are developed for existing intranet and extranet systems. Efficiency gains refers to 'automation' when existing processes and work configuration transferred to mobile data environment (Barnes, 2004). In many cases, mobile applications and technologies can offer business value in two main areas: operational efficiency, through the ability to distribute information to the workforce remotely; and customer service, through the provision of an additional channel through which interactions can occur, in effect adding to the customer value proposition (Leung and Antypas, 2001).

Another way to exploit mobile technology is to build a custom application. It is often most appropriate approach due to increasingly complicated nature of corporate system and integration required, as well as its suitability to adapt to specific operational requirements and business context. This way, mobile technologies can be used to enhance the efficiency of business processes that include location-sensitive or time-critical activities to reduce transaction costs or improve service quality (Varshney and Vetter, 2002). The interest in business processes soared considerably and its importance was understood within the information technology community in order to improve possible organizational processes. Scherr (1993, 82) defines a business process as "a series of customer-supplier relationships that produces specific results at specific points in time", see also (Laamanen & Tinnilä 1998). Hammer and Champy (1993) define a business

process again as a collection of activities that takes one or more kinds of inputs and creates an output that is of value to the customer. Davenport (1993) defines it to be a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs. Characteristically the processes may pass intra and inter organizational boundaries and the set business processes vary from company to company (Seibt et al.). Zahran (1998) notes that the process is the glue that ties the skills, technology, organizations and management together in order to achieve set business goals and objectives.

An underlying assumption often adopted is that business processes can be improved through the adoption and integration of new technology (Hammer & Champy, 1993). However, we have to admit that the essential lesson has been learned from previous IT investment failures, i.e. that IT plays an essential role in supporting business activities, not vice versa. The role of information systems in performing customer service provided a toolkit for business growth for decades, but not the engine. In particular mobile technology in B2B relationships should be used with caution. An underlying condition for creating an innovative customer service can be only realised successfully if the improved business process and supporting ICTs fit. Usage of the most modern technology may bring both positive and negative impacts on levels of customer service, and this should be evaluated in advance, earlier rather than later, because the future possibilities and complexity offered by the third-generation mobile networks are even greater than those currently suggested by research and developers. The UMTS standard is set to make the convergence of existing data and communication networks possible and will undoubtedly have the potential to increase the speed, richness, interactivity and personalisation of applications and services with a mix of video, audio and text data. Consequently, third-generation services and applications will be more sophisticated, more expensive to develop than existing ones, and should definitely carry appropriate customer/employee interaction, uniqueness and strong business value.

To facilitate an understanding of the potential of mobile technology for business processes, it is worthwhile to consider a Braudel Rule - the key to explaining the Freedom Economy or so-called future of mobile business (Keen and Mackintosh, 2001, pp. 31-56). In other words, the value of mobile technology in business processes lie not in their convenience, simplicity or immediacy within existing routines but in the freedom it creates by following one major rule. An ultimate goal is to create so called *process freedoms* by adding value along the entire supply chain and in related logistics operations and business partner relationships and by making fully mobile as many as possible of the steps, people, information items, and communication needed in order to design an effective business process. As a continuation of this rule, Valiente and Heijden (2002) proposed a method to derive mobile opportunities by taking the existing business process and by gradually increasing the mobility of the participants in the process, and complicating their locations by different degree of its uncertainty (Kristoffersen and Ljungberg 2000). Indeed it appears to be quite obvious that the more mobile the actors are or the higher their location uncertainty is, the less feasible the use of traditional information systems becomes for coordination and decision making. In addition, nomadic information environments are likely to increase complexity of information management in organisations and will require changes in business processes and organisational structures (Lyytinen and Yoo, 2002).

Motivated by the above spectrum of arguments, further in our case study example we adopt the process approach to implementing mobile technologies. As with most applications of technology, we do not believe that mobile technology by itself can contribute to performance. People, systems and processes must work in concert to achieve higher performance levels. The core business processes will perhaps drive the evolution of corporate mobile applications towards achieving the characteristics of

excellence. Therefore, we will try to describe one of them, a complaints-handling process, in our paper along with a mobile system that was piloted in the case organisation.

3. Research Method

The industrial case study contributes to the research into mobile applications in business that has arisen out of the author's work in the Mobile Commerce Research project at the Institute of Advanced Management Systems Research, sponsored by TEKES (National Technology Agency of Finland) for about two years. It involved the third largest company manufacturing fine paper in Europe, one of its key customers - the largest printing firm in Finland -, and its business partner organisation - one of the largest paper merchants in Europe. The findings reported here were obtained from an in-depth case study that was the by-product of a research and development process where a team of four people at a research organisation participated in the pilot project of the target organisation as consultant body. For this purpose we have focused on developing mobile solutions for enhancing complaint handling process and used constructive research methods as a part of exploratory research strategy. We chose to conduct the single-case study "which focuses on understanding the dynamics presented within a single setting" (Eisenhardart, 1989). The single-case study method is also considered as being a potentially rich and valuable source of data, suited to exploring relationships between variables in their given context and allowing organisational changes to be studied close up (Benbasat et al., 1987) especially if it represents a critical case (Yin 1994). The fine-paper business was selected as a vertical market for mobile business applications for several reasons. First, it is considered one of the most complex and strong industrial clusters in Finland and currently faces economic recession. The fine-paper production industry has its own distinctive features, e.g. a multitude of actors involved in the value chain, enduring business relationships, complex business influenced by globalisation, and fierce competition within the industry and from other emerging e-industries. Second, while in most cases ICT is seen as a substitute for paper, it also offers enhanced prospects for the paper industry (Kuuluvainen, 2002). The subject of the case was chosen as it represents a critical case in relation to improving cross-boundary organizational process through exploitation of mobile technology.

