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Abstract

Mobile technology offers a high potential to significantly transform the ways how a company can interact with their customers and even with own employees. In recent years researchers started to analyze those potentials from the perspective of customer relationship management (CRM) but mainly concentrated on traditional business-to-customer (B2C) relationships. The concept of collaborative CRM extends this view of traditional CRM to virtual organizations and networked businesses. While the concept of collaborative CRM has been discussed by several authors already, the impact of mobile technology is still open to research. This paper investigates the role of mobile technology in collaborative CRM based on existing research, scenarios and supporting systems. The goal is to increase insight about the current role of mobile devices such as smartphones or personal digital agents (PDA) in collaborative CRM business scenarios and the support of these scenarios by CRM systems. From the broad scope of collaborative CRM the focus of this research is on collaboration with customers. The findings show that current mobile scenarios merely incorporate the collaborative CRM concept and that CRM systems provide only basic functionalities for incorporating mobile devices in collaborative CRM processes.

Keywords: collaborative CRM, mobile technology, CRM system

1 Customers and collaborative CRM

There is a paradox in existing concepts on customer relationship management (CRM). While all posit to increase customer orientation, the customer himself and influencing business partners are often left out of the solutions. Among the examples are traditional sales force automation (SFA) solutions which target the sales force and CRM systems which have been implemented without involving

the end customer (Rigby et al. 2001, Alt and Puschmann 2006). Usually, customer contact is conducted using surveys, outbound call center contacts, online interactions via portals, and the field staff. In comparison, technologies such as RFID or Bluetooth technology and mobile devices such as personal digital assistants (PDA) and smartphones are different, but they have the potential for enabling a closer interactions with customers (Alawairdhi et al. 2008, Atkins et al. 2006, Nori 2007). Although companies have identified the potential of mobile technology and started to incorporate them into their business models, only few of them have used the wireless technology to actively improve and tighten their customer relationships. The full potential is still unknown and target of current research. Meanwhile the world of mobile devices is changing at an ever increasing pace (e.g. larger bandwidth, better usability, reduction of production costs as also provider fees) and generates continuously new possibilities.

The concept of collaborative CRM can broadly be conceived as collaboration between one or more value chain actors (e.g. suppliers, partners, customers and further external actors such as e-markets) to achieve more customer benefits and to improve customer relationships. While collaborative CRM is still a blurred concept in itself, including mobile technologies has attracted far less attention by researchers despite an integrated view seems promising. Mobile devices do not only offer interactions with customers at any place and at any time (Smith 2007) but from the perspective of collaborative CRM they also offer the opportunity for closing the customer lifecycle, involving the customer in business processes and added value in serving him (Kadyté 2005). On the other hand topics such as data security, privacy and consumer rights require more attention than in traditional CRM processes and overloading customers with unsolicited information needs to be avoided.

In view of these opportunities this research will investigate the role of mobile technologies in real-life business scenarios from the perspective of collaborative CRM as well as to assess the contribution of CRM systems to the realization of similar scenarios. This approach connects constructs from different research domains, but targets a topic that has received only little attention from researchers so far. Therefore the research undertaken in this paper is of an exploratory nature. It first reviews the goals of CRM and CRM systems and analysis the field of collaborative CRM as well as the current application of mobile technology in collaborative CRM. Second, based on this literature review a framework is suggested for assessing the scope of mobile technology and collaborative CRM. This framework is applied on several real-life scenarios. Third, a selection of CRM systems from different market segments and their support of mobile technology are explored. The paper concludes with an overview on potential benefits of mobile devices in collaborative CRM, current application areas and the available technology support in CRM systems as well as some future scenarios and research suggestions.

2 Mobile devices in collaborative CRM

2.1 CRM and CRM systems

CRM can be defined as a 'process that utilizes technology as an enabler to capture, analyze and disseminate current and prospective customer data to identify customer needs more precisely and to develop insightful relationships' (Paulissen et al. 2007). It entails all aspects of relationships a company has with its customers from initial contact, pre-sales and sales to after-sales, service and support (Makatsoris and Chang 2008). One of the main success factors is the appropriate and cost-efficient maximized satisfaction of customer needs (Rigby et al. 2001, Paulissen et al. 2007). Prerequisites are an extensive knowledge about the customer needs as well as the appropriate positioning of product and service offerings within the customer lifecycle (Ives and Learmonth 1984). This requires a careful alignment of all interaction activities to the demands of each *buying cycle* stage (Osterwalder and Pigneur 2003, Muther 2002) in the customer process (Österle 2001). The overall enabler for CRM is information and its utilization. Detailed information about customers, previous interactions, experiences and future expectations is essential for the delivery of satisfying offers in cost-efficient ways. The acquisition and usage of this knowledge in customer interactions is a key element in CRM concepts, such as multi-channel-management (MCM), customer interaction centers or communicative CRM.

CRM systems are one element for the implementation of CRM concepts. Among their typical functions are the *support of CRM core processes* (Berger et al. 2009) on an operational and analytical level as well as the *integration into internal application environments* (e.g. ERP, EC-systems) *and customer interaction channels* (e.g. MCM). CRM systems traditionally cover process support in the areas of marketing, sales and service with dedicated functionalities for information aggregation (e.g. customer history) and process specific presentation (e.g. installed base and service history in service helpdesks). They enable companies to *identify particular customers* after their initial registration regardless of the interaction point and to provide *individualized services*.

