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Inhalt:

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Cooperative Development & Realization of Situation Dependent Mobile Services

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1 Motivation

As the experiences with mobile services are showing, service concepts known from the stationary internet cannot be transferred into the mobile environment. Instead, only those mobile services tend to be successful that take the specific features of the user's context into account and apply this information to generate an added value for the mobile customer. Services that automatically adapt to the context are termed *Situation Dependent Services* (SDS). Initial examples for SDS are mobile *Location Based Services* (LBS) or personalized internet services. By now, LBS are based on a low level of situation dependency and use mostly simple filtering techniques with database lookups.

A popular example of a **service platform** is i-mode that has been developed in Japan and was recently launched in Europe. In i-mode only basic situation dependent services are supported by now. One possibility to enrich and simplify the usage of a mobile service, is the adaptation to the individual end-user's needs. From the service provider's point of view there are several aspects that make the realization of situation dependent mobile services complex:

- Service providers are mainly context providers, not network providers.
- Service providers are not allowed to store data about the user's behavior. (only with an end-user's agreement of confirmation or anonymization of information)
- Service providers have no access to sophisticated information about the end-user's situation, which is important for an efficient adaptation of mobile services.
- Currently, there are no standards for the sharing and the accounting of situation specific information in mobile radio networks, that allow to transfer differentiated information about the user anonymously.

Important **research questions** for the development and realization of situation dependent mobile services are:

- **Understanding the End-User's Situation:** How can an end-user's situation be defined? Which information about the end-user's situation are relevant for situation dependent mobile services? How can situations be classified, described, enriched and transferred?
- **The Development and Usage Process:** How could the lifecycle of a *Situation Dependent Mobile Service* be described? What opportunities are connected in this lifecycle? For Whom?
- **Analysis of the End-User's Acceptance:** What about the end-user's acceptance of *Situation Dependent Mobile Services*? Which properties are important for the end-user? How can the user be protected from becoming a transparent individual? How can this be communicated to the end-user?
- **Designing Cooperative Development:** In which way should the interaction, the information flow and the cooperation for service distribution work. Who plays which role? How does the accounting work?
- **Realization of Situation Dependent Mobile Services:** What technical conditions have to be considered? What kind of architecture is needed? Which cooperation partner has to accomplish which technological task?

The balanced combination of these elements in a methodical framework is regarded to be fundamentally important for the development of successful *Situation Dependent Mobile Services*.

2 Understanding the End-User's Situation

A situation concept should classify the mobile situation context and make the customer's situation context suitable for the cooperative providing of situation dependent services. A situation can be distinguished into the measurable aspects of a user's situation according to three dimensions: **Time**, **Place** and **Person**. These dimensions correlate with the primary situation determinants that are presently transmittable in mobile networks. *Time* and *Place* are the common and most obvious dimensions that are easy to measure. The *Person* summarises all measurable aspects of a

person. It includes the identity and demographic information as well as information about the specific behaviour. Depending on the scope of application this basic classification can be extended (Amberg, Wehrmann, 2002).

The proposed situation concept (Amberg et al. 2002,1) is based on the idea that the adaptation of a mobile service according to the customer's situation context provides a real benefit and an improved user experience. A mobile service that is able to access the context is much more able to solve a problem efficiently and to provide a certain added value compared to a service without this information.

The situation concept includes a three-step process to determine the user's situation for a mobile service:

- **Determination:** In a first step, the elementary situation information (called situation determinants here) are measured. For the *identification* of a mobile customer in mobile GSM networks the *Mobile Subscriber International Subscriber Directory Number* (MSISDN) can be used. To calculate the *position* of the mobile terminal, there are network or terminal based solutions. By merging this information with the world time, the end-user's *local time* can be calculated.
- **Interpretation:** On the basis of the situation determinants and by consulting additional data sources, detailed information about the user's situation is derived.
- **Description:** The derived knowledge about the user's situation is then coded in a suitable mark-up language.

3 The Development and Usage Process

The development and usage process describes the main process steps for providing situation dependent mobile services. The usage cycle (Amberg et al. 2002,1) differentiates the following three basic (not disjunctive) categories of services: *Individualised Services* are any kind of user initiated services. They are adapted to the individual customer's needs. *Proactive Services* are automatically generated services which are triggered by special events. *Evolutionary Services* are services which are updated and enhanced successively by continuous analysis and evaluation. The main processes of an usage cycle are:

- **Detection of the Situation Determinants:** The *Mobile Network Operator* detects the situation determinants. Objects of the detection are position, time and user identity.
- **Interpretation of the Situation Determinants:** The *Mobile Network Operator* enriches the information by consulting additional information sources.
- **Transfer of the Situation Descriptions:** The *Mobile Network Operator* encodes the situation description and transfers it to the service provider. To ensure the privacy, personal information is removed.
- **Individualisation of Mobile Services:** The service provider uses the situation description for the individualisation of user initiated services (pull services). The individualisation of mobile services is a tool for customer orientation and the manageability of services.
- **Event Control in Mobile Services:** The service provider can define situation based rules. The *Mobile Network Operator* compares these rules with the situations. If a rule matches a situation, a proactive service will be generated (push service). A great potential of mobile services is the ubiquitous addressability of customers which is founded in the close interconnection of customer and personal mobile device. This allows services to get activated or initiated by a particular circumstance and enables active notification services. Regarding the legal aspects and Godin's permission marketing concept (1999), a complete new dimension of services for customers and service providers is conceivable.
- **Knowledge Generation in Mobile Services:** Knowledge generation for mobile services makes a long-term analysis, evaluation and extension of services possible. A service provider may use the historical data about customer transactions and the respective user's situation as valuable sources for an evaluation of his mobile services. Thus he can conclude the demographic properties, the regional allocation or many other attributes that help to enhance or upgrade a service. Additional tools may further help the service provider to better understand the intentions, purposes and the special needs of users in special situations. An evaluation of services by the customer may help to identify wrong adaptations. Depending on the success and the influencing factors, a service can be stopped or advanced in an evolutionary style.

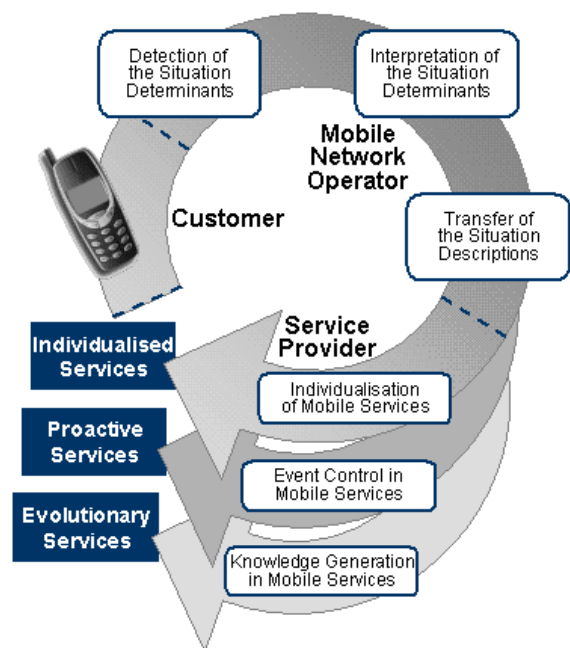


Figure 1 - Usage Cycle for *Situation Dependent Mobile Services*

4 Analysis of the End-User's Acceptance

Service providers can use an acceptance model to understand the reasons for the user's acceptance of existing mobile services ex post or to adapt the requirements for the service development. The characteristics of this acceptance model should specifically focus on situation dependent mobile services and the usability as a permanent controlling instrument for the interactive adaptation of services to the user's requirements. The structure of the suggested acceptance model (Amberg et al. 2003,1) is based on the principal idea of the **Balanced Scorecard** (BSC) (Kaplan, Norton, 1996). Accordingly, the acceptance model uses a balanced set of individually measurable acceptance criterions for the analysis and the evaluation of the end-user's acceptance. The balanced consideration of the criterions that are used for measuring the user's acceptance, leads to a more sophisticated evaluation.

We use the complementary categories benefits/costs and service/general conditions to structure the acceptance model. The distinction between service specific acceptance and general acceptance factors (general conditions of services) is derived from the model of Herrmann (1999). There are four dimensions, that can be distinguished: **Perceived Usefulness**, **Perceived Ease of Use**, **Mobility** and **Costs**. The first two dimensions *Perceived Usefulness* and *Perceived Ease of Use* are taken from the **Technology Acceptance Model** TAM (Davis, 1989). The *Perceived Usefulness* is an additional incentive to use a service. In opposition to this, the *Ease Of Use* is an effort, which is an obstruction for the *Usage* of a service. Both dimensions describe the service specific influencing factors of the acceptance of a service. The acceptance model extends the TAM approach with two additional dimensions: *Mobility* and *Costs*. To regard the influencing factors in more detail, a further refinement of the dimensions is recommended. According to Kollmann (1998), the subdivision in **First Use** and (regular) **Usage** is reasonable. The *First Use* is a kind of barrier for the *Usage* of a service. Both are necessary for a balanced consideration of the user's acceptance of mobile services. In addition to this, it is possible to subdivide these eight criterions further on (e.g. in emotional/rational or qualitative/quantitative) (Amberg et al. 2003,2).

5 Designing Cooperative Development

An interaction model describes the service and information relationships between the involved participants. From a conceptual perspective of providing situation dependent mobile services, three or four market participants can be differentiated. Information products are offered by the **service provider**, procured by the **Mobile Network Operator** (MNO) and paid by the **customer**. For physical products a **logistic provider** is involved for the physical transportation between service provider and customer.

In the scope of the proposed interaction model (Amberg et al. 2002,2), the *Mobile Network Operator* takes a major role as an **intermediate** between service provider, customer and if necessary logistic provider. From the customer's view he is the contact for all customer specific concerns. He ensures the access to the mobile network, manages the personal settings and profiles (e.g. privacy protection), receives and processes the user requests, transmits the information products and is responsible for billing. From the service provider's view he provides a widespread service platform, which enables him to offer any service to the customer. The resulting central role of the *Mobile Network Operator* is obvious. Consequently, aspects like protection of privacy or data security have to meet high demands. Considering the security aspects, the *Mobile Network Operator* has to establish himself as a trustable party, commonly termed as **Trusted Third Party** (TTP). The authors consider emotional barriers to be very important. Concepts to ensure and guarantee trustability are an important field of research.

The *Mobile Network Operator* is the only involved party, which has the infrastructure to measure the situation determinants. This is an essential reason for being the only one who can handle the interpretation and description of situations efficiently. The strict borders of data protection and legal regulations (Enzmann, et al. 2000) on the one hand and the sensibility of customers regarding their personal data on the other hand determine that the *Mobile Network Operator* should only transfer anonymous situation descriptions. Most information products provided over the platform of the *Mobile Network Operator* do not depend significantly on the user's identity. An implementable concept for ensuring the privacy is using alias or session-IDs instead of a personal ID.

6 Realization of Situation Dependent Mobile Services

A convenient system architecture focuses on the implementation of the cooperation platform. The situation description that is conveyed from the *Mobile Network Operator* to the service provider normally contains a reference to the identity of the user. The type of reference depends on the degree of intensity that characterises the relationship between the mobile customer and the service provider (Amberg et al. 2002,2). The customer must have the choice to select the type of reference that he wants to transmit to the service provider:

- **Anonymity** (e.g. Session-ID): The service provider only gets a weak reference that points to the current data session of the customer. The customer-ID can not be resolved by the service provider.
- **Pseudonymity** (e.g. X-ID or Nickname): The service provider receives a pseudonym for the user that remains the same over all data sessions. Therefore, the service provider can recognise a mobile customer without knowing his identity.

- **Identity** (e.g. MSISDN): The service provider gets access to the technical address of the mobile terminal that enables him to resolve the customer's identity.

7 Outlook

One future task is the refinement of the existing facets, that were shortly introduced in this paper and the search for further aspects, that significantly affect *Situation Dependent Mobile Services*. For the further design of these services the development of the mobile commerce market is very important. According to the imminent global rollout of 3rd generation UMTS networks and later 4th generation applications, the identification and understanding of key success factors will play an important role.

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