The research strategy incorporated the constructive paradigm and followed three steps, starting with an analysis of the state of the art, followed by creation of the concept, and ending in evaluation. First, the background information, including both theoretical and practical information, was analyzed. Literature review and case study design methods were used to analyze the total extent of the problem. The current state of the compliant management technology was studied during the literature review process by going through research areas with potential relevancy to service recovery. The case study design was used to elicit information, identify and illustrate possible problems of compliant management practices within chosen context. Remenyi (1998) argues that a particularly strong tactic in ensuring the validity of research is to use multiple sources of evidence when conducting a single-case study as this helps ensure validity. Furthermore, the use of multiple data sources (interviews, documents, questionnaires) in our study provided more convincing and accurate evidence on findings from industrial research. In our data collection efforts, we used F-to-F interviews and documentary materials as the primary source of data. We conducted semi-structured interviews privately with each of the 10 focus group members from the paper-manufacturing company, customer printing houses and wholesaler. Semi-structured interviews have advantage in case study research by allowing researchers to clarify questions and responses to explore new dimensions and enhance the overall quality of the data gathered. Documentation was utilised to supplement and verify data collected from other sources (Yin 1994). The official

documents we received (a standard flow diagram and summaries of complaints handled in the year 2003) gave us a picture of how the complaints had been handled by the paper-manufacturing company. As an independent external facilitator of the process, the author of this study conducted a series of expert surveys to enable customers, service technicians and management at the mill to provide data for defining problems and opportunity situations regarding customer service. Responses were obtained from 16 experts. The data-collecting process, covering the stages of feasibility and development through to preliminary experiment, took one and a half years. During the feasibility study, which included eliciting customer requirements, a strategic decision was made to focus on enhancing customer care solutions as handling complaints proved to be the most critical business process. Based on the knowledge obtained from the problem analysis, the complaint handling process was improved and concept to design a system that would produce a potential solution to a specific problem. The ultimate goal of the project was to design a mobile system prototype that would provide access to customer care services via mobile devices at the point of need and would also benefit B2B relationships in the value chain for fine paper. From the beginning of the project in March 2003 until the final prototype was delivered in June 2004, potential users from all three companies were constantly involved in the process of interface design, functionality testing and influenced its major features during monthly project meetings and workshops. The accuracy of all data was verified through document exchange and quarterly meetings involving project stakeholders. Lastly, a construct with fully developed architecture was piloted in the field experiment to evaluate and demonstrate the results. 11 target users form the three organisations participated in the field experiment took part in Finland throughout December 1-31, 2004. Afterwards in-depth interviews have been conducted with 6 smartphone application users who participated in the experiment. The rest of the participants used PC and laptop based application. A system acceptance questionnaire was also constructed and placed on-line to collect experiences form all the participants.

4. Findings of the Case Study

4.1 Background and Need for Change

The industry in which the case organisation operates, paper-making, is a very mature one, where a long-term relationship with business customers is of particular importance. For many years the vision of the case company was, and still is, to be a customer-oriented and innovative paper company. Nonetheless, it has grown despite having substantially fewer resources than competitors. The case organisation has been able to compete successfully by concentrating its limited resources on developing its core businesses in fine paper and paperboard production, and became the third largest European producer in the business area. It was evident by 2002 when the research project was initiated the fine-paper industry in Europe was not achieving its desired level of performance and was unlikely to achieve its stated aim of increasing profits by two more years. The companies recognized that the demand for fine-paper products by both resellers (wholesalers, retailers) and end-users was very sluggish and forecast that growth in paper prices was unlikely to be realised because of the ongoing economic downturn. The fine-paper branch of the pulp and paper industry produces a multitude of paper-based products. It is a complex industry and depends on good customer relations with a great variety of players, ranging from paper mills and printers to retailers and consumers. A successful commercial publication is the sum of many different elements: content, layout, illustrations, font and, often very crucially, paper and print quality. Despite the complexity, there are certain key guides to how to become more successful on the market. In the supply chain you need your