In recent years, the success of companies, such as Proctor & Gamble (Kracklauer and Warmbrunn 2004) or Nike (Piller 2007), with strong collaborative elements in their business models has added a new perspective to CRM concepts. They have shown that more intensive collaboration between value chain actors can be one answer to meet customer expectations in a holistic way that are also difficult to imitate by competitors (Ehret 2004). This collaborative approach in relationships was additionally boosted by the concept of Web 2.0 (O'Reilly 2005) that promoted among others the concept of involving customers into the product design, creation as well as sales and marketing process. Research indicates that inter-organizational as well customer involving collaboration across the boundaries of individual firms is one evolution trend in CRM (Romano and Fjermestad 2003). Currently researchers try to embed these ideas into the CRM concept as well as to suggest corresponding system functionalities (Enrico 2007, Greenfield 2008, Roche 2008, Fux et al. 2007).

2.2 Collaborative CRM

The notion of collaborative CRM is still in discussion and has two interpretations that are often mixed (Reinhold and Alt 2008). The first is closely connected with communicative CRM and focuses on interaction channels (e.g. phone, fax, e-mail,

self service portals) between a company and its direct customers. The second extends the CRM concept on the level of value chains and business networks. This approach consolidates concepts of networked organizations and marketing to enable the creation of customer relations and value at a network level by sharing or pooling of network resources and capabilities (Kracklauer et al. 2004, Ehret 2004). It *enables producers, distributors and service providers* to extend their customer acquisition, retention and development beyond their company borders and even to *involve the customer* directly. But the creation and provision of collaborative offerings demands from the involved collaborators an interconnectivity of service and products as well as an *integration of involved processes*. The term collaboration as well implies that these entities work together to achieve a common goal. Customers in this context can be the external targets of collaborations but also participators in collaborative CRM processes. The latter case is closely connected with the introduced Web 2.0 concept. It requires *interactivity in interactions* during the whole customer buying cycle. All of these collaborative relationships must in addition *provide visible benefits* to each collaborator so that a continuous engagement can be ensured and the value of the collaborative work can be measured by each collaborating partner (Dunn 2005).

Due to the short history of research in collaborative CRM the body of knowledge is still fragmented. So far, the most attention was directed to identifying and utilizing business opportunities within customer-oriented processes or methods such as customer segmentation or product bundling (Rocks et al. 2005, Wirtz et al. 2004). Previous research has also shown that advanced inter-organizational business processes require dedicated IT infrastructures (Österle et al. 2001, Vervest et al. 2005, Rodon 2007). Several assessments of collaborative CRM cases have resulted in first insights of strategies (Kracklauer et al. 2004, Vervest et al. 2005), processes (Geib et al. 2006), organizational and technological requirements (Geib et al. 2006, Reinhold and Alt 2008), risks and opportunities (Ehret 2004, Kracklauer et al. 2004) as well as affected relationships (Ehret 2004, Kracklauer et al. 2004, Weber 2001).

2.3 Mobile technologies

Mobile technology is closely connected with ubiquitous computing and covers a broad technological spectrum from RFID, mobile communication devices to autonomous robots (Lyytinen and Yoo 2002, Smith 2007, Kalakota and Robinson 2001). This research draws the attention on mobile communication devices such as smartphones or PDA's with extended functionalities such as for cross media communication or global positioning system (GPS) access. Their impact on business processes and the ways of conducting business has been analyzed from numerous perspectives so far, for example on business processes in general (Fano and Gershman 2002), supply chain management (SCM) (Teck-Yong 2006), value networks (So and Chung 2005) or in relation between technology and business service (Carlsson et al. 2005). With regard to CRM *unique device characteristics* such as mobile network access points, customer interaction points, smart personal computers or tracking devices (Kalakota and Robinson 2001) seem to have the potential for enhancing collaborative CRM processes (see Figure 1). The devices can be used to accelerate processes by allowing location independent access to information resources as well as systems and to change the way *how companies interact with their customers*. They can be used to replace personal communication, help to easily identify the customers at any time and even to

determine a physical location as well as condition via GPS, network access point or near-field communication (NFC). But it has also become clear that the value of mobile technology should not be overestimated. Real benefits can only be achieved if mobile technology is implemented within the business logic and an appropriate technical infrastructure (Kalakota and Robinson 2001, Kadyté 2005). The embedment of mobile devices into business processes should therefore be accompanied by a business process redesign that makes careful use of the unique characteristics of mobile devices and *delivers additional value to customers* (Reuver et al. 2008, Tarasewich et al. 2008). Otherwise the potential users or customers will not accept them because of the drawbacks that mobile devices also imply (Gebauer 2008). Users may not only feel always contactable and traceable but also do network and sometimes service providers charge *significant fees*.

