SPECIFIC CHALLENGES FOR SMALL AND MEDIUM-SIZED ENTERPRISES (SME) IN M-BUSINESS

A SME-suitable Framework for Mobile Services

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Abstract: It seems to be a widely accepted notion that Small and Medium-sized Enterprises (SME) play an important economic and social role and often contribute to innovation. But at the present situation the development and operation of a service to be used with mobile and wireless terminals (mobile service) is not bearable for most of them due to technical reasons and the market structure. In this article we will discuss the SME-specific obstacles in m-business. We will also propose a technical framework as remedy for this situation.

1 INTRODUCTION

Small and medium-sized enterprises (SME) represent 99 % of all enterprises in the Europe Union (European Union, 2006) and play thus an important role in the economy as well as in society. But at the current state-of-the-art and market situation in many European countries it is very hard for them to set up data services to be used with mobile and wireless terminals like cellular phones, PDAs or smartphones.

In our opinion this is one of the main reasons for the absence of success of mobile data services in Europe. This phenomenon is called the "European Mobile Data Service Dilemma" (Steinert & Teufel, 2005) or "Advanced Mobile Services Paradox" (Blechar, Constantiou & Damsgaard, 2005); the appellation as "paradox" stems from the fact that despite of the high penetration rates of mobile terminals and the success of simple data services (e.g. SMS, download of ringtones and logos) advanced mobile services generate only a few percent points of the revenue of mobile network operators (Brücker et al., 2006).

In the article at hand we discuss special characteristics of SME and the special challenges for them when they want to develop and operate mobile services, may it be for own use (e.g. support for mobile workers) or for customers of the SME. As solution we propose a technical framework, which offers a comprehensive runtime environment for mobile services.

The remainder of this article is organized as follows: in the second section we discuss definitions of SME and their characteristics; section three covers our comprehension of mobile services. SME-specific challenges when dealing with mobile services are covered in section four. Our proposed solution approach — a technical framework for mobile services — is sketched in section five. Section six gives an overview about related work, before we summarize and conclude in the last section.

2 CHARACTERISTICS OF SME

According to the European Union (2003) SME are defined as enterprises which have at most 250 employees and an annual turnover not exceeding 50 million Euros. Further there is the distinction of small enterprises — they have fewer than 50 staff members and less than 10 million Euros of turnover — and micro-enterprises (less than 10 persons and 2 million Euros of turnover). But this is by far not the only quantitative definition of SME: other sources define SME as businesses with fewer than 500 employees (Audretsch, 1999) or even give different values for different sectors (Marwede, 1983; p. 45): a industry firm is small when it has 50 employees,

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but a trade business is medium-sized with more than 2 employees. Using quantitative measurements seems at least to be easy manageable, but how do we count employees with different level of productivity or part time workers?

There are also definitions based on qualitative aspects like legal form, the role of the firm's owner, their position on the market, the organisational structure or economic and legal autonomy (Marwede, 1983).

Although there is no uniform definition of SME the notion that SME play an important economic and social role seems to be well accepted (OECD, 1982; Acs, 1999). This is supported by surveys which state that 70 % of all labour relations and over 80 % of apprenticeship training positions in the German non-public sector are provided by SME (Günterberg & Kayser, 2004).

While SME are not able to exploit economies of scale at the same order of magnitude as big enterprises can do (Audretsch, 1999) they have the advantage of flat hierarchies and thus being very flexible. There are many examples of SME that contributed to major innovations (OECD, 1982, p. 12; Almeida, 1999; Audretsch, 1999). In some cases inventions that were rejected by major firms were later brought to market by small start-up companies. Also SME don't change their managers as often as big enterprises and thus can concentrate on long-term strategies.

SME often have high-specialized know-how in a certain area which could be utilized for mobile services. But they have limited resources and cannot afford to employ highly specialized employees. Since innovations always go together with risk big firms have several innovations running at the same time to diversify risk, but SME cannot do the same (Geschka, 1997).

3 MOBILE SERVICES

3.1 Definition

The core business of mobile network operators (MNO) is the provision of wireless communication capacity for both voice (telephony) and data transmission ("bit pipe") to be used with mobile terminals like cellular phones, PDAs and smartphones. In the article at hand we only consider data transmission. Mobile terminals (MT) in our sense means "handheld device"; devices like notebooks or tablet PCs are not considered as real mobile terminals, because one can't carry them along in a ready-to-receive-state most of the day.

Examples of standards for basic wireless communication services for data are GPRS, WiFi or UMTS. If a service provider (in our case SME) uses these basic services for supplying additional information we talk about a "value added service". An example for such a value added service would be a navigation service, which guides the user to facilities in his nearer surrounding, whereas a GPRS-connection (basic service) is used to provide the actual navigation hints in form of WML-pages. For the sake of simplicity we use the term "mobile service" in the remainder of this article if we actual mean "mobile value added data service".

4 SPECIFIC CHALLENGES FOR SME WHEN DEVELOPING AND OPERATING MOBILE SERVICES

There are some specific challenges when developing mobile services (see also Chittaro, 2006) which are faced by big enterprises as well as by SME:

Display quality: MT have only a small display with low resolution and reduced colour-depth, there is no real keyboard or a "mouse" available for user input.

Limited Resources: MT have limited resources like memory, cpu-power and battery capacity; the available bandwidth for wireless data communication will be not as good, cheap and reliable as for wired data communication.

Data protection concerns: Wireless data communication is more vulnerable with regard to security threats and could be eavesdropped. There is also the danger that a MT with sensible data on it is lost or stolen.

But there are more challenges, which are particular hurdles for SME because of their limited personal as well financial resources:

Different types of mobile terminals: There is a plethora of different types of mobile terminals. The estimation for the number of different types of mobile terminals in the European market is several hundred. They all have different capabilities and support different formats for data exchange and programming platforms. While for Personal Computers several minimum capabilities can be assumed (resolution of at least 640x480, HTML-

browser and keyboard/mouse available), there is still a lack of standardization for MT. The WURFL-project (WURFL, 2006) tries to compile a list with the capabilities of many different types of mobiles devices and therewith demonstrates the heterogeneity of mobile devices in an impressive way. So it is no wonder that Schlickum (2005) mentions that the effort for adapting a mobile application/service for different devices often exceed the effort for the actual implementation of the application. Further the cost for the acquisition and maintenance of the required arsenal of MT shouldn't be underestimated and could especially for SME impose serious problems.

Heterogeneity of underlying networks: There is also a great heterogeneity of underlying wireless networks and it is likely that news standards will emerge in the next few years. A mobile service has to be adapted for many wireless standards, which requires more resources than SME can afford.

Dominance of the MNO: Nowadays the market for mobile services aimed at customers is dominated by the portals of the mobile network operators, e.g. the i-Mode-portals available in several European countries. It is at the disposal of the portal operator if a service gets into their portal or not. The negotiations with the portal provider often take several months. We heard reports that some portal providers seem not to be interested in working with SME. But in most countries there is more than just one single portal: there is one portal for the subscriber of each mobile network operator, so the SME has to negotiate with all MNO and adapt the service for all portals (the portals use different technical standards and infrastructure) to reach all mobile subscribers in one countries. Things get worse if a mobile service should be made available in different countries.

Lack of expertise: Developing mobile services requires highly specialized experts, but SME cannot afford such experts. Also the operation of a mobile service is still a full-time job because of the great complexity. SME often rely on the expertise of external IT-consultants, but they are expensive and are only called when there are problems concerning the IT-infrastructure required for the day-to-day business (Marmaridis & Unhelkar, 2005).

Decision process in SME: While in big companies decisions about new technologies are made by special departments with experts, in SME it is often the owner of the firm who makes such decisions. Without technical knowledge it is even harder to assess the potentials of new technologies.

R&D Landscape: Research and Development is mainly aimed at the needs of big enterprises, so there is often a lack of know-how about latest technologies in SME (DIKMU, 2006).

Brand-Building: For success in m-commerce (customer services with direct revenue) a well known brand is important, but it is very difficult do build one for SME (Strüker et al., 2003).

Our proposal for a solution to tackle these SME-specific hurdles is the development of a special technical framework called MODIFRAME[1] for the provision of mobile services, which will be introduced in the next section.

5 A SME-FRIEDNLY FRAMEWORK FOR MOBILE SERVICE

5.1 Architecture

The proposed framework (see figure 1) provides a comprehensive runtime environment for mobile services and consists of several modules:

Application router: All incoming requests are first handled by the application router, which analyses the service requests and forwards it to the corresponding service provider (SME). The data communication between the MT and the framework may be transmitted using several standards for wireless data communication like GPRS, EDGE, UMTS or WiFi. During a session the communication standard used be can changed ("seamless roaming").

Transcoder: A transformation module is responsible for the adaptation (transcoding). The actual service provider (SME) delivers the content in a generic format and the transformation module transcodes it to a target format that can be displayed by the MT that submitted the request, e.g. cHTML (for devices with i-Mode-capabilities), (X)HTML or WML. But binary content has to be transcoded as well: for bitmap pictures and animations it might be necessary to reduce the resolution or colour depth, animations could also be deanimated or have the frame-rate reduced.

[1] „MODIFRAME" stands for „Mobile Dienste Framework" („Dienste" is the German word for „services")

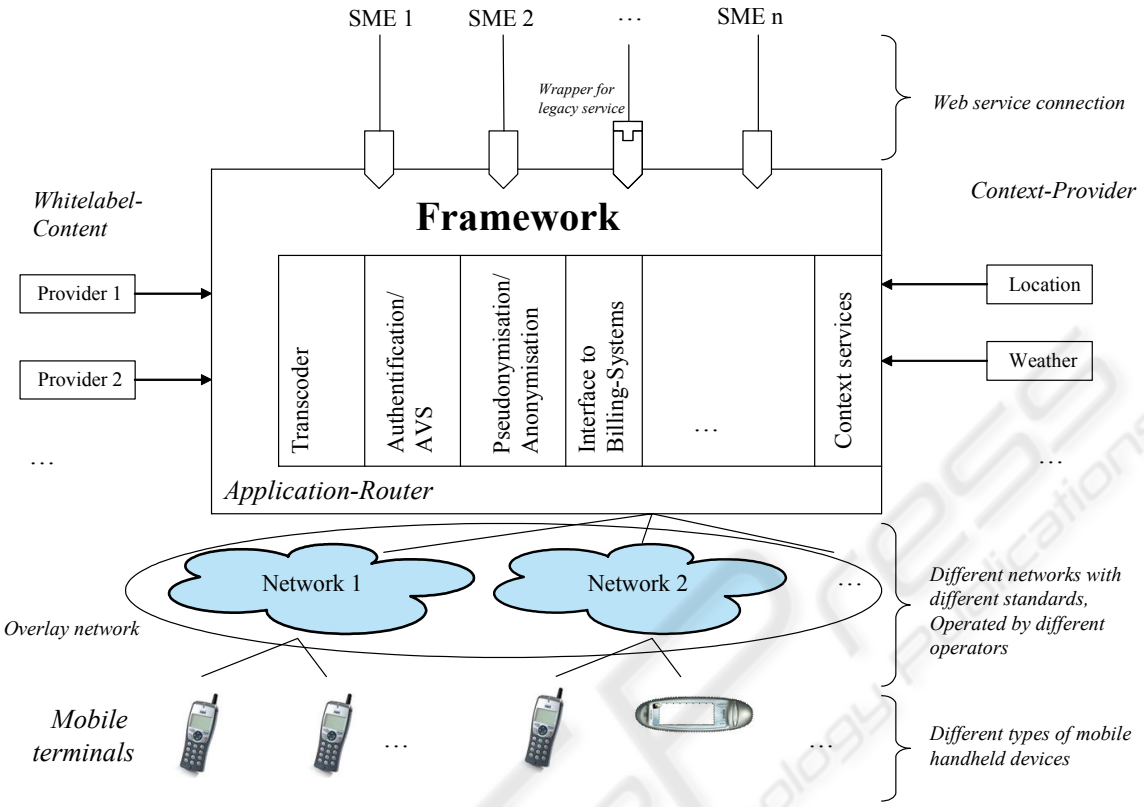

Figure 1: Overview of the framework.

Context: According to our understanding context information for mobile computing is any information that is available in explicit form at runtime of a service (or application) and is used deliberately to support the user when interacting with his mobile device (see also Dey (2001)). Since MT have ergonomic limitations like mentioned above (small display, cumbersome data input) it is especially import to have context-aware mobile services. The framework thus provides context services which can be used by individual services hosted by the framework, e.g. the current position of the user ("Location based services"), the weather (services like tourist-guides shouldn't recommend outdoor-activities when it is raining all day long), user profile or the available technical resources (bandwidth, profile of MT, etc).

Authentication: For some services authentication of the user might be necessary and maybe even age verification. Unlike in the fixed-line internet many standards for wireless communication demand an authentication of the MT (e.g. using the information on the SIM-card of a GSM device). This network authentification can be used for service authentication, so the user hasn't to enter a username and password like for many conventional internet services.

Anonymisation/Pseudonymisation: The framework can mediate a service request between MT and SME without revealing the identity of the originator of the request and thus acts as anonymiser (for single request service) or pseudonymiser (for multi-request sessions).

Billing: Some services for customers are thought to generate direct revenue (e.g. a navigation service with a fee for each session). For these services the framework will provide interfaces to several billing systems. Billing means that telecommunication services are paid over the telephone bill. (M-payment also covers the case of non-telecommunication-services that are paid with a mobile device, e.g. send a SMS to a premium number to buy a chocolate bar from a vending machine).

Whitelabel-Content: Whitelabel-Content is content provided by third parties to be used by service provides (SME) for enriching their own services. For example a service aimed at soccer fans may include latest sport news or a mobile event guide might resort to a navigation service provided

as whitelabel content to show users how to get to the locations of the recommended events.

Migration-support: So called "wrappers" help to operate legacy services developed for other platforms with the framework. Wrappers are a well know instrument for the migration of software.

The communication between the framework and the SME as actual provider of the services is realized using webservice technology (Cerami, 2002). Webservice are a popular and reliable technique for the realisation of distributed application: the call of a remote function is transparent for the developer, which means remote functions can be invoked like local ones. The whole process of encoding and transmitting the data over a network is encapsulated by special libraries. Based one a machine-readable description in form of a WSDL-file (Web service description language, a XML-grammar) the developer generates so called stubs, which can be invoked like local functions and perform all the "remoting" behind the scenes.

It is also easy to bundle different mobile services hosted by the framework to get a compound service.

The framework follows the "All-IP-Approach": all communication is realized using the Internet Protocol (IP); the different standards for wireless communication are used to transport IP-packets. When an IP-layer can be build upon a given standard for wireless data communication this standard can be used for communication between mobile terminals and the framework.

6 RELATED WORK

6.1 Industry-Solutions for Hosting Mobile Services

There are many gateways for sending SMS/MMS or receiving (premium) SMS. These gateways only can be used for simple forms of mobile services like the delivery of digital content (ringtones, pictures, etc) and messaging-based services (e.g. delivery of advertisement messages, information services etc. controlled with SMS-commands). Many gateway-operators ask for high setup-fees (four-digit-number of Euros) and/or even a guaranteed turnover each month, so setting up a mobile service is a very risky venture for SME.

As part of UMTS the IP Multimedia Subsystem (IMS) is an architecture with three service platforms — SIP, OSA and CAMEL — and aimed at the provision of IP-based multimedia services like Push-to-Talk in packet oriented networks (Licciardi, Moiso & Palama, 2003). Since IMS is operated by the mobile network operator as part of his infrastructure he will control access to the IMS platform and will not allow every SME to set up a mobile service.

There are solutions like those from Extended Systems/iAnywhere or Mobileframe to bring the data from the backend systems like ERP to MT, but these solutions aim at bigger enterprises and focus on B2E-scenarios.

6.2 Empirical Studies Concerning SME and Mobile Services

There are not many empirical results concerning mobile services and SME:

A study by Villanen et al. (2004) is concerned with mobile B2E-services in SME: Their findings are that one third of the companies with mobile employees but without a mobile solution to support them state that they see a need for mobile support. There are also short descriptions of seven case studies that demonstrate how SME from different industrial sectors use mobile technologies to support their workforce

A qualitative study by Harker & Akkeren (2002) tried to explore the perceived needs concerning mobile data technology of SME in Australia across three levels of adopters of new technology (non-, partial-, and full-adopters). Another study by this group (Akkeren & Harker, 2003) concentrated on SME that already used the internet for e-Mail and had an own website; it was found out that 60 % of these full adopters were "very interested or interested in acquiring" mobile data technology.

7 SUMMARY AND OUTLOOK

We discussed the special characteristics of SME and the hurdles that keep of most of them away from participation in m-business. In our opinion this is one of the major reasons for the lack of success of mobile data services on the European market. Our solution-approach is a technical framework for hosting mobile services developed by SME. The framework hides the heterogeneity of the underlying wireless network infrastructure and mobile terminals. Even the MNO would benefit from the framework, because they hadn't to support multiple SME while developing mobile services and the

services hosted by the framework will generate additional data volume and thus revenue for the MNO.

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