customers' business. Today we talk about an economic downturn, which also affects the paper industry. Historically, however, as soon as markets moved out of recession, the quest to build more solid business relationships always generated interest in customer service. There is a much talk in the industry about focusing on customer service in manufacturing settings, but surprisingly few companies have visualised where to start and how to accomplish this. Our case is no exception, and critical incidents are often overlooked. Maintaining the best customer relationships requires effective management of critical incidents. That a customer has a complaint does not have to mean lost revenue for a business. By taking prompt and constructive action, businesses can turn dissatisfaction into customer loyalty and generate new income in the long run (Hoffman 1995). Critical incidents related to fine-paper products consist of feedback and claims, which together are referred to as complaints. A call centre cannot provide the answer since resolving the conflict requires group decision-making and follows complex check-up procedures on the part of the technical customer service working at the mill and of the personnel maintaining the printing machines at the customer site. Besides being a complex activity that requires group decision-making, coordination and information sharing, the handling of complaints related to fine-paper products is also a seasonal activity that puts additional pressure from time to time on both customers and technical service personell. Another factor is related to the timeliness of the product to the end-user, as commercial prints and reports with 'old news' do not sell to the consumer. Smooth running, high quality and trouble-free production become even more crucial as increasingly complex products are printed at higher speeds on wider machines.

By applying the most modern form of ICT, the paper-producing industry can probably cope with the challenges posed by the network economy. Despite being considered a very conservative industry, paper companies have begun to look for state-of-the-art solutions in customer care and more attractive ways of resolving conflicts. For major processes in the supply chain, such as handling complaints, the cooperation takes place mainly through complex communication and understanding. This suggests that an interactive medium that enables instant information delivery, easy access to that information flow and sharing among participants should be considered an appropriate communication artefact for resolving industrial complaints.

4.2 Existing Complaints Handling in the Case Company

To analyze the total extent of the problem in current service recovery practises the existing complaints handling process was first mapped in careful detail. It is useful to present the 'as-is' process, and then suggest the new 'to-be' process. We received a standard description of how the complaints are currently handled by the case company. The information was collected from employees of the case company by means of an expert survey and was used to represent the current procedure for handling complaints on an *'as-is'* basis. Modeling has become a useful method for describing specific aspects of business process analysis, especially for studying cross-departmental and cross-organisational processes (Steneskog et al, 1996). The complaints handling process clearly lies at the boundaries of different organisations. Using some standard modelling principles we can illustrate the complaints/claims process in a more standardised way so that the working activities, actors, input and output objects will be visible. For this purpose we employed P-Graphs method that describes business processes in a semi-formal way. It was developed by Steneskog et al (1996) and has been successfully used in similar research projects (Seibt et al. 1997; Heijden & Valiente, 2002). After the complaints/claims process is structured into the work activities of the different actors and objects (information) within a certain time and at a certain place, we used the real values for how complaints with business customers were handled. Adding location, time and

information dimensions made it possible to model the working activities and observe certain problematic spots in the process by changing their parameters.

There are 8 actors allocated at each mill and all of them at some point are actively involved in handling complaints (refer to Figure 1). The main process actors are key customers (purchasers, at the printing and reseller organisations) and employees from the paper producing company (further abbreviated as PP): technical customer service engineer (TSC), technical customer service manager (TSM), sales assistant for issuing credit (SAA), customer services manager (CSM), logistics manager (LM), production and operations managers (OPM, PRM), mill management (MM), sales office representatives.

Each paper-producing mill of the case company, customer and reseller rely on a different and proprietary database to store incoming complaints and most of the employee work at the customer service is done manually. Neither of the proprietary complaints systems have a web interface which could work from any place and at any time. In view of the typically hectic scenario of business, process actors usually work mobile in geographically dispersed locations, and are at the same time preoccupied with different, i.e. their own particular, activities during a working day. Moreover, if process actors can choose to use a different communication medium that is not integrated, the information may be scattered in different places and the data dispersed in different formats.