Functionality	Mobile device
Mobile network access point	Provides location independent and ubiquitous access to information, systems and services as well as various features to interact with them
Customer interaction point	Enables to identify the mobile users by the device ID, telephone number or stored codes and to access individualized services
Smart personal computer	Offers a mobile data storage as well as a platform for application to store and process data
Tracking device	Enables determination of real-world locations as well as provision of location based services

Figure 1: Unique mobile devices characteristics for collaborative CRM

In addition, mobile devices constitute *four basic functionalities* (see Figure 2) to CRM strategies. Phone communication services offer the easiest way of communication and collaboration but are cost-intensive (e.g. skilled contact persons are necessary for communication) and availability can be limited (e.g. working hours). They also offer access to automated service such as interactive voice response for automated routing of customers to skilled employees or to activate a call-back. Messaging functionalities use SMS or MMS and are cheap to realize but also insufficient for time-critical or interactive communication about complex issues. They can be used by messaging services for one-way information delivery or for simple dialogs with automated services based on standardized messages (e.g. request of account balances). Advanced mobile devices open their operating system for the execution of external applications and processing of data. This functionality can be used by mobile applications, but their development can be expensive and implies the risk of incompatibilities with other systems. Connections to the internet or mobile networks have become important in recent years because the bandwidths have significantly increased while the associated costs have decreased. This functionality offers access to web-based information via mobile portals, to participate in business processes via the portal services as well as to synchronize mobile client-server applications.

Functionality	Mobile device
Phone communication	Offers the basic telephone function for direct communication and to use call-back or interactive voice response services
Messaging	Is able to receive and send text or multimedia messages (SMS/MMS)
Operation platform	Platform for mobile applications (e.g. java applications) and to access additional equipment (e.g. printers, storage cards)
Internet access	Access to specific WAP sites, optimized web content for mobile usage or normal internet-content via mobile browser

Figure 2: Basic functionalities of mobile devices (Smith 2007)

2.4 Lessons learned from literature review

Recent research on CRM and collaborative CRM indicates an increasing need for collaborative processes between customers and companies in CRM to ensure a high customer orientation as well as satisfaction in the future. The incorporation of mobile technologies into CRM system technology is one option to achieve this goal. Through it, a transformation from traditional unidirectional interaction behavior in CRM processes to collaborative bi-directional CRM processes becomes possible. The results can be a higher alignment of business offerings with customer needs, optimization of internal business processes with customer feedback and an increased customer satisfaction with the delivered services.

But the literature review reveals as well significant gaps when attention is given to how these ideas can be realized. Despite the large body of literature on CRM, collaborative CRM has received only little attention. Beyond the strategic perspective of collaborative CRM more knowledge about the benefits and risks, implementation in business scenarios and required technology support seems necessary. The application of mobile devices in business scenarios has attracted more attention but still remains challenging in practice (Carlsson et al. 2005). This originates not only from the novel technology but also the little experience gained from real-world implementations and what potentials the technology offers at all. A common conception how mobile devices will change CRM and what topics need to be considered in mobile CRM strategies has to develop yet. Currently they are mainly perceived as contact channels or mobile operation platforms that are used to contact customers, to enhance the customer self-service and to support sales or services representatives outside of the company. The potential as enabling devices for collaborative relationships between business and customers needs to be investigated further.

In summary, mobile devices with their unique characteristics seem to offer the opportunity to enhance collaborative CRM by increasing the level of interactivity in relationships, integration and cooperation between business partners as well as customers and to enable ubiquitous information flows. This could bring business scenarios closer to the 24x7, anytime, anywhere vision (Kalakota and Robinson 2001).

3 Mobile devices and collaborative CRM in business scenarios

3.1 Research framework

For the assessment of current real-life business scenarios and how they use mobile devices to support collaborative CRM a framework was designed. The included

dimensions and characteristics were derived from the literature review (CRM, CRM system, collaborative CRM and mobile devices) and extended with an additional dimension to capture potential customer benefits. **Napaka! Vira sklicevanja ni bilo mogoče najti.** shows the complete framework, the dimensions and their characteristics. This framework was applied on several mobile business scenarios in the field of marketing, sales and service. These scenarios were selected by a web research about companies within the German market that offered customer centric services for mobile devices. They were required to feature a mobile portal and to support at least one stage in the customer buying cycle (Osterwalder and Pigneur 2003) with a mobile service. The final set of scenarios as well as brief description can be found in Figure 3. For the in-depth examination of the mobile services a set of mobile devices was used as well as available whitepapers, mobile demonstrators and company presentations. Based on the identified support of each proposed collaborative CRM characteristic in the scenario the test result was chosen from a three level scale indicating no visible support ▢, partial support ◖ or support of similar characteristics and virtually full support ●.

Business Case	Overview
Deutsche Bahn AG (German Railways) http://mobile.bahn.de	Leading passenger and logistics company in Germany and operates in 150 countries worldwide. Their core businesses are passenger transport, transport & logistics and infrastructure & services. They apply mobile devices as additional sales and customer information channel. For online usage a mobile portal is available. Similar to offline application a user can access the navigation services, retrieve information about connections or track works and book mobile tickets. To accelerate this mobile booking procedure it is possible to store preferences via the regular non-mobile portal of German Railways. The ticket is delivered via a MMS that contains a 2D icon with the encoded ticket information. It can be offline verified by a conductor via a special scanning device. Currently an additional mobile ticket is in development (Touch&Travel) that uses near field communication technology (NFC) to identify the distance a customer has traveled via scanning devices at each train stations. The final price calculation and accounting is based on the travel distance and billed monthly. For offline use on mobile devices the DB Rail navigator software is available. With this software a user can analyze connections, create and save personal travel routes, access additional information about railway stations (such as facilities and station layouts) and synchronize travel information with other office tools (e.g. MS Outlook). Upon permission the application can synchronize its data as well as access the Internet. This enables a user to purchase tickets and to retrieve the latest information about trains and connections. If the mobile device has GPS access the user can also use a navigation service (e.g. for finding the way to next railway station).

DM Drogeriemarkt http://www.funaufladen.de	They are one of the leading drug store chains in Germany. They adopt mobile devices mainly for mobile marketing. Their target users are rather young and mobile device affine customers. The devices are used to inform customers about special offers, to deliver so-called mobile coupons and marketing products such as free SMS as well as custom ring-tones or wallpapers. A users must initially register for the program (dm-SMS-service) to regularly receive coupons and use the other services . A mobile coupon B1is a SMS that informs a customer about a new personal offer (e.g. reduced price for a certain product) that is available for him. Customers still must later print out the usable coupon at a service station in a DM market or at home via a special portal (http://www.funaufladen.de) because the coupon works with a common barcode.
Deutsche Post http://m.deutschepost.de	Largest provider of postal services in Germany and part of Deutsche Post World Net. Mobile devices are primarily used as information and recently also as sales channel. Customers can use a mobile portal (http://m.deutschepost.de) to access most mobile services. These services include search functions for retail outlets, postal codes, information about prices and formats as also functions for the mobile creation of letters and postcards. In addition links to mobile services from other subsidiaries of Deutsche Post World Net (e.g. shipment tracking with DHL and mobile banking with Postbank) are available. The mobile creation of letters and postcards features the customization of templates, upload of own templates as also mobile payment and shipping order. The mobile portals also introduce Handyporto postage but this service is solely used via the exchange of SMS. A customer has to send a SMS that contains a keyword (e.g. card or letter) to a service number and will automatically receive another SMS with a 12 digit code. This code must than be written at the postcard instead of placing a stamp.
DHL http://mobile.dhl.de	Is a world-wide operating logistic provider and also part of Deutsche Post World Net. Mobile devices are primarily used as an additional information channel. Via a mobile portal customers can track shipments, search for automated service stations (Packstation) and classical post offices as well as pricing information. The fully automated Packstation enables a customer to place and receive shipments nearly 24h a day. The stations are an alternative to the personal delivery process to every household as well as to regular service stations. Customer who wants to use the station must separately register and specifically direct the shipments he wants to receive to this station by providing the station and his authentication number as receiving address. If the user provides a mobile phone number during the initial registration process he will receive a SMS if new shipments have arrived as well as information about special offerings (e.g. reduced prices, free shipments). It is planned that in the near future the GPS functionality of mobile devices can be used to identify the position of customers and to display nearby services stations, mailboxes and offices as also to buy stamps.

Postbank	Postbank is a financial service provider in the German market. For mobile services a mobile portal, mobile applications and services based on messaging services are provided.
http://mobile.postbank.de https://ibanking.postbank.de	The mobile portal offers a search function for cash and service points, to request mobile transaction numbers (mTAN), a mobile banking solution (mBanking) that features most of the non-mobile online account functions, to use a feedback form and a mobile brokerage function with whom courses can be accessed and stocks can be traded. The mTAN and alert functions are executed with messaging services. Upon request a user will receive mTANs for certain transactions. Alerts for the alert functions must be specified (e.g. if a transaction arrived, certain operations were performed with the account) within the mBanking websites (mobile or non-mobile). Afterwards the user will receive a SMS if the conditions of such an alert occur. In addition to the portal based mobile banking service a special portal is available for iPhones with an optimized user interface.
	For mobile phones, smartphones and PDA's a mobile application (StarMoney Mobile) for offline mobile banking can be purchased.
Lufthansa	Lufthansa is a world-wide operating airline and partner of the Star Alliance. They use mobile devices as information, sales as well as service channel.
http://mobile.lufthansa.com	In addition to the traditional information of customer about flight changes or delays via SMS if the customer has provided a mobile phone number during the booking procedure a mobile portal with various services is available. It provides information about arrivals, departures and timetables as well as flight-related services such as current travel information, a lounge directory, baggage regulations with the option to trace own baggage and links to external mobile services from business partners such as public transports, airports, railway operators and hotel booking sites. Customers can book flights via the mobile portal, perform the check-in procedures and access their profile related information at the loyalty program "Miles&More". Customers can also use a mobile boarding pass and a SMS check-in option. The boarding pass is transferred via SMS or e-mail and contains a link to a mobile website that holds a 2D icon that is used for authentication during the boarding procedure. The mobile offering is supplemented by some entertainment services such as brand related ringtones, wallpapers and screensavers.
Aral	German chain of petrol stations and part of the BP Group. They use mobile devices solely as information channel for any interested user without individualized services for own customers.
http://mobile.aral.de	The provided mobile portal enables customers to access information about specific station prices, the station services, company news, campaigns and loyalty program offerings, city maps, traffic jams as well as nearby hotels, restaurants or parking sites. It is also possible to use a route planner that calculates and visualizes a route between a start and end position.
	In addition a driver's logbook is available as offline application. Users can enter the travel related data and the application automatically adds statistical information (e.g. average petrol consumption).

Figure 3: Summary of analyzed business scenarios

3.2 Findings

The analysis in **Napaka! Vira sklicevanja ni bilo mogoče najti.** confirms the advancing usage of mobile devices in relationships between companies and their customers as well as the formation of new mobile device enabled business processes. Current practitioners seem to attribute the highest potential to sales related processes as the support of purchasing activities is pivotal in most scenarios. Although processes in the awareness, evaluation and after-sales phase are supported as well, they offer hardly more than self-service information pools.

No scenario covers all buying cycle stages and the integration with CRM core processes is differing between a large extent (Deutsch Bahn and Lufthansa) and no visible integration (Aral).

The integration of the mobile channel into existing CRM infrastructures and its alignment with other channels differs in all scenarios. On one hand scenarios like Lufthansa and Deutsche Bahn show a deep integration with customer data from other channels as well as into back-office processes and on the other hand scenarios like Aral or Deutsche Post are integrated with back-office process but not individualized for customers. Although the more complex mobile scenarios require a detailed customer profile they do not show always a higher level of individualized services.

Mobile services are primarily offered via mobile portals and messaging services. Only few offer dedicated mobile services that enable the customer to retrieve individualized information or to initiate or participate in processes such as booking a flight or using a mobile ticket. Messaging services are used to deliver information that must be accessible without access to the Internet (e.g. mobile ticket, identification codes, process status information) or that represent a delivery to a customer (e.g. mobile applications, mobile content). Mobile applications are hardly offered what implies that most of the services require an active connection. The devices are mainly used to offer an additional 24h accessible customer interaction point and sometimes to identify the user as a customer via mobile identification codes. Other features of mobile devices such as GPS functionality or NFC are barely used. Mobile services generate in nearly all scenarios transaction cost but no further fees. DM offers free SMS to his customers for customer initiated interactions.

The analyzed scenarios show a low level of collaboration and the characteristics of mobile devices are scarcely used to raise this level. Even though an inclusion of customers in CRM information flows and early signs for the involvement in CRM process flows is apparent, from the perspective of collaborative CRM, the collaboration between actors is still underdeveloped. The mobile devices are mainly used as channels for the passive provision of information to customers or as access points to mobile version of existing web-portal content or desktop applications (e.g. mobile banking). Only few scenarios, such as German Railways or Lufthansa, make explicit use of the devices unique characteristics and enhance their processes with them and to deliver additional value for customers. These scenarios show as well early efforts to incorporate services from business partners to cover a larger part of the customer process. But this form of using the mobile device as a collaborative customer interaction point seems to be in a very early development phase. Even though applications such as iGoogle (Google 2009b) or Xsmart (Xsmart 2009) and loyalty programs such as Payback or Miles&More illustrate how services from different providers could be aggregate in one mobile portal or device to create collaborative customer dialogs and offerings as well as to link customer interactions of different provider. Currently the analyzed scenarios offer little more than links to other related mobile services. Despite this, it is remarkable that often applications or services offered that are unrelated to any customer processes and can scarcely be seen as incentives stimulating future purchases. Sometimes those offerings are brand related (e.g. wallpapers for mobile devices) but more common are generic offerings such as ring-tones, free mp3-downloads or free SMS-bundles.

Dimension		Characteristics and subsets	Deutsche Bahn	DM	Deutsche Post	DHL	Postbank	Lufthansa	Aral
CRM and CRM-systems	Focus on customer buying cycle stage	Awareness	◐	●	○	○	○	●	●
		Evaluation	○	◐	◐	○	◐	●	◐
		Purchase	●	○	●	◐	●	●	○
		After-Sales	●	○	●	◐	●	○	○
	Relevance for company CRM core processes	Market/Potential analysis	◐	◐	○	○	◐	◐	○
		Contact management	●	○	●	○	◐	●	◐
		Individual sales	●	○	◐	○	◐	●	○
		Channel assignment	●	○	●	○	◐	●	○
		Sales prospects management	●	○	◐	○	◐	●	○
		Campaign management	○	●	○	◐	○	●	○
		Customer analytics	◐	◐	○	○	◐	○	○
		Loyalty management	●	●	○	●	○	○	○
		Customer service	●	○	●	●	●	●	●
		Feedback management	○	○	●	○	○	○	○
	Channel and back-office integration	Mobile services are integrated with back-office processes (e.g. accounting) and application services	●	●	●	◐	●	●	◐
		Mobile channel is synchronized with other customer interaction channels	◐	●	○	◐	●	◐	○
		Multiple channels are necessary to use one mobile services	●	●	○	◐	●	○	○
	Individualized processes and services based on the customer relationship	Processes are individualized with available customer profile information	●	●	○	○	◐	●	○
		Communication is personalized based on the relationship history	◐	●	○	○	◐	◐	○
		Automated customer interactions	●	○	●	○	●	●	○
	Registration method for later customer identification in mobile business processes	Customers must authenticate (e.g. credit card) to use some of the mobile services	●	○	○	○	○	●	○
		Customer must have a CRM profile account to use some of mobile services	●	●	○	●	●	○	○
		Customers must separately register for the mobile service	◐	○	○	○	●	○	○
Collaborative CRM and mobile devices	Collaboration of business partners and/or customers in the scenario	Collaboration between service provider and customer	●	○	○	○	●	●	○
		Service incorporates service of intra-firm providers	●	○	●	●	●	◐	◐
		Service incorporates mobile service of external providers	◐	○	○	○	◐	●	◐
		Services support interaction between customers	○	◐	○	○	○	○	○
	Customer interaction through the whole customer life cycle	Collaboration in business processes (e.g. multi-step product specification)	◐	○	●	○	◐	●	○
		Customers can initiate interactions	●	○	●	○	●	●	○
		Service providers can initiate interactions	○	●	○	◐	○	◐	○
		Automated information exchange (e.g. standardized forms, automatic information processing)	●	○	●	○	●	●	○
	Provision of integrated customer services from collaborating business partners	Access to location and process relevant information from several collaboration partners	◐	○	◐	○	○	◐	●
		Ubiquity of information flows from different channels and collaboration partners	◐	○	◐	○	○	○	◐
		Services from different providers are connected in one holistic service for customers	●	○	○	○	○	◐	◐
	Support of basic mobile functionalities	Mobile portals	●	○	●	●	●	●	●
		Mobile applications	●	○	○	○	●	○	●
		Messaging services	●	●	●	●	●	●	○
		Provision of phone numbers for direct contact	●	◐	○	◐	●	●	○
	Utilization of unique mobile devices characteristics	Interaction point during whole customer buying cycle	●	◐	◐	◐	●	●	◐
		Device or stored data is used to identify a customer	●	◐	○	○	◐	●	○
		Use of mobile storage in business processes	●	◐	◐	○	●	●	○
		Provider for location based services	◐	○	○	○	○	◐	◐
		Device is used to determine the location of the user	◐	○	○	○	○	○	○
	Degree of communication interactivity	Display of information	●	●	●	●	●	●	●
		Uni-directional communication	●	◐	●	●	●	●	○
		Interactive communication	●	●	◐	○	●	●	○
	Generated costs for mobile service users	Every usage of a service can produce additional fees	○	◐	◐	○	◐	○	○
		Mobile services requires a subscription with regularly fees	○	○	○	○	○	○	○
		Generates transaction costs with mobile carrier	●	◐	●	○	●	●	●
Benefits for Customers		Ubiquitous interaction points with service and product providers	●	○	●	◐	●	●	○
		Accelerated and location-independent processes	●	○	◐	●	●	●	○
		Influence on process outcome or service configuration	◐	○	◐	○	●	◐	○
		Customer can easily identify himself with his mobile devices in a CRM process	●	○	○	○	○	●	○
		Provided services are context and location sensitive	◐	○	○	○	○	○	○
		Interaction with several business partners during one customer process	○	○	◐	○	○	◐	○

Figure 4: Evaluation Framework

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Benefits for customers that have been realized in the scenarios are in the field of ubiquitous customer interaction points by using mobile portals, the ad-hoc provision of their customer profile and authentication in business processes with the usage of messaging services. An acceleration of traditional processes is also visible but in most cases only if messaging services make interaction with human personal obsolete (e.g. check-in at airports, buying a ticket). The possibility of using mobile devices to completely automate a customer process (e.g. mobile tickets with mobile validation, earning and spending loyalty program bonus points with mobile devices) or to interact with a customer during the product specification process (e.g. reconfiguration of a holiday trip additional offerings when the customer is already on the trip) are not widespread. Therefore a customer has only little more influence on the process outcome. The technology and necessary applications such as SMS/MMS scanners for receiving information from any kind of mobile devices (Xsmart 2009), applications that can extract or recombine travel information from different messaging types (Tripit 2009) or services that enable to identify the position of a standard mobile devices very accurately without GPS extensions (Google 2009a) are available but it seems that companies hesitate to make use of them. At least very rare is the provision of context and location sensitive mobile services as well as the possibility to interact with different services providers through one customer process (e.g. to book a flight as well as a hotel or car at the destination without re-entering all necessary information).

4 Mobile scenario support through CRM systems
4.1 Evaluation framework

As the previous analysis illustrates, the starting point for mobile scenarios that support collaborative CRM is the ability to identify mobile users as specific customers or their belonging to a specific customer segment. With this premise the offering and transferring of individualized services becomes possible. But this requires an integration of mobile channels with CRM infrastructures that hold the information about customers and that are used to adjust all channel activities. More advanced CRM systems may in addition offer process design tools that allow for an easy inclusion of mobile devices and functionality in CRM processes. Some scenarios may also require a release of certain CRM system functionalities (such as mobile entry of sales data, simulation of pricing alternatives, access to services cases and the customer installed base) to customers or distribution partners and their mobile devices.

Based on these derived assumptions from the findings in chapter 3 an evaluation framework was defined and applied to CRM systems with the aim to capture the support of mobile scenarios through these systems. Those systems were selected as representatives for each market segment (small, mid and enterprise business size) in B2B and B2C relationships. In addition to these traditional CRM systems three stand-alone solutions with dedicated functionalities for B2C mobile channels were included. All systems are briefly characterized in Figure 5. The framework consists of three dimensions that cover the target users that are addressed with the support of mobile devices as well as what processes and features are supported for internal use through employees and external use through customers. The evaluation was conducted with information from product whitepapers as well as freely available test versions.

System provider	System category	Market segment	Relationship focus	Company website
Salesforce	CRM	small to upper market	B2B, B2C	www.salesforce.com
SAP	CRM	mid to upper market	B2B, B2C	www.sap.com
Microsoft	CRM	small to upper market	B2B, B2C	www.microsoft.com
Selligent	CRM	mid to upper market	B2B, B2C	www.selligent.com
Sugar CRM	CRM	small to mid market	B2B, B2C	www.sugarcrm.com
Siebel/Oracle	CRM	mid to upper market	B2B, B2C	www.oracle.com/siebel
Update	CRM	small to mid market	B2B, B2C	www.update.com
Xsmart	Mobile Channel	small to upper market	B2C	www.xsmart.ch
Sevenal	Mobile Channel	small to upper market	B2C	www.sevenval.com
Arvato Mobile	Mobile Channel	small to upper market	B2C	www.arvato-mobile.com

Figure 5: System characterization

4.2 Results of system analysis

The analysis in Figure 6 reveals a significant gap in functionality and process support between the classical CRM systems and the specialized systems. Although classical systems offer customizable web access options that are integrated with the CRM core processes as well as data (customer access rights, customizable portals or micro-sites) these functions are not optimized for usage by customers and mobile devices (screen size, offline access, MMS micro-sites). Their functionality is primarily focused on mobile CRM access for employees and with limitations for trading partners. Functionalities for customers and their mobile devices are very rare. Even though the necessary technology is sometimes integrated in the CRM system (e.g. Siebel uses SMS/MMS to inform employees about new customer information) it is not applicable for the customer interaction process. This gap is filled by specialized mobile CRM providers like Arvato or Sevenal. These providers offer a broad spectrum of components for supporting CRM processes through the mobile devices of customers. Currently these providers seem to focus on mobile marketing (e.g. mobile content, mobile portals, SMS/MMS interaction) and mobile sales (e.g. mobile tickets and mobile purchases). The support of location based services and features seem less developed in all systems.

Dimension		Characteristics and subsets	Salesforce	SAP	Microsoft	Selligent	Sugar CRM	Siebel/Oracle	Update	XSmart	Sevenval	Arvato Mobile
General system characteristics	Target user groups	Employees	●	●	●	●	●	●	●	○	○	○
		Distribution channels	◑	◑	○	◑	○	◑	◑	◑	◑	◑
		Customers	◑	◑	◑	◑	○	◑	○	●	●	●
	Target users for mobile CRM features	Business-to-Business (B2B)	●	●	●	●	●	●	●	○	○	○
		Business-to-Customer (B2C)	◑	◑	◑	◑	◑	◑	◑	●	●	●
		Customer-to-Customer (C2C)	○	○	○	○	○	○	○	○	○	○
	System features	Web front-end	●	●	●	●	●	●	●	◑	◑	◑
		Offline installation possible	◑	●	●	●	●	●	●	○	○	○
		Server installation required	○	◑	◑	◑	◑	◑	◑	●	●	●
		Versions for mobile operation systems are available	●	●	●	●	●	●	●	●	●	●
	Mobile technology support	Integrated support of messaging service (SMS/MMS)	◑	○	○	○	○	●	○	●	●	●
		Interfaces for mobile applications	◑	◑	◑	◑	◑	●	◑	●	●	●
		Integrated mobile portals	●	◑	◑	◑	◑	●	◑	●	●	●
Mobile devices for management of CRM processes (employee centric)	Functionalities	CRM system access from mobile devices (online)	●	●	●	●	●	●	●	○	○	○
		CRM system access from mobile devices (offline)	◑	●	●	◑	◑	●	◑	○	○	○
		Mobile versions with special functionalities for CRM processes (e.g. scanning, location finder)	◑	◑	◑	◑	◑	◑	◑	○	○	○
		Mobile version of the CRM system with reduced functionality	●	●	●	●	●	●	●	○	○	○
	Standard CRM system functionality on mobile devices	Sales (opportunity, lead, contact management)	●	●	●	●	●	●	●	○	○	○
		Service (ticket management, knowledge base)	◑	◑	◑	◑	◑	◑	◑	○	○	○
		Marketing (campaign management, interaction center)	◑	◑	◑	◑	◑	◑	◑	○	○	○
		Analytic functionalities (reports, data analysis)	◑	◑	◑	◑	◑	◑	◑	○	○	○
		Back-office integration (interfaces, web services)	○	◑	◑	○	○	○	◑	○	○	○
Mobile devices as part of CRM processes (customer centric)	Additional requirements for mobile CRM processes	In addition to the CRM system a platform or middleware for mobile CRM is necessary	○	●	●	○	◑	◑	○	●	●	●
		For integrated messaging services a SMS/MMS provider is required	◑	○	○	○	○	◑	○	●	●	●
		For mobile portals a mobile portal server is necessary	○	○	○	○	○	○	◑	◑	◑	◑
		MMS scanning device can be integrated	○	○	○	○	○	○	○	●	○	○
		Barcode scanning device can be integrated	○	○	○	○	○	○	○	●	○	○
		Mobile positioning systems can be integrated	◑	○	○	○	○	○	○	◑	●	○
	Integration between CRM system and mobile devices in customer processes	CRM processes can be configured to incorporate mobile devices of customers (e.g. as channel in campaign or service management)	◑	◑	○	○	○	○	○	●	●	●
		CRM processes can be configured with a set of standard mobile process steps (e.g. messages as campaign step)	○	○	○	○	○	○	○	●	●	●
		CRM processes can process information from mobile devices (e.g. SMS, identification via phone number)	○	○	○	○	○	◑	○	●	●	◑
	Availability of mobile functionalities and components for customer interaction	Provision of static mobile content (e.g. information, search functions)	○	○	○	○	○	○	○	●	◑	○
		Provision of dynamic mobile content (e.g. dialog forms, content downloads, mobile coupon creation)	○	○	○	○	○	○	○	○	●	●
		Provision of interactive mobile content (e.g. order functions, coupon converting)	○	○	○	○	○	○	○	●	●	●
		Provision of voice services (e.g. interactive voice response)	○	○	○	○	○	○	○	◑	○	○
		Provision of navigation services (e.g. maps, visual user positioning)	○	○	○	○	○	○	○	●	●	◑
		Configuration and deployment kit for mobile applications	○	○	○	○	○	○	○	◑	◑	◑
		Editable mobile portals	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑
		Configurable messaging services	○	○	○	○	○	◑	○	●	●	●

Figure 6: CRM system evaluation (Legend: ○ = not possible ◑ = partially possible ● = possible)

Reason for the differences between the two system types can be the universality of CRM systems (e.g. they try to cover B2B CRM as well as B2C CRM requirements and integrate all necessary applications such as ERP, Content Management, point of sales systems) and the still low maturity of mobile CRM and knowledge about opportunities, options and relevance for business. In contrast the specialized systems for the mobile CRM deal with a definite domain. For CRM system providers and researchers this implies to deeper investigate what mobile functionalities are needed in general for CRM processes and to provide functionalities that can be further customized to match individual requirements. Examples that can be derived from the specialized systems are a deeper

integration of the mobile channel in marketing campaign management, capturing of device ID's and provision of customizable mobile portals. Although the specialized systems show these features, they also introduce own CRM databases into existing CRM infrastructure what implies the risks of CRM information islands and a slowdown of integrated CRM processes. In addition to the improvement of their own mobile features the CRM system providers could foster an easy integration of the more advanced specialized systems (e.g. web services).

In general, both systems types offer only little functionality for collaboration with customers as perceived in this paper what seems to have roots in the identified systems separation. Collaborative CRM processes do not only require a flexible change between interaction channels but also interactive communication with customers during a CRM process (e.g. specification of requirements, configuration of offerings, ubiquity of interaction points).

5 Discussion

5.1 Conclusions

The research in this paper supports the view that mobile technologies may enhance CRM core processes and also indicates a high potential for collaborative CRM processes. But the recognition of the basic and extended functionalities of mobile devices in those processes is required to provide added value for business and customers. Only if the offered mobile services show benefits in the perception of customers they will make use of them and engage into collaborative processes. Otherwise they will only suspect to be traceable and always monitored and reachable. This is particularly relevant when focusing on personal mobile devices such as PDA's and smartphones. For business the devices offer the opportunity for interactive CRM processes between business and customers as well as collaborative link between business partners. They enable a nearly 24h accessibility to services, the availability within most customers and also a direct way for communication between customers and companies. For example the integration of mobile devices and CRM systems the advantage to have a customer at hand during the whole relationship process and to use the existing CRM infrastructures for an improved communication (Smith 2007). However, the analysis of real-life scenario has shown that current business scenarios seem to stick on the provision of passive information flows or uni-directional communication between business and customers. Collaboration or interactive processes are still rarely. Only in scenarios where the customer buying cycle is supported in more stages and more high-end features of mobile devices are utilized than also a higher degree of collaboration with customers and business partners is visible. Those scenarios seem also to provide more visible benefits to customers.

The comparison between the real-life scenarios and the support of mobile devices in current CRM systems seems to affirm that without specialized systems only simple scenarios may be realized. The contribution of standard CRM systems seems currently rather low. Most CRM systems provide barely more than mobile access to CRM functionalities for employees. Customers are far less integrated in CRM processes with the help of CRM systems and mobile devices what could be a reason for the paradox mentioned in the introduction. Although the CRM systems allow the capturing of information about the availability of mobile

devices and the preferred contact channels of customers they often support only integration with mobile portals or between computer and telephone (CTI). This low support in CRM systems impedes the development of innovative mobile collaborative CRM scenarios because a higher level of technology and functionality support is necessary (e.g. mobile devices can be dynamically included in the marketing campaign design with standard campaign items such as MMS, campaign portlets, incorporating of customer positions in campaign steps sequences). Hence, ambitious solutions require software and hardware from specialized providers and their integration into existing CRM infrastructures.

5.2 Future research

Reasons for the low degree of collaboration between business partners and customers as well the low inclusion of mobile devices in collaborative processes seem to be the low maturity of the topic collaborative CRM itself as well as missing knowledge about the opportunities that mobile devices offer for CRM in general. Future research should address this issue to unleash the potential that several examples indicate (Hampe et al. 2004, Haaker and Vos 2006). For practice the exemplification of innovative CRM scenarios in case studies that show the application of mobile devices and collaborative CRM to achieve added value for customers and business will be of high value. Especially the field of marketing and service seems to hold potential because research has concentrated primarily on sales related topics, such as product information and support of the sales process. A common problem of most existing research is their focus on traditional CRM processes. They investigate how these processes can be simplified with mobile devices (e.g. mobile ticketing, product presentation, mobile banking) but do not go further and redesign the whole scenarios. For example like the prototype of German railways that uses the mobile device to measure the travel distance for billing by identifying the device at a train station terminal. The system analysis has shown that there is a gap between standard CRM system functionalities and those of specialized solutions for B2C interactions. But the results of this analysis represents only a first insight and should be further detailed by future research (e.g. with scenarios, surveys) to get better understanding. Despite this, it seems necessary to further standardize mobile technology and the interfaces between CRM infrastructures and mobile devices. Currently the devices feature a broad variety of browser technologies, interfaces, