

A Cooperation Model for Personalised and Situation Dependent Services in Mobile Networks

Veröffentlichung in: Olivé, A.; Yoshikawa, M.; Yu, E.S. et al. (Eds.) Advanced Conceptual Modeling Techniques. LNCS 2784, Springer-Verlag Berlin Heidelberg, 2003. ISBN: 3-540-20255-2 pp 136-146.

Inhalt:

Situation dependent services are services that significantly depend on the user's context. Considering the individual needs, such services are regarded to be more beneficial to the customer than non-individual services. In this paper we present a conceptual framework and characterise a service platform for the cooperative development of situation dependent services. The framework pays attention to the current market situation and considers legal, economical and technical conditions that are relevant for providing situation dependent mobile services. The cooperative service platform which is hosted by the mobile network operator gives service providers access to the usage situation of their customers. Taking advantage of that platform, the provided services can be adopted effectively according to the customer's situation and needs.

Leistungsbereich: Produktentwicklung

Ansprechpartner: Jens Wehrmann

Dokumentart: Artikel

Kontakt

Safari GmbH Office Mannheim
Goethestraße 18 D-68161 Mannheim

Safari GmbH Office München
Reitmorstraße 4 D-80358 München

Tel: +49 - 621 - 18 144 720

Fax: +49 - 621 - 18 144 740

info@safari-gmbh.de
www.safari-gmbh.de

Dieses Werk ist urheberrechtlich geschützt. Alle Rechte, auch die der Übersetzung, des Nachdrucks und der Vervielfältigung vorbehalten. Kein Teil des Werkes darf ohne schriftliche Genehmigung der Safari GmbH in irgendeiner Form (Fotokopie, Mikrofilm, Datenträger oder einem anderen Verfahren) reproduziert oder unter Verwendung elektronischer Systeme verarbeitet, vervielfältigt oder verbreitet werden.

A Cooperation Model for Personalised and Situation Dependent Services in Mobile Networks

Michael Amberg, Stefan Figge, Jens Wehrmann

Abstract. Situation dependent services are services that significantly depend on the user's context. Considering the individual needs, such services are regarded to be more beneficial to the customer than non-individual services.

In this paper we present a conceptual framework and characterise a service platform for the cooperative development of situation dependent services. The framework pays attention to the current market situation and considers legal, economical and technical conditions that are relevant for providing situation dependent mobile services.

The cooperative service platform which is hosted by the mobile network operator gives service providers access to the usage situation of their customers. Taking advantage of that platform, the provided services can be adopted effectively according to the customer's situation and needs.

Keywords

mobile commerce models and architectures; service modelling; content personalisation and user modelling; location based services

1 Introduction

Due to the high investments in the technical infrastructure the mobile network operators are under pressure to ensure a certain amount of transaction volume with mobile (data) services. In spite of their former efforts to develop and provide mobile services by their own, they now incline to concentrate on their own core competencies while opening their data networks to specialised service providers. For that purpose, the mobile network operators have to develop and provide service platforms that supply service providers with the infrastructure for mobile data communication, billing of services as well as the handling of the collection procedure.

As the experiences with mobile services are showing, service concepts known from the stationary internet can not 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 personalised 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 simple situation dependent services are supported by now. The situation concept as introduced in this paper assists in structuring the mobile user's context and supports a cooperative development of situation dependent mobile services. It outlines a situation concept that can be technically handled and discusses the aspects that are relevant for conveying context information to the service providers.

1.1 Fundamental Conditions to provide Mobile Services

For the development and commercialisation of situation dependent mobile services fundamental conditions such as legal, technical and economical conditions have to be considered.

Legal Conditions: As providing situation dependent mobile services is closely connected with the collection, storage and interpretation of personal information, it is obvious that this kind of data processing has to be supervised by some kind of data protection act. Even if penalties caused by violation against laws do not mean an immediate economical threat for a service provider, it might cause customers to decline a service or a service provider (Enzmann et al. 2001). The Compass approach emphasises the customer's privacy and regards it as an influencing factor of success.

Technical Conditions: This category includes technical standards and specifications that are relevant for the exchange of data between the cooperation partners. While the internet provides a common communication infrastructure, the open questions are which interfaces to define between the involved participants and which format to use to convey the content.

Economical Conditions: As the providers of situation dependent mobile services are economically organised companies some kind of clearing has to take place for supplementary services. Especially, the value of the customer's situation data has to be clarified.

2 Compass – A Cooperation Model for Personalised and Situation Dependent Services

The Compass approach that is outlined in this paper defines a methodological framework to provide situation dependent mobile services cooperatively.

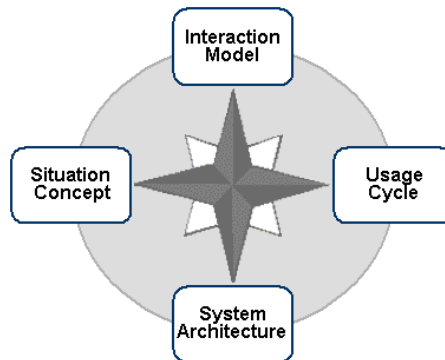


Figure 1 – The Compass Approach

The Compass approach integrates four major components (see Figure 1). Considering these components in a balanced way, is understood to be a critical success factor within the development of mobile services.

- The **Compass Situation Concept** structures the mobile usage context and makes the situation information accessible for the cooperative service production.
- The **Compass Interaction Model** describes the flow of services and information between the cooperation partners.
- The **Compass Usage Cycle** presents the process to provide situation dependent mobile services and describes several service types.
- The **Compass System Architecture** details the technical adoption of the situation concept and suggests an underlying system infrastructure.

In the following, each of these four components is covered in more detail.

3 The Compass Situation Concept

The Compass approach is based on the idea that the adoption of a mobile service according to the customer's situation 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.

Depending on the scope of interest, there are several definitions of the term "situation". For the development of SDS, it is sufficient to define a user's situation as all aspects that have a measurable influence on the individual, are measurable over mobile devices and are relevant for customising a service. Table 1 compares existing classifications focused on mobile as well as internet services with the classification proposed in this paper.

Hitz et al. (2002) distinguish four dimensions and use these to adapt web applications. The dimensions are significantly abutted to the demands of the technical infrastructure

for web applications. Scheer et al. (2002) differentiate four types of context that are almost similar to the dimensions proposed here. They regard the person dimension in more detail and distinguish between *Personal* and *Action Based Context* of a person. Their classification is solely used to outline context sensitivity and not to develop and improve SDS. Gessler and Jesse (2000) classify *Time*, *Location* and *Context*. Context is further subdivided into *User Context* (the user's characteristics), *Object Context* (other relevant objects nearby i.e. a restaurant) and *General Context* (other information for example weather). We believe that the *Object* and *General Context* do not directly belong to the user's situation but may help to identify the user's behaviour.

Table 1 - Comparison of Different Classifications of a User's Situation

Proposed here	Hitz et al. (2002)	Scheer et al. (2002)	Gessler and Jesse (2000)
- Time	- Time	- Time Context	- Time
- Place	- Location	- Local Context	- Location
- Person	- Terminal Equipment	- Personal Context	- User Context
	- Network Parameters	- Action Based Context	- Object Context
			- General Context

In this paper we propose to distinguish 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.

The **Compass Situation Concept** includes a three-step process to determine the user's situation for a mobile service:

- a) **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 network or terminal based solutions exist. By merging these information with the world time the user's **local time** can be calculated.
- b) **Interpretation:** On the basis of the situation determinants and by consulting additional data sources detailed information about the user's situation is derived.
- c) **Description:** The derived knowledge about the user's situation is then coded in a suitable mark-up language.

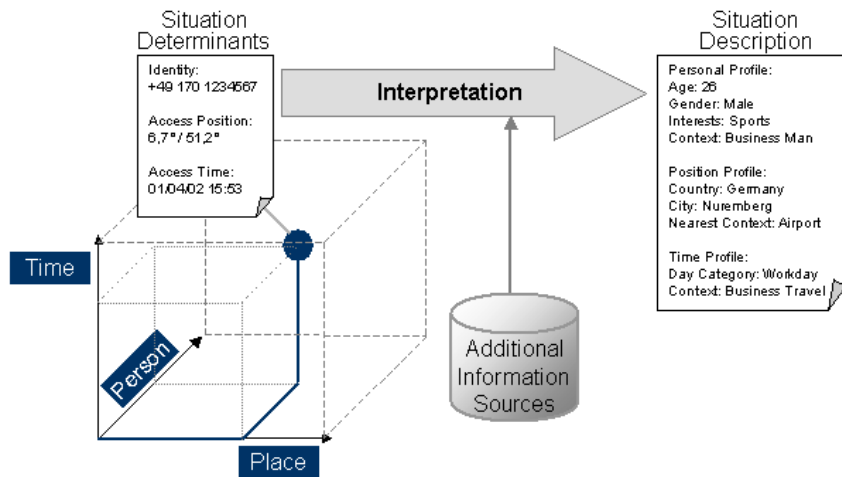


Figure 2 - The Compass Situation Concept

The situation determinants are used in the interpretation process to derive a semantically richer description about the user's situation. A good example is the interpretation of the degree of longitude and latitude of the geo coordinate into information about the country, the city or street. To do such an interpretation, additional information sources are needed.

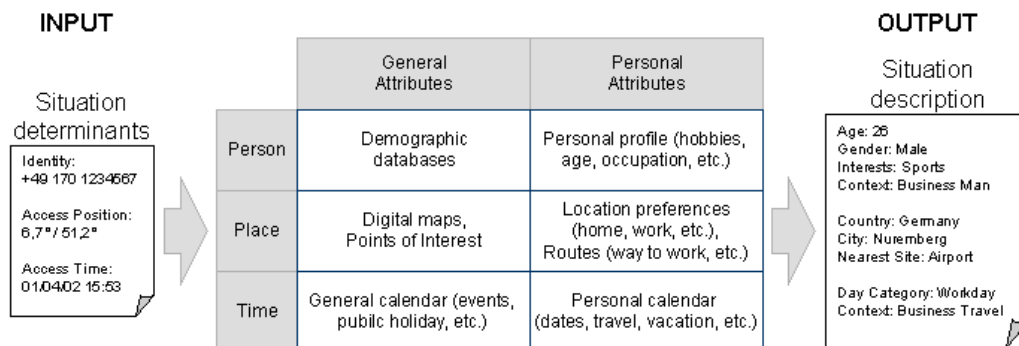


Figure 3 – Information Sources for the Interpretation of the Situation Determinants

An approach for structuring the required sources of information is given by the combination of dimensions and a degree of individualisation (Figure 3). The degree of individualisation is differentiated in general and personal attributes. The first include attributes that are valid for all mobile customers while the personal attributes depend on the individual. After the interpretation process the result has to be coded adequately into a situation description that can be exported in a document.

4 The Compass Interaction Model

The **Compass 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 (Figure 4). Information products are offered by the service provider, procured by the mobile network operator and paid by the customer. For physical products a logistic provider is involved for the physical transportation between service provider and customer.

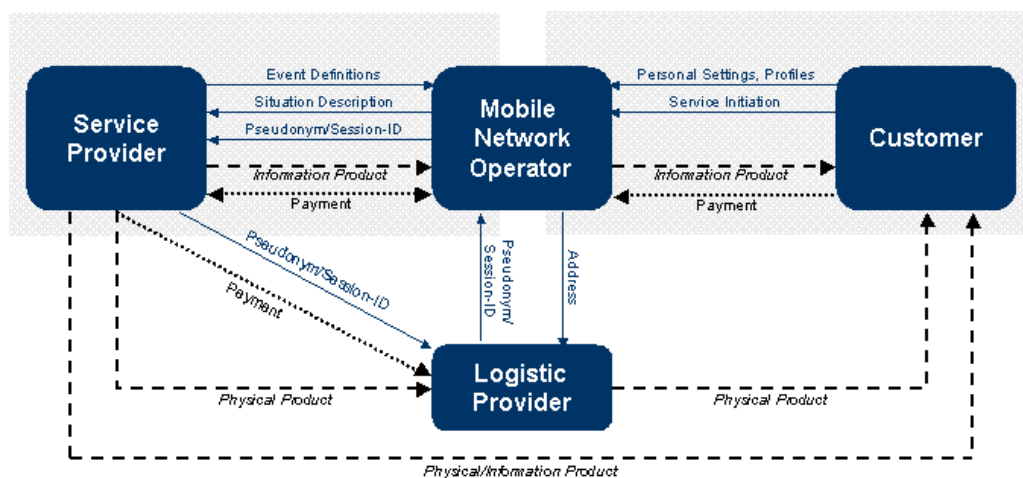


Figure 4 - The Compass Interaction Model

In the scope of the Compass Interaction Model, the mobile network operator takes an important 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. This platform enables the service provider to offer any service. The resulting central role of the mobile network operator is obvious. Thus, 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 party of trust, 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.

Typically, the used services are charged to the users mobile phone account bill. The mobile network operator may account the service fees to the service provider and a

revenue sharing can be realised. The possible tariff models and different possibilities for accounting the services are not discussed in this paper.

The mobile network operator is the only involved party, who 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. 2001) 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. A practical concept for ensuring the privacy is using alias or session-IDs instead of a personal ID.

If a service includes the transportation of physical products, the observance of anonymity – if necessary - is more difficult to assure. For this case the Compass Interaction Model includes a specific interface to a logistic provider.

5 The Compass Usage Cycle

The **Compass Usage Cycle** describes the main process steps for providing situation dependent mobile services and 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 analysing and evaluating them in continuous time steps.

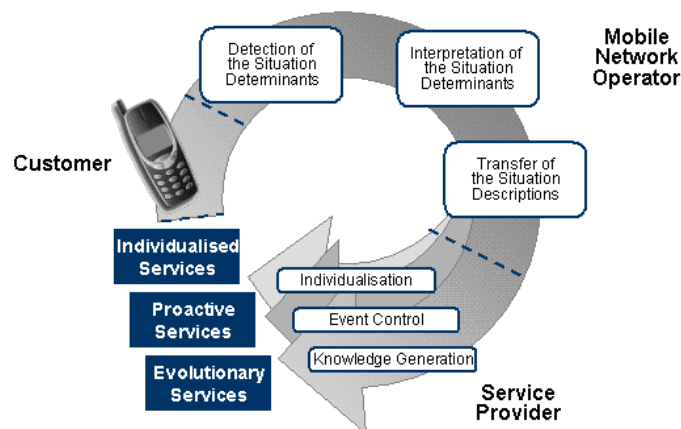


Figure 5 – The Compass Usage Cycle

Figure 5 illustrates the Compass Usage Cycle. The main process steps 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.
- **Individualisation of Mobile Services:** The service provider uses the situation description for the individualisation of user initiated services (pull 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 with a situation a proactive service is generated (push service).
- **Knowledge Generation in Mobile Services:** Knowledge generation for mobile services enables a long-term analysis, evaluation and extension of services.

The first two tasks have already been outlined. In the following, the remaining tasks of the Compass Usage Cycle will be discussed.

5.1 Transfer of the Situation Descriptions

After the situation description has been generated, an interface for the transfer to the service provider is needed. To ensure the protection of privacy, any information about the identity of the customer is removed and the situation description can be transferred in a pseudonymous or anonymous manner. The challenge is to reduce some of the elements without decreasing the significant information content. The following information elements have to be transferred: Pseudonym or session-ID, situation determinants as an atomic description of the situation and a set of interpreted information about the situation (e.g. town, customer age etc.).

Suitable interfaces must be defined for the transfer. For example the transfer of location data can use the *Mobile Location Protocol* (MLP) provided by the *Location Interoperability Forum* (LIF). As the situation description includes valuable information, several accounting models between network and service provider are imaginable.

5.2 Individualisation of Mobile Services

The individualisation of mobile services is a tool for customer orientation and the manageability of services. The adaptation of services should lead to a rising user acceptance. As introduced in the Compass Situation Concept, three categories of individualisation can be differentiated:

Adaptation referring to the Location: Services considering the location are well-known and Location Based Services (LBS) are discussed in literature sufficiently (Figge 2001, Ovum 2000, May 2001).

Adaptation referring to the Time: There is a wide spectrum from week and daytime up to an adaptation to individual dates including the social context.

Adaptation referring to the Person: Important components for an individualisation are preferences, profiles, knowledge and the interests of a customer.

5.3 Event Control in Mobile Services

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. This makes mobile services to a tool for the marketing of the future (Möhlenbruch & Schmieder, 2001). Regarding the legal aspects and Godin's permission marketing concept (Godin, 1999), a complete new dimension of services for customers and service providers is imaginable. To control the matching of predefined rules, the mobile network operator has to investigate predefined rules and the situation of the customers continuously. The service provider as well as the customer must be able to control (set, modify, delete and limit) the rules and any kind of notification functionality.

5.4 Knowledge Generation in Mobile Services

A service provider may use the historical data about customer transactions and the respective user's situation as a valuable source for an evaluation of their mobile services. Thus, he can conclude to the demographic properties, the regional allocation or many other attributes that help to enhance or upgrade a service. Additional tools may further assist the service provider to understand the intentions, purposes and the special needs of users in special situations better. 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.

6 The Compass System Architecture

The **Compass System Architecture** focuses on the implementation of the cooperation platform. The Compass components that have been conceptually outlined in the former chapters are discussed concerning the present realisation alternatives (Figure 6).

The Compass Usage Cycle is initiated by the mobile customer at the time he or she is trying to access a mobile service. The determination of the user's situation is the basic challenge to provide situation based mobile services. With positioning and identification technologies that are available in mobile networks it is already possible to retrieve the selected situation determinants. The mobile network operator is able to use these information to consult databases that might have their origin in *Customer Relationship*

Management (CRM) or portal activities. With these databases the situation determinants can be interpreted and semantically richer information derived. In the next step these information have to be conveyed to the service provider. Commonly, an *Extensible Markup Language* (XML) schema is used to define the structure and content of a data interface. All involved participants have to agree upon the necessary data interfaces before a concrete coding and transmission of a user's situation can be executed.

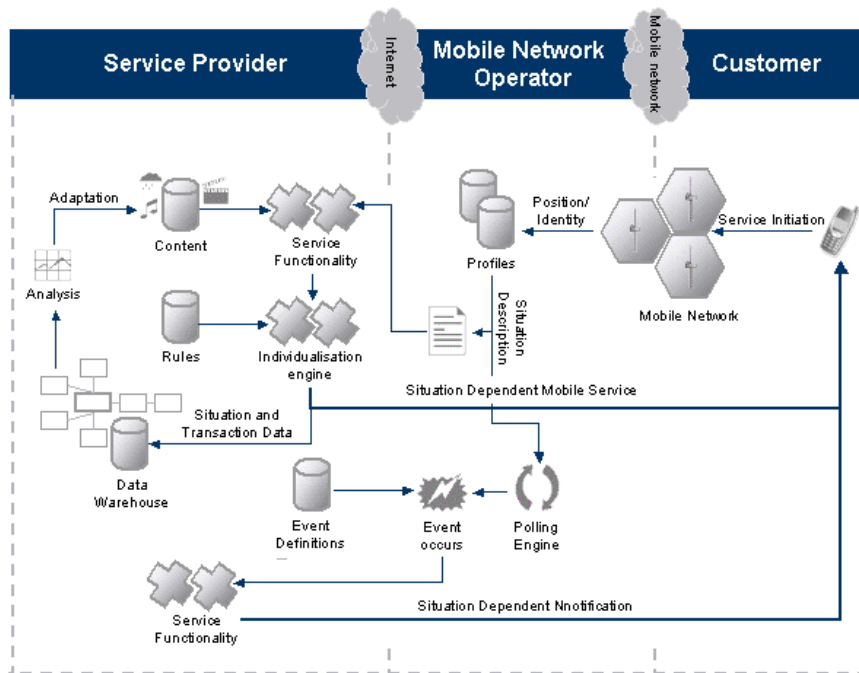


Figure 6 – The Compass System Architecture

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. 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.

The anonymity as the weakest reference still provides all potential of the situation concept. Additionally, the other two types of reference allow the service provider to adapt the service even more comprehensively. To transmit the real identity might be desirable if the customer already has a trusted relationship with the service provider and if settings and preferences are already stored within the service provider's scope.

To implement the individualisation of a service, the service provider may define a set of rules and use the so called rule based matching concept (Riemer & Klein, 2001) to specify and control the service's behaviour. If the customer has decided to reveal his or her identity or the pseudonym to the service provider it will be possible for the service provider to store and process profiles and transaction data.

The second approach to use the situation concept is to leverage the situation description to generate knowledge at the service provider. To do this, transactions done by the customer are related to their current situation description. That information is then stored within a data warehouse. With the analysis of this information through *Online Analytical Processing* (OLAP) or *Data Mining* tools (Böhlein, 2001) it is possible in the following to get a deeper understanding about the customers intentions and needs. On the basis of this information it is possible to redesign and enhance the service offering and make the service more successful.

7 Summary

Compass is a methodological approach that describes a conceptual framework and the fundamental requirements for a service platform to cooperatively develop and provide situation dependent services. In the authors opinions, cooperation platforms are one of the most important issues of research for mobile business. The added value generated by cooperation platforms may lead to an increasing usage intensity of mobile services and influence the revenue of service providers and mobile network operators positively.

This paper introduces Compass as a high-level framework. Future papers will discuss aspects of the methodological approach in detail. Although the Compass System Architecture discusses major implementation issues of a cooperation platform, the development of prototypes is already in progress to help verify the practicability of the outlined concepts.

Literature

Enzmann, M; Pagnia, H.; Grimm, R. (2000): Das Teledienststedatenschutzgesetz und seine Umsetzung in der Praxis. In: *Wirtschaftsinformatik 42*. Wiesbaden, Germany: Vieweg Verlag, 5/2000, S. 402-412

- Figge, S. (2001): Situation Dependent mCommerce Applications. In: Dholakia, R.; Kolbe, L.; Venkatesh, A.; Zoche, P. (Hrsg.): *Conference on Telecommunications and Information Markets Proceedings (COTIM 2001)*. Kingston, USA: University of Rhode Island
- Figge, S.; Schoedel, S. (2001): Architekturen für mobile Geschäfte. In: Witte, C.. (Hrsg.): *Computerwoche Extra*. München: Computerwoche Verlag, 8/01, S. 8-10
- Gessler, S.; Jesse, K. (2001): Advanced Location Modeling to enable sophisticated LBS Provisioning in 3G networks. In: Beigl, M.; Gray, P.; Salber, D. (Hrsg.): *Proceedings of the Workshop on Location Modeling for Ubiquitous Computing*. Atlanta, Georgia: <http://www.teco.edu/locationws/9.pdf>
- Godin, S.(1999): *Permission Marketing*.: Finanzbuch Verlag, München, Germany
- Hitz, M.; Kappel, G.; Retschitzegger, W.; Schwinger, W. (2002): *Ein UML-basiertes Framework zur Modellierung ubiquitärer Web-Anwendungen*. In: *Wirtschaftsinformatik 44*. Wiesbaden, Germany: Vieweg Verlag, 3/2002, S. 225-235
- Horstmann, R.; Timm, U. I (1998): *Pull-/Push-Technologie*. In: Koenig, W. (Hrsg.) *Wirtschaftsinformatik 40*. Wiesbaden, Germany: Vieweg, 3/1998, S. 242-244
- May, P. (2001): *Mobile Commerce – Opportunities, Applications, and Technologies of Wireless Business*. Cambridge, UK: Cambridge University Press
- Möhlenbruch, D.; Schmieder, U. (2001): Gestaltungsmöglichkeiten und Entwicklungspotenziale des Mobile Marketings. In: Heilmann, H. (Hrsg.): *HMD - Praxis der Wirtschaftsinformatik*. Heidelberg: dpunkt Verlag, Heft 220, S. 15-26
- Ovum (2000): *Mobile Location Services - Market Strategies*. London, UK: <http://www.ovum.com/MOBILE>
- Scheer, A. W.; Feld, T.; Göbl, M.; Hoffmann, M. (2002): Das Mobile Unternehmen. In: Silberer, G.; Wohlfahrt, J.; Wilhelm, T. (Hrsg.): *Mobile Commerce – Grundlagen, Geschäftsmodelle, Erfolgsfaktoren*. Wiesbaden, Germany: Gabler Verlag