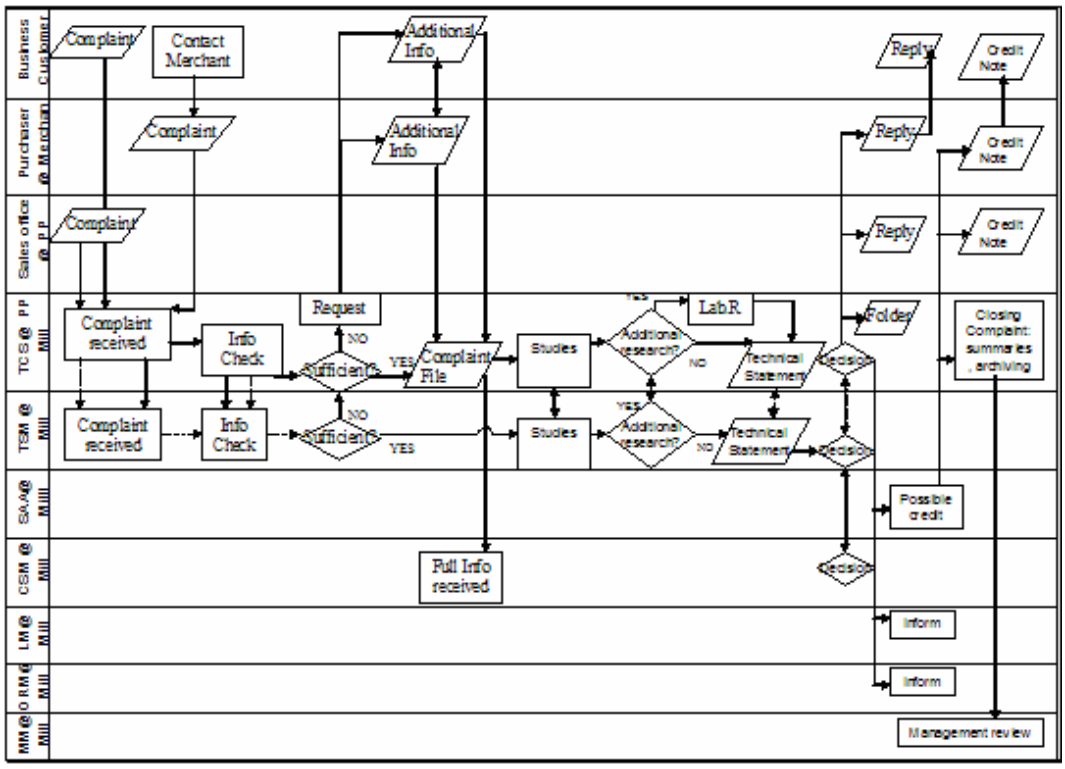

Figure 1: Existing complaints handling process at the case company. Explanations of the flow chart: the vertical axis indicates the static location of the actors, the horizontal axis time; rectangles = complaints process activities, rhombs = input and output information; double arrows mean the activity is coordinated between actors, dashed line = partial involvement, not always required.

The existing complaints handling process suffers from coordination difficulties when the process actors are working remotely. These people are located at different offices across

the continent and use various technological artifacts to communicate. But not all the actors have the same intensity and scope of mobility. Technical managers at the paper-producing company are key decision-makers in solving complaint-related problems, but they are highly mobile and work at least twice a week away from desktop computers. Engineers, on the other hand, are involved in routine work on the mill premises, which is characterized as micro mobility. These people are most often overloaded with customer's questions, are heavily involved in the communication process and need a good visual interface when describing laboratory results to the customers. Effective customer response should be immediate. No matter how mobile and where the customers are, they expect to have problem solutions on-line (PC and/or mobile device) and in real time. Wireless has value for managers on the move, whereas high-resolution desktop computers are mandatory for engineers.

Systems that are currently in use such as electronic mail or mobile phone calls may have several advantages; they are likely to be a burden in the complex group work activity of handling complaints. The above systems are very intrusive by their very nature, especially in communication-intensive environments when people have to work under the pressure of time. E-mail is an asynchronous medium, but imposes information overload with risk of being unable to keep track of how the handling of the complaint is progressing. Another problem is related to telephone calls. While it is an extremely flexible medium, producing lots of unstructured and codified information, it also requires the user to do a lot of work by manually retransmitting that semi-structured information to the relevant team member. Knowledge workers in the paper-manufacturing company spent 15-30% of their day searching for information and lose about 6 working hours altogether per complaint because of interruptions to their work. People often became frustrated because they were unable to get to things via a single access point, as necessary information was often spread across different actors and communicated via multiple devices. Electronic media may lead to new patterns of communication, encouraging people to collaborate at the point of need with certain team members, perceiving each other's actions instantly but asynchronously.

Variety in the communication medium used makes the information flow process slow and inefficient (knowledge workers spend a lot of time on requesting and providing information manually, a lot of copy/paste work is involved). The system fails to integrate and structure the incoming information from the customers and leaves it optional for the customers to enter. This also makes it more difficult to perform statistical analysis of annual complaints and identify the various problems associated with it.

The process is time-consuming and expensive, as it usually takes 7 days to process a standard customer complaint. Initial complaint information is often insufficient and it takes too long to both ask for and receive the additional information necessary to start handling the complaint. Business partners do not share any joint knowledge base to find out what other technicians have done with the same problem in the past, neither internally nor across organisations. To put it bluntly, the existing complaints handing process suffers from major disadvantages as working space, working time and information become fragmented. Thus the only way that remains to get results by the end of the day is to manually resend or request the process-related information and data. However, the outlook for companies may seem very gloomy since both the speed of business activities and the amount of information flow will only increase in the future. The existing compliant handling process clearly calls for improvement and redesign.

4.3 Key Elements for Designing New Customer Service

In the era of the mobile Internet, solving a certain complaint or paying off claims becomes a matter of minutes. But is it enough to rely upon a stand-alone mobile communications medium when resolving customer complaints? It is not likely that the adoption of mobile communication devices will automatically induce order and discipline within groups. But both task demands and individual differences may affect the way groups use the media available to them. In order to solve the existing problems, first of all operational changes are needed as tools for Business Process Redesign (BPR), followed by necessary changes in supporting IS infrastructure, to which mobile solutions can be added as enabling technology.

The 'to-be' process has been innovated from the customer's perspective, as is suggested in the classical theories of BPR. As a rule of thumb, the complaints handling system should be structured from the customer's perspective and must operate simply, effectively and quickly. There are two important pillars of BPR in our case. The first concerns removing or reducing activities that do not add value and ensuring the efficiency and effectiveness of those that do. Here we applied "object-oriented" modelling techniques discussed by Crowston et al. (1987), where information flow can be streamlined by new technologies to provide necessary coordination among group members. Customer service can indeed be reinforced by the mobile use of Web technology if users organise their activities in a collaborative manner with dynamic membership. Collaborative customer service implies that communication of critical information and instant interactions are established at the point of the critical incident, where people from different organisations are working on critical incidents through dynamically established collaborative groups.

The second is based on Meyer's (2001) idea that, to improve process performance even further, the company should add value to the customer's experience if it cannot reduce the value-added time any more. The principal value for the customer will be a visibility of the handling process, which is critical to them - the ability to track the complaint in real time and to have control over the process from the moment the complaint was instigated.

Following are some of the IS infrastructure changes required to support the new complaint handling solution. They also serve as underlying conditions for new service mechanism are highly interdependent and, last but not the least, they rest on the efficient process that is usually achieved through traditional methods of business process reengineering.

To extend the positive effects of process visibility across several organisational borders, a paper producing company needs operational transparency with it suppliers, customers, and partners to be able to work with their diverse systems and to understand what information is being passed from one task in a process to another. In other words, information transparency requires that companies harmonise their processes with others by making them increasingly open (disclosing detailed information across company lines) and accessible. It also means that shared infrastructure should be in place to execute open processes with others in the industry.

The case company is an active member of Papinet Standard, and sooner or later the industry will operate according to a common global standard for transactional exchanges. The global standard for handling complaints has already been created to establish common language and common codes for information flows and exchanges within fine paper value chain.

The commonly shared and real-time complaints system aims to establish a higher degree of integration within the existing value chain. This approach takes into account enterprise resource planning (ERP) technology as it has been widely implemented in today's organisations. The next goal for the company is to build an SAP-based system for

planning its resources and incorporate the standard. Both the case company and its customers will have newly designed web-based interfaces over the intranet, making the process of handling complaints increasingly open and accessible.

This also means that all information exchanged during a process has to be provided at the right level of data; this is termed data granularity. Any modernised complaint system would be useless if it failed to structure incoming information from the customers and leaves it optional for the customers to complete relevant data fields. This has been taken into consideration by creating a common digital template with obligatory data fields and error-proved testing.

Synchronisation issues are critical when using mobile Internet applications in 'offline' scenarios (Kalakota and Robinson, 2001) where the user is not continuously connected to the Internet but only when needed. E.g.: service technicians might be bale to work on some critical cases during the flight by updating information locally on the terminal. Right after the communication is established again, the locally stored information must be synchronised against server of the system. In general, it permits all the process activities to be executed at the appropriate time by providing up-to-date information.

Application of mobile technologies has a potential to strengthen new service mechanism. In our case, mobile technology serves as an alternative access platform to a web-based system regardless of time and location. This means that any user of information has to be sure that access to the information is dependable and that it is available when it is expected to be available. Customer and business partners will be able to access time critical information in back-end systems using both fixed and mobile internet.

4.4 Web-based System with Mobile Access

Let us describe the architecture of the proposed complaints handling system with mobile functionality (see Figure 2). A web-based system is primarily built for a PC and GPRS-enabled smart phone, but is written with generic code and will in fact work on all html\xhtml-supporting terminals.

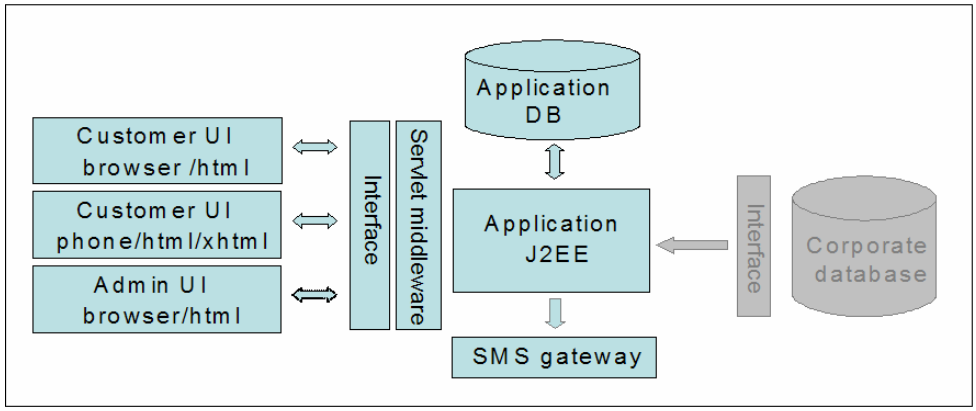

Figure 2: Architecture of the proposed system

Customer/Admin UI. The customer/administrator uses a web browser on a computer or a phone to access our system. The browser of a mobile device does not have to support xhtml, but it must support html. It means that we use html (html4-strict) instead of xhtml

both for the PC and the phones. Since xhtml is easier to implement than html, it is usually the case that a smart phone browser that supports html also supports xhtml.

Servlet/interface. The interface between the browser and our system is based on servlet middleware or Java servlets and uses a template system, named "Velocity", to create the actual interface.

J2EE. The servlets use an abstraction layer that we have created and named "Knowledge Base", which accesses the J2EE-based core of the system. This is the application core, which is where all business logic is handled. The custom made applications are usually developed using Java because of its platform independence and modular structure (Paavilainen, 2002). The software transfers information requests and reposes between back-up system and the terminal.

Application database. The application core stores all data in a database, including personal profile information. All access to the database goes through an abstraction layer, which makes it possible to change the database to another brand without having to recompile the application.

The web-based complaints handling system can be accessed via a mobile device and the Internet accompanies its user everywhere, regardless of the type of device used. The system can work on any html\xhtml-supporting mobile device, but the Nokia 6600 was chosen for its reliability, faster navigation and cost efficiency compared with alternative smart phones. In a final product the web-interface and mobility feature should be integrated on top of the existing corporate ERP system. "Application database" integration with the "Corporate database" is done by modifying various fields in the deployment descriptor text file according to the J2EE and JBoss deployment specifications. If case a higher degree of integration is needed, "Application/J2EE" should be additionally supported and carry appropriate interface to be connected to other parts of the corporate IS infrastructure.

4.5 Enhanced Business Process

The main users of the new system will be key customers (foreman in the printing plant, sales representatives for manufacturing and merchant organisations, and purchasers at the printing and merchant organisations); the case company's employees involved in the complaints process at the mills, as well as senior management form respective organisations. The initiator of the enhanced business process is a foreman working at the customer printing facilities who encounters a problem that has already occurred in the past so he/she knows what information will be needed by the case company's technical staff. This would also be the fastest way to handle and solve complaints.

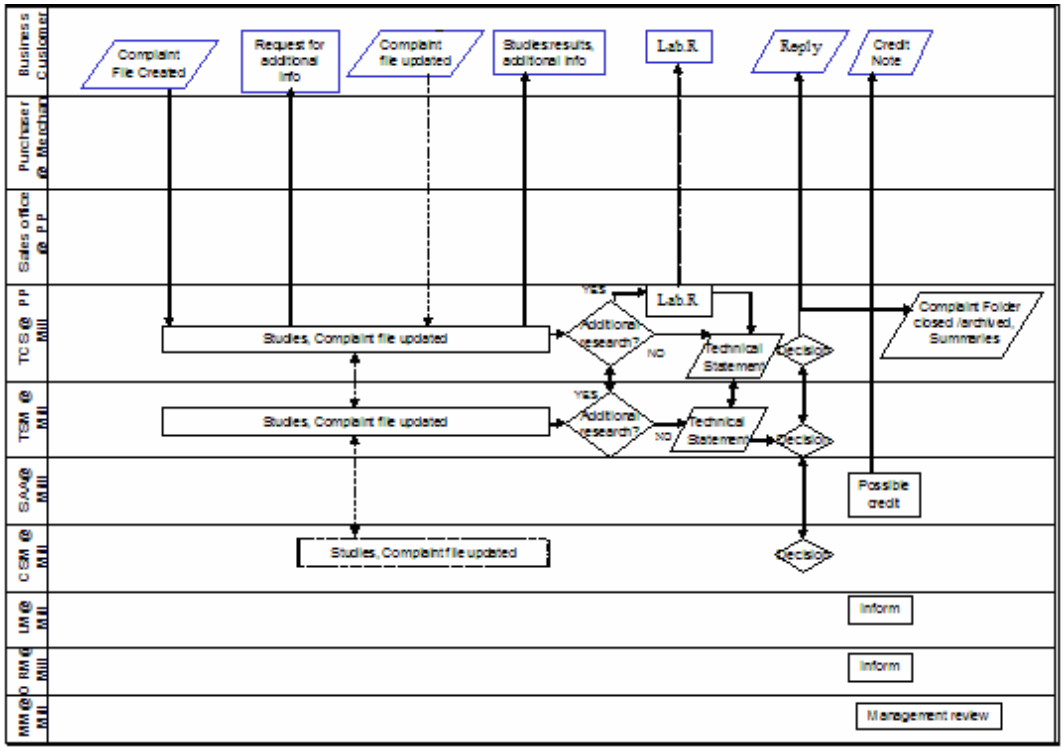

Figure 3: Suggested new process for handling complaints at the case company.

There are two *usage scenarios* for the modernized complaint system. In the best-scenario case, we have a direct link between a customer who files the complaint and the TCS (manager & engineer) at the mill. The second scenario is more applicable abroad only if language constraints do not allow the customer to send a complaint directly to the mill. In this case a sales office should register the complaint on the web during a phone call or face-to-face meeting with the customer. *A password* will be required to log into the web-based system, so paper-mill employees working with complaints will know who the customer is. *A self-documenting and self-reporting* complaint file might include auto alerts in the form of an SMS or e-mail for actors performing at the end of the process, e.g. operations and productions managers, logistics managers, etc. At the end of the complaints handling process, the *auto summary* of the complaint file will generate a Excel file, and will allow the use of the well-structured information for various statistical analyses (beyond the current way of monitoring the success rate of complaint reply and closing time).

We believe a smart phone serves merely as an additional tool and is not a replacement for a PC. It is meant to be used for information tracking, other checkups and decisions when a user cannot access the PC. Having the smart phone on hand, a user would simply be able to use the system when a PC is not an option. A PC/Laptop is also supposed to be the primary tool for customers filing complaints. However, they will also have the choice of making the best use of smart phones when checking the status of very urgent complaints, or updating some critical information.

The main features of the proposed complaints handling system are traceability and structured information. Traceability will allow the user of the application to track the progress of complaints handling activities in real time. Users will be bale to access and update the complaint file – a self-documenting and self-reporting common most important document within a system – via a PC or any other mobile device. When

somebody is working on something with the complaint, the customer as well as other colleagues can see it.

Another important advantage of the web-based system is to have very structured initial information coming from customers. This also makes them think about the reasons before claiming and include additional info at the very beginning. A customer in an ideal case will create a complaint file at the very beginning of problem recognition, and should provide as much information as possible about the problem. The user will have the option of choosing a complaint type and filling in the required information fields, according to the reason for the complaint. The system incorporates instantaneity and supports automatic notification; thus participants perceive each other's actions with no perceptible delay. Each group member is instantly notified by the system when a certain activity is finished or new questions arise. Depending on the work mobility, user may select whether he or she wants to receive e-mail notification or an SMS.

The principal value for the customer will be visible customer service, providing real-time information about their complaint status throughout its investigation process. Initially, we proposed that even if it is no longer possible to reduce the lead-time for the complaints handling process, its visibility will result in increased customer satisfaction. Providing more visibility will have a potential to increase the customer's trust and may result in a better business relationship.

By comparing survey results before and after the field experiment when complaint handling was piloted, we observed increase in customer satisfaction with the new service by 20 %. In the old process, there were up to 15 possible steps in administrating a complaint, depending on its nature and complexity. In contrast, the maximum possible steps have been reduced to 7 in the reengineered process. Other positive indicators include the average response time for issuing official decision in standard complaint cases, falling from 5 working days (38,65 hours) to 6 working hours.

With gathered evidence from our field experiments, we are quite confident that the changes traced in customer care will be a necessity for several reasons. First, it saves costs. By using real-time information sharing, it is possible to reduce the timing of complex problem-solution cycles and eliminate inconsistent communication. Better transparency of the initial data also reduces the risk to pay-off maliciously created claims. Second, the idea of knowledge mobilization is realized by providing a visibility of complaint status and access to real time customer information for different corporate bodies (technical service teams, sales representatives, senior management). Third, a transparent and easy way of reporting the problems at the point when they occur, professional knowledge sharing and its mobilization in between the cross-borders of customer and producer enhances trust and eventually builds up closer ties between these organisations.

5. Conclusions

This paper explored the role and possibilities of mobile technologies to improve complaint management process within the fine-paper supply chain. In order to convince customers to stay with the company for a long time, it is absolutely essential that the customers experience a positive level of service, in the form of the latest technology and effective solution, which excels over that of any other paper supplier. The paper product manufacturers must consider carefully new trends in the behaviour of customers who increasingly operate in nomadic environments, and look for innovativeness and value-adding features in the customer service operations. Fortunately we have realised that mobile technology in itself is not exciting in business process, but only its use to increase the quality of service makes it valuable. The mobile Internet enables the transmission and

use of time-sensitive information whose value is part of its instant delivery in handling complaints. We do not underestimate the value of mobile technology, but emphasise that true business benefits will be achieved only if the mobile applications are implemented within new business logic and sound technical infrastructure. In addition to business process improvement there should be a technical business infrastructure that can serve as a basis for state-of-the-art technologies to facilitate the movement of data, simplify communication and improve the possibilities for business process participants to collaborate. In our case, the introduction of an innovative mobile service for business customers rests on business process redesign supported by standardisation, integration, transparency, data granularity, information accessibility and synchronisation. Operational changes in business process, first of all, require changes to be made in corporate information systems and, last but not the least, the rapid development in the mobile technology area provides new possibilities for enhancing customer service further.

References

Barnes, S.J. (2004). Wireless support for mobile distributed work: a taxonomy and examples. In the Proc. of the 37th Annual Hawaii International Conference on System Sciences. IEEE Computer Society.

Benbasat, I., and Goldstein, D.K., Mead, M. (1987). The Case Research Strategy in Studies of Information Systems. MIS Quarterly, 11(3), 369-386.

Bendeck, F., and Kötting, B., Schaaf, M., Maurer, F., Valenti, M., Robert M. (2001). Engineering of e-Business Applications & Infrastructure and Applications for the Mobile Internet. Proc. of the 10th International Workshops on Enabling Technologies. IEEE Computer Society.

Carlsson,C., & Walden, P., Veijalainen, J. (2004). Mobile Commerce: Core Business Technology and Intelligent Support: Minitrack Introduction. In the Proc. of the 37th Annual Hawaii International Conference on System Sciences. IEEE Computer Society.

Chae M. and Kim, J., Kim H., Ryu H. (2002). Information Quality for Mobile Internet Services: a Theoretical Model with Empirical Validation. Electronic Markets, 12 (1), 38-46.

Crowston, K. and Malone, T. W., Lin, F. (1987). Cognitive science and organizational design: A case study of computer conferencing. Human Computer Interaction, 3, 59-85.

Davenport, T.(1993). Process Innovation. Boston, Harvard Business School Press.

Hammer, M., and Champy, J. (1993). Reengineering the Corporation: A manifesto for business Revolution. New York: Harper Business.

Heijden, H. v/d and Valiente, P. (2002). The value of mobility for business process performance: Evidence from Sweden and the Netherlands, Proceedings of the European Conference on Information Systems, Gdansk, Poland.

Hoffman K.D., Kelley S.W. and Rotalsky H.M. (1995), "Tracking service failures and employee recovery efforts", Jour*nal of Services Marketing*, Vol 9, No 2, 49-61.

Kalakota, R. and M.Robinson (2001). M-Business: The Race to Mobility. McGraw-Hill, New York, USA.

Keen P. and R. Mackintosh (2001). The freedom economy: Gaining the M-commerce edge in the era of the Wireless Internet, Osborne/Mcgraw-Hill, Berkeley; CA, USA.

Kristoffersen, S. and F. Ljungberg (2000). Mobility: from stationary to mobile work. In K. Braa, C. Sorensen & B. Dahlbom (ed.): Planet Internet, Lund, Sweden, Studentlitteratur.

Kuuluvainen, J. (2002). Business cycles, Information Technology and Globalisation in the Forest Sector. Final report on Finnish Forest Cluster research Programme: Wood Wisdom.

Laamanen, K. & Tinnilä, M. (1998). Terms and concepts in business process management. Helsinki, Federation of Finnish Metal, Engineering and Electrotechnical Industries: 55.

Lehmann, H., & Kuhn, J., Lehner, F. (2004). The Future of Mobile Technology: Findings from a European Delphi Study. In the Proc. of the 37th Annual Hawaii International Conference on System Sciences. IEEE Computer Society.

Leung, K. and Antypas, J. (2001). Improving returns on m-commerce investments. Journal of Business Strategy, September/October 2001:12-13.

Meyer C. (2001). While Customers Wait, Add Value. *Harvard Business Review*, Vol 79, No 7, p.24.

Müller-Veerse, F. (1999). Mobile Commerce Report. Durlacher Research Limited, London.Corp.

Paavilainen, J. (2002). Mobile Business Strategies: Understanding the Technologies and Opportunities. Great Britain: Addison-Wesley, IT Press.

Remenyi, D. (1998). Doing Research in Business and Management: an Introduction to Process and Method. London: Sage.

Ritz, T. & Stender, M. (2003). B2B Mobile Business Processes: Scenarios and Technologies. Proc. of the 14th International Workshop on Database and Expert Systems Applications, IEEE Computer Society, 885-889.

Scherr, A. (1993). A new approach to business processes. IBM Systems Journal 32(1): 80–98.

Seibt et al (1997). *CEBUSNET Consolidation Framework*. Lehrstuhl für Wirtschaftsinformatik insbesondere Informationsmanagement Universität zu Köln.

Stafford, T.F., & Gillenson, M. L. (2003). Mobile Commerce: What It Is and What It Could Be. Communications of the ACM, 46 (12), 33-34.

Steneskog, G., Mårtensson A. and van der Heijden, H. (1996). *Modelling Business Processes: The Pgraph Notation,* Management report series No. 279, Faculteit Bedrijfskunde, Erasmus Universiteit, The Netherlands.

Valiente P. and Heijden, H. v/d (2002). A method to identify opportunities for mobile business process processes, SSE/EFI Working Paper Series in Busines Administration 2002-10, Stockholm School of Economics.

Varshney, U., and Vetter, R. (2002). Mobile commerce: Framework, applications and networking support. Journal on Mobile Networks and Applications, Kluwer, Vol. 7, No. 3, pp. 185-198.

Yin, R.K. (1994). Case Study Research, Design and Methods, Sage Publications, Newbury Park.

Zahran S (1998) Software Process Improvement, Practical Guidelines for Business Success. Harlow, Addison-Wesley.