A METHOD TO IDENTIFY OPPORTUNITIES FOR MOBILE BUSINESS PROCESSES

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ABSTRACT

In this paper we explore the opportunities for exploiting mobile technology in business processes. The paper addresses this research question by exploring the issues both conceptually and empirically. Our main aim in this paper is to develop an opportunity discovery framework to assess to what extent mobility could improve the performance of a business process.

We propose a method to systematically derive opportunities by taking the existing business process and by gradually increasing the mobility of the participants in the process (and thus complicating their locations). The more mobile the actors are, the higher the geographical barriers, and the less feasible the use of traditional information systems becomes. We present two case studies of existing mobile business processes, and we show how the mobile information systems that were used in these business processes can be identified through our method.

INTRODUCTION

Two important novel technology success stories over the last decade have been the Internet and the mobile phone. Development and spread of these technologies have been rapid, and this development has over time resulted in substantial and sometimes unforeseen changes in consumer behaviour. Lately, interest has grown in applying mobile technology not only in consumer markets but also in business settings (Heijden and Valiente 2002; Smith, Kulatilaka et al. 2002). Because of this, the relationships between mobile technology usage and business performance improvement have become issues of practical and theoretical concern.

Companies with an interest in selling mobile technology provide numerous success stories on how their products could result in business benefits. While these stories are useful in many ways, they also tend to distort our understanding of the relationships between mobile technology and actual performance improvement. Most of them are vendor and product-biased. How organizations can more generally adopt and deploy these technologies to create business value remains an issue which has seen little rigorous study.

In this paper we explore the opportunities for using mobile technology in business processes. We take the position that the benefits of mobile technology are hard to quantify in isolation, and that the unit of analysis to identify value should be the *business process*. Thus, our main aim in this paper is to develop an opportunity discovery framework in order to assess to what extent mobility could add value to a business process. Our paper addresses this research question by exploring the issues both conceptually and empirically.

Usefulness of opportunity frameworks can be questioned from a theoretical perspective. However both instrumental and practical frameworks developed in the past have aided the process of analytical discovery of ideas within the field of information systems such as the computability profile of McCosh et al (McCosh, Rahman et al. 1981), the opportunity matrix for the exploitation of telecommunications-based IS (Runge and Earl 1988). Our framework fits into what has been called *technology-fitting frameworks,* i.e. frameworks that try to match the attributes of specific technologies to problems or opportunities (Earl 1989).

The paper is structured as follows. First, we discuss the research to date on mobile technology, in a search to identify what it is that makes mobile technology useful in a business setting. We then seek to link these findings to mobile business processes. This eventually results in a stepwise methodology with which mobile business process opportunities can be identified. We present two cases to illustrate our methodology in section four. We also expand our study design in this section. Finally, we discuss the limitations of our study and suggest directions for further research.

MOBILE INFORMATION SYSTEMS: SOME BACKGROUND

Mobile information systems can be defined as information technology integrated into an organization that employs wireless devices to make ubiquitous computing available to their users. Typically, those devices are mobile phones, but personal digital assistants or other types of terminals equipped with a mobile connection could also serve this purpose.

Research on mobile technology in an information systems (IS) setting has been very limited, and has only lately appeared in major IS journals and conferences. A number of recent publications about mobile technology focus specifically on application development (e.g. (Varshney and Vetter 2001)), marketing strategies, (Kannan, Chang et al. 2001) and mobile consumer behaviour (Anckar and D'Incau 2002). These papers reflect the increasing interest of IS academics in mobile technology, but they do not specifically deal with the use of mobile technology in business environments.

A few authors have focused on the *mobility* of the users, and how mobile technology can improve this mobility. Specifically, Kristoffersen et al. distinguish between three different types of mobility modalities, namely *travelling*, *wandering* and *visiting* (Kristoffersen and Ljungberg 2000). For example, there are different types of mobility in performing music. Both a marching band and a street musician require mobility to perform. Yet the former plays while moving (*travelling/wandering)* whereas the latter plays at different locations (*visiting*). Depending on the required mobility, different technologies will support activities in different ways. Here, the *actor mobility* is in focus when studying the different modalities offered by technology.

In order to identify opportunities for mobile information systems in business processes, we need to identify the key advantage of using mobile technology as opposed to traditional, fixed technology. The removal of geographical constraints has been identified as an important part of mobility (Abowd, Atkeson et al. 1997). Location theory emphasizes geography as a factor for location decisions and has been used fruitfully to describe the role of location-based mobile services (Mennecke and Strader 2001). *Location uncertainty* becomes, thus, also relevant to analyse when studying mobile information systems. In line with these arguments, we propose that the main advantage to use mobile technology is that *decision making, coordination and control can take place in the presence of geographical constraints*. So, while a traditional information system is "a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making, coordination, and control in an organisation" (Laudon and Laudon 2002), a *mobile* information system supports decision making, coordination and control where geographical barriers would have previously prevented this. Thus, identifying mobile opportunities will require us to examine decision-making, coordination and control within the business process, and we will have to do so by examining the geographical circumstances under which decision making and coordination take place.

MOBILE BUSINESS PROCESSES

The concept of business process has been used in a large number of contexts and for far different purposes. Several authors have developed definitions of business processes (Davenport and Short 1990; Davenport 1993; Hammer and Champy 1993). We adopt the well-known definition of Davenport (Davenport 1993) that a business process is a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs. Business processes have different degrees of complexity, and typically cross-departmental boundaries and even organisations (Fiedler, Grover et al. 1995).

This section outlines a five-step method to study the opportunities for mobile technology in a given business process. The business process may already use mobile technology: if this is the case, our method will recognise this and demonstrate why it is used. If the business process does not make use of mobile technology, our method will identify opportunities for doing so.

The five steps are: 1) Model existing business process using a standard P-graph, 2) Add and classify locations, 3) Highlight decision making, control and coordination patterns, 4) Complicate the locations (this step will uncover all mobile opportunities) and 5) Evaluate the mobile opportunities (this step will zoom in on the attractiveness of implementing the mobile information system). Each step will now be discussed in more detail.

Step 1 • Model existing business process using standard P-graph

Modelling has become a useful method for business process analysis, especially for studying cross-departmental and cross-organisational processes. There are a large number of techniques to describe different aspects of business processes. These techniques have been borrowed from related areas such as IS implementation, manufacturing field, architecture and engineering activities, etc.

P-Graphs, developed by G. Steneskog at the Stockholm School of Economics in Sweden, is one of these methods that illustrate business processes in a standardised way. They have been used successfully in EU projects highlighting the implementation of information systems for business process redesign (e.g. the Cebusnet project, (Seibt 1997)). P-graphs are suitable for our purposes because they allow us to pay specific attention to decision-making, control and coordination of the business process.

Figure 1 displays a sample P-Graph model: it contains actors (participants in the business process), activities, input and output objects, and their relationship over time. The activities of the actors are grouped into *actor lanes*.

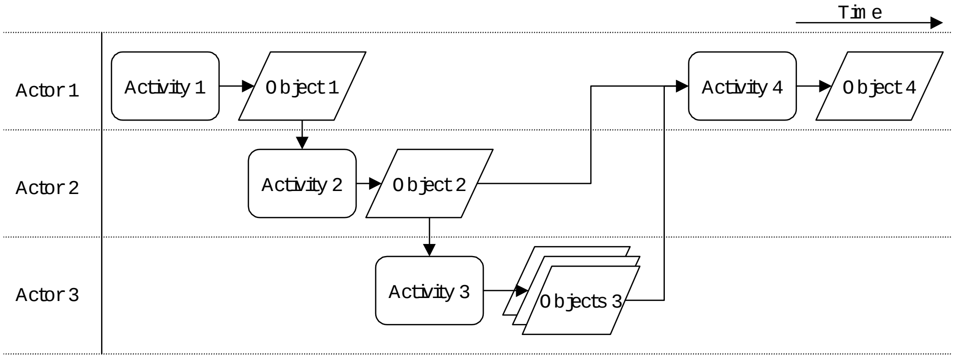

Figure 1 Model the business process using a standard P-Graph

Step 2 • Add and classify locations

The next step in the identification process is to add the locations of the actors. This is done by labelling the location at the left-hand side of the P-graph, as shown in Figure 2. At this point, we divert from the standard P-graph modelling method. P-graphs are, like all models, abstractions from reality. The reason that locations were not included in the original version of the P-graphs is that location is not relevant for most purposes of business process modelling. However, it is highly relevant for the study of mobile opportunities. Therefore, the locations are now included. We have placed actor 1 in the field and actor 2 and 3 in the head office and in the business unit respectively.

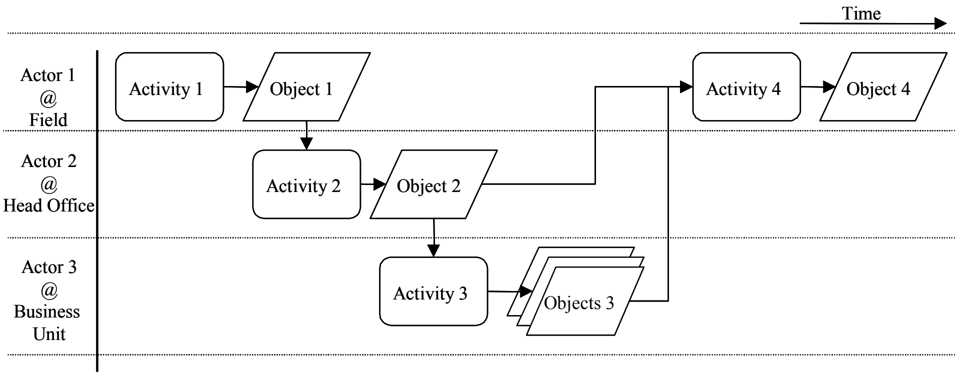

Figure 2 Add locations

It is well possible that an actor is at two or more different locations to perform his or her activities. If this is the case, then the labelling of one lane will not correctly represent the different locations where he or she will reside. To address this issue, the actor lanes should be split. Thus, one actor can have multiple lanes in a P-graph. What needs to be ensured, is that each lane corresponds with exactly one location.

After the locations have been specified, we need to classify the locations in gradual ordering of location uncertainty and actor mobility as mentioned in the introductory section. The categories are listed in Table 1.

Table 1 Classifying locations in order of increasing location uncertainty and decreasing actor mobility (adapted in part from the work of (Kristoffersen and Ljungberg 2000))

Actor / location category	Description	Location uncertainty	Actor mobility
Wandering	Actor performs activities while moving between different locations. The locations are locally defined within a building or local area.	Low	High
Visiting	Actor performs activities at different locations	Medium	Medium
Travelling	Actor performs activities while moving between different locations usually inside a vehicle.	High	Low

Actors that perform activities at a stable and known location will be classified as *stationary.* Obviously, both their location uncertainty and their mobility degree are low.

Step 3 • Highlight decision-making, control and coordination patterns

The next step involves the identification of important decisions in the business process and in the clear separation between activities that control and coordinate other activities. For example, it could be that actor 1 in Figure 1 faces a major business decision as part of his activity 4. For this decision to make, the actor needs object 2. After the decision has been made, the actor can then convert input object 3 into output object 4. *Only if* a decision uses information from other actor lanes, it should be modelled explicitly, as is done in Figure 3.

Also, the coordination and control patterns in the business process need to be identified in a rigorous fashion. Often, some actor supervises or oversees the operational activities of the other actors, typical in the case of information intensive processes. He or she performs *coordination activities* based on information given by the other actors. For example, the coordination activities could involve an assignment process, where the workload for each individual employee is determined. Such a coordination activity needs to be modelled explicitly in the P-Graph. Dashed, two-sided arrows are used to pinpoint what activity is being coordinated by the coordinating actor. The co-ordinating actor is usually stationary and it is modelled in its own lane in the P-graph.

Figure 3 represents a version of our demonstration P-graph. The coordinating actor is included and actor 1, located in the field, will be visiting known locations and perform activity 1 and activity 4.

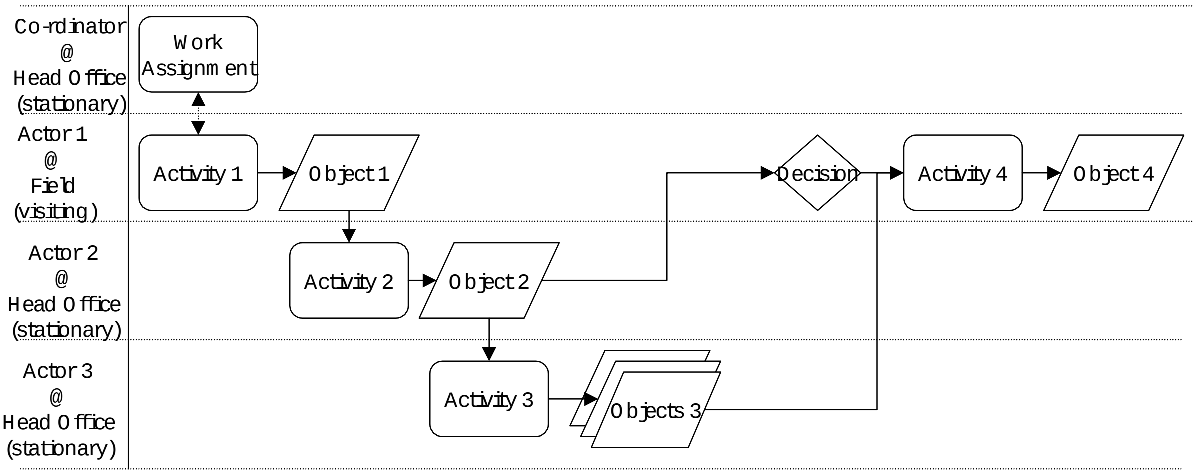

Figure 3 Highlight decision making, control and coordination flows

We have now arrived at the final version of our P-graph. The next steps deal with the structured identification of mobile opportunities.

Step 4 Complicate locations

The following step is what can be called the *complication* of the locations. This basically implies that we increase the mobility of all actors by gradually increasing the location uncertainty. Because location uncertainty creates a geographical constraint, mobile technology can enter the picture in order to overcome this constraint (cf. our discussion above). Essentially, opportunities for mobile information systems arise *wherever actor lanes connected by decision lines and coordination lines have at least one non-stationary location mode.* Thus, if all work is stationary, then we can complicate one of the actor location modes, and in doing so, we create an opportunity for a mobile information system.

Let us take the example P-Graph in Figure 3. Even without changing anything, we already have several opportunities for mobile technology. Indeed, in a real-life setting, these mobile information systems are likely to be there already. Since actor 1 is visiting and actor 3 is stationary, there is an opportunity for mobile technology between the coordinating actor and actor 1 (perhaps in the form of a assignment notification on the mobile phone of actor 1). There is also an opportunity for a system that provides actor 1 with information for his decision in activity 4 (perhaps a retrieval system on a PDA with a wireless connection). Finally, an opportunity could arise in the retrieval of input objects from actor 3.

New opportunities can easily be identified if we complicate the locations of all the actors. In principle, we could let all the actors wander in the forest: this would lead to five new opportunities for mobile information systems.

Of course, this method of arriving at opportunities for mobile technology tells us nothing about the desirability and the feasibility of having such a mobile information system. Many opportunities might simply not make sense or are not feasible for a wide variety of reasons. Therefore, the final step of our method deals with the structured *evaluation* of these opportunities.

Step 5 Evaluate opportunities

Evaluating opportunities can be done along a variety of lines. In the first place, the impact on the performance of the business process could be examined. Second, the implications for the individual actors could be studied. It may be that at the business process level there are no significant performance gains, but the actors themselves may benefit greatly from being more mobile. We will discuss each line of study in more detail in this section.

Business process performance has many dimensions: customer satisfaction is typically considered the overarching performance indicator for every business process. This indicator in turn, is impacted by a variety of efficiency and effectiveness criteria such as overall lead-time, workload per unit and process flexibility. Mobile information systems could impact these indicators in a number of ways.

For example, by increasing the mobility of the actors, the business process could gain in lead time (as waiting time and transport time are reduced) and gain in flexibility (as actors may be quicker at arriving at a certain location to perform their activities). Unfortunately, many of these performance criteria are highly specific to the circumstances surrounding the business process. Therefore, any evaluation of mobile business processes opportunities must be preceded by an identification of the most important performance indicators for the business process. The opportunities could then be judged based on their estimated impact on these indicators.

A balanced evaluation should also take into account any impact on the actors per se. There may be benefits if actors enjoy freedom of movement. Also, their satisfaction may increase if the business process works more smoothly than it previously did.

EMPIRICAL ILLUSTRATION

Two case studies were adopted to further explore the identification of mobile opportunities in business processes (cf. (Yin 1994)). Specifically, we selected business processes that met two criteria: (1) proven mobile technology was demonstrably used, and (2) the technology was used in the core of the business process, not in the peripheral parts. We studied the cases from September to November 2001, and used public material, interviews, P-graph modelling, documentation and personal experience for our data collection. Case study reports were reviewed by the interviewees, and three expert sessions with industry representatives were organised to discuss our findings. The two case studies are Taxi Stockholm, in particular the taxi dispatching business process, and Scaninge, in particular the supply chain management process of a forestry company. Section 4.1 and section 4.2 discuss these cases in more detail. Every section starts with the business context and continues with the analysis of the business process in focus. We then pinpoint the location properties and discuss the decision-making, control and coordination patterns to logically arrive at the mobile opportunity that became manifest in the case.

Taxi Stockholm

Business context

Taxi Stockholm AB is a taxi driver company owned by Taxi Trafikförening, a 101-year-old Swedish taxi driver cooperative with a membership of about one thousand taxi owners. Taxi Stockholm AB's business area is divided into two main sections: a customer service and traffic control centre for taxi and courier services, and a service organization for its members. Operating in a deregulated market, Taxi Stockholm runs by far the largest taxi circuit in Sweden, with over 1,500 vehicles, and a total capacity of around 50,000 transport requests per day. Taxi Stockholm employs 163 people and has 3,840 associated taxi drivers. Year 2000 revenue was 9.1 million SEK.

Taxi Stockholm is responsible for the development, marketing and administration of the transport services offered to customers. They build the brand for the cooperative owners and provide drivers with work. In return membership requires acceptance of the company's policies regarding brand, uniforms, car appearance, dispatch system, etc.

Taxi Stockholm's headquarters are located at Luntmakargatan 64 in Stockholm where the dispatch system matches around 25,000 transport requests per day with available cars (approximately nine trips around the globe). Reservations pass through the customer service centre and are relayed on to drivers via the taxi dispatch system.

P-Graph construction

It takes around six seconds to allocate an idle car from the instant the customer contacts Taxi Stockholm's call centre. The underlying dispatching process can be divided into a number of steps as described here (cf. the P-graph in Fig 4). First, a customer contacts the call centre through any of the available channels. The customer can talk to a telephonist, use the IVR, access Internet or use the card system for special hotel guests. Secondly, the confirmation of the location starts. The main objective is to identify the origin of the customer. Thirdly, the dispatch system allocates a car. Finally the car is contacted and it picks up the customer.

This particular process has a number of mobile actors which need to be co-ordinated. The location of the actors is therefore analysed in detail. The call centre is situated in the heart of Stockholm at the company's headquarters. At Luntmakargatan, allocation of customers and taxi drivers is carried out. Customers are spread all over Stockholm's county. The origin of the customers is the main parameter that influences the allocation process. The taxis, representing the next group of mobile actors, are located at a particular taxi zone. Taxi Stockholm divides the city into 200 zones. A zone with a customer, that has required a taxi, is denoted a *primary zone* (PZ). Each zone has a number of adjacent zones called *backup zones* (BZ). All zones are parameterised to permit changes on the zone size depending on the traffic intensity. Smaller zones are, thus, used during rushing hours. The parameterisation of the zones enables also to define backup zones according to accessibility and not only proximity. It permits to reject a particular zone as backup to a primary zone if there exists any kind of geographical barrier, such as a waterway, that makes accessibility to the primary zone impossible. The call centre, thus, correspond to a stationary modality representative for co-ordinating actors with a stable location and no mobility requirements. Taxi drivers, however, represent the travelling type of mobility with a high location uncertainty but limited mobility permitted inside the vehicle.

Table 2 Classifying locations for Taxi Stockholm

Location	Location Uncertainty	Actor Mobility	Mobile Modality
Call-centre	No Uncertainty	No Mobility	Stationary
Customer	Medium	Medium	Visiting
Taxi driver	High	Low	Travelling

A number of decisions are requested for the allocation of the mobile resources. Co-ordination between the call centre and the customer is required during the contact and confirmation process. Customers are often interested in the estimated time of arrival of the taxi, approximate information about tariffs of the services, etc. A request regarding the size of the allocated car depending on the number of travellers is another type of co-ordination required when the customer contacts the call centre. The allocation of a taxi can be therefore framed as a decision process requiring information about the customer's needs.

Cars need also to be co-ordinated during the allocation process. Information regarding location and status of the car is sent to Taxi Stockholm's headquarters. When a customer requires transportation the allocation system proceeds as follows. Idle taxi drivers located at a primary zone are assigned a queue number on arrival. This means that, within the primary zone, the driver's waiting time is the allocation criteria to get a new customer. Proximity to customer is not evaluated at a primary zone because the estimated time of arrival does not usually differ between drivers within the same zone. Moreover, the process is fair to drivers.

If the primary zone has no available cars, allocation proceeds to select a taxi from a backup zone. This time the queuing criteria is disregarded, and selection performs on a proximity basis. This guarantees customer satisfaction and reduces the estimated time of arrival. If still no available car has been allocated the dispatch system starts a bidding process broadcasted to idle cars. All cars, then, get a list with area numbers and unattended customers. Pressing a zone code and the send button on the cars mobile terminal will assign the driver the job.

Finally control patterns to contact the allocated car arise. Information about the address where to meet the customer, special instructions to the drivers, tariff based parameters, etc. must be forwarded to the drivers.

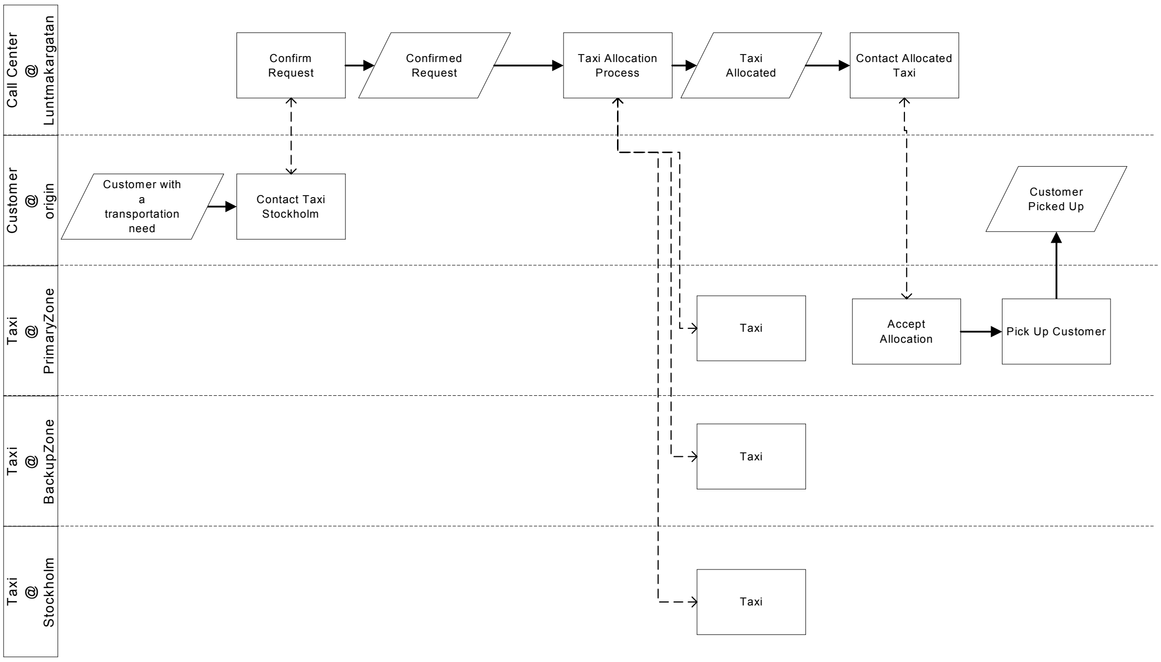

Figure 4 P-Graph of Taxi Dispatch Business Process

A number of co-ordination patterns appear to secure the information flow between the mobile resources located at geographically spread locations. The need for co-ordination, in all cases, relates to the crossovers between different locations at the process graphs depicted above. Based on these needs Taxi Stockholm has identified an opportunity to improve the dispatching process through the use of advanced mobile technology based on GPS, radio communication and information system technology.

Business process benefits

There are a number of goals that were achieved. The allocation of available cars is a critical process for the company. *Taxi load* and *Estimated time of arrival* are usual parameters guiding the allocation process. These two performance criteria, together with profitability per car and hour, represent the overall corporate goals. Since these criteria often conflict, complex algorithms are needed to allocate the resources. This is exacerbated by the fact that the customer need for cars is usually the highest when few drivers are available, i.e. early morning on weekdays and late midnight on weekends. Real-time information regarding the cars' position is therefore inestimable. One main achievement with the project has been the reduction of the distance between the vehicles and the customers through a better allocation process. The company has actually identified around 20% savings since the start of the project. Another positive indicator of the project has been the increased taxi load achieved. The range parameter has been increased marginally through the increased throughput of the radio-net. However, the functionality offered to drivers is similar to that offered previously. In the future Internet access, training courses, etc will be available in the cars. These are however future visions.

Scaninge[1]

Scaninge timber AB is a forestry and sawmill company located in the Northern part of Sweden. At the time of the study the company's name was Graninge Skog & Trä AB, today an energy supply company that sold the forestry and sawmill line of business summer 2000. Scaninge is, at the moment, owned by Graninge AB (40%) and Svenska Cellulosa AB (60%). Operations are based on four sawmills located in Sweden. The turnover in 2001 was 1,800 MSEK.

The company implemented a mobile information system to improve their supply chain management. The project (SKINFO) started 1987 when the company became interested in using radio-technology to enhance co-ordination between units operating in the forest (harvesters & forwarders) and the main office for management and planning of transports at Bollstabruk.

Due to demands on quality and timely delivery, increased information was needed to secure lower stocks and fresher pulp. Paper producers demand the timber to be no more than three weeks old when it enters the process. Graninge experienced a number of problems that led to the implementation of a company wide mobile solution. Some problems were timber wasted when it is left too long in the forest, or when the dimensions requested by customers do not make the best use of the timber in stock in the mill, secure timber in-flow to keep the mill going on, etc. The idea behind the introduction of mobile data technology was, therefore, that the process from harvest to delivery could be more efficient and deliveries more timely if the value chain could become more integrated.

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[1] The empirical data for this case study was collected by G. Nilsson for the purposes of his master study at the Stockholm School of Economics. Used with permission of the author.

After the specification requirements were made the company decided to install a system based on Mobitex for the radio communication and Telesofts' MobiBase-module for communication with the central information system. Telesoft developed the first module in a DOS-based environment for easier testing. Prototypes were installed in a number of mobile units based in the forest so that machine operators could give their comments on the interface during the implementation phase.

P-Graph construction

The business process in focus for this study is operations for timer production from start to delivery at the sawmill. Trees are felled, trimmed and cut in appropriate lengths by harvesters in the forest. Forwarders pile the logs along the roadside in order to be transported to the sawmills. A truck picks up the timber and transports it to the sawmill. In the sawmill the timber is sorted, measured and processed. Sorted and sawed timber is either delivered according to previous placed orders or stocked until customers require new timber (cf. fig. 5).

In the 1990s Graninge divided its woodland region into five different districts. Each district was managed by an inspector responsible for timber production. The districts were sub-divided into two or three forests areas supervised by foremen responsible for the on site operations. At each particular forest area, a number of machine operators harvested and forwarded timber. Trucks collected timber dispersed over the whole harvest area and transported the logs to the sawmills.

There existed a number of geographical constrains in order to carry out the process. The administrative unit, where data was registered, is located away from the forest units. Moreover the operating land was 245,000 ha. productive woodland, and there existed a need for regular information exchange between units at the different locations both on the move (such as the transport units, i.e. trucks, harvesters and forwarders) and on different locations (inspectors that supervised the different forests districts).

As depicted in figure 5 actors were located at different geographically dispersed areas. Mobility modalities for these actors are presented in table 3.

Table 3 Classifying locations for Scaninge

Location	Location Uncertainty	Actor Mobility	Mobile Modality

Bollstabruk	No uncertainty	No mobility	Stationary
Truck drivers	High	Low	Travelling
Harvester & Forwarder	High	Low	Travelling
Inspectors	High	Low	Travelling
Sawmill operators	Low	High	Wandering

Volume planning was developed out of a central database with information from the reports from each forest district. Inspectors made regular visits to the forest areas to co-ordinate the production of timber and prepare reports that were sent to the central information system for update. At the districts, production was carried out according to monthly delivery plans that had to be forwarded to the foremen at the forests areas. Before the implementation of SKINFO re-arrangements of timber production required the inspectors to make regular visits to the different areas to communicate changes in the production plans.

Three types of reports were therefore forwarded to the central office at Bollstabruk: production reports from each forest area, salary reports from the workforce in the forest and machine reports regarding information about repairs, machine status, need for spare parts etc. Moreover transport and route allocation was required to avoid timber waste along the roadside of the forest areas. The process depicted above is therefore divided in two main sub-processes, common distinctiveness for information intense processes, as described in the framework section, namely the *planning and control* process (hereinafter process management) and the *production* process itself. The process management is represented by its own swim-lane in the P-graph and expands along the production process located in different regions to accomplish the saw log production. Both processes are close interrelated and information exchange between the sub-processes is required.

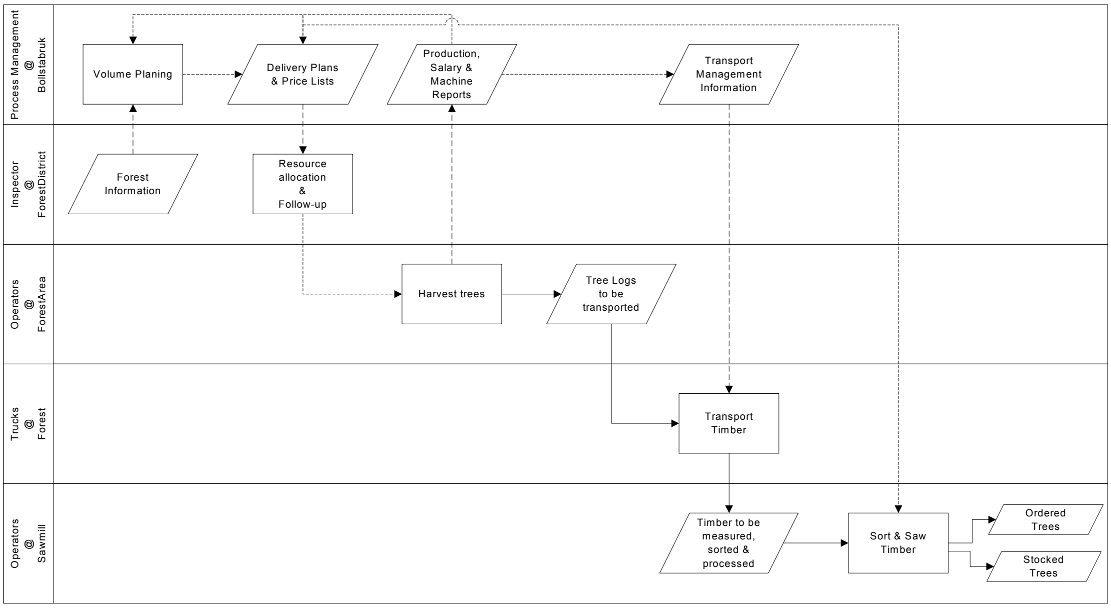

Figure 5 P-Graph of Scaninge's supply chain process

Business process benefits

A number of opportunities were achieved through the implementation of SKINFO, according to the case above. Increased detail level of delivery plans by re-calculations in the case of operation disruptions was achieved by means of coordination between machines out in the forest and the operations office. Information interchange between employees globally was achieved. The range of services offered increased from standard messaging to data and information access. Another advantage was volume reports from harvesters and forwarders on a daily basis. This opportunity impacts directly on transport management, relevant progress & status reports from production and roadside stocks and deviation reports to the sawmills. Finally, better computer based planning system facilitating the work for *work leaders* by enabling information access on different locations and on the move was achieved. The overall improvement can actually be expressed as faster and more effective changes on production management.

CONCLUSIONS

In this paper we have proposed a method to systematically derive opportunities for mobile business processes. We do so by taking the existing business process and by gradually increasing the mobility of the participants in the business process. The more mobile the actors are, the higher the geographical barriers, and the less feasible the use of a traditional information system becomes. This procedure can be summarised by the sentence: “complication of the location”. In our paper we also present two case studies of existing mobile business processes, and we show how the mobile information systems that were used in these business processes can be “discovered” through our method. Finally, we pay attention to the business process performance benefits that the use of mobile technology enabled.

There are a number of limitations to our method, which in turn provide stimulating areas for further research. In the first place, we focus on existing processes, not on radically new processes that are invented from scratch. The critical reader may comment that the creative process has been ignored in our method and that the identification of mobile information systems is too mechanical. However, we believe that our method is a *tool* that can assist in the identification of opportunities: it should never be used mechanically and replace creativity. We offer our method in the hope that it will stimulate creativity in the design of new mobile information systems.

Second, there is obviously a lot that can be said about the benefits of mobile technology in relationship to business process performance. 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. Further research should be directed towards deeper studies of the different usage levels of technology and the way they impact the processes and the people that participate in it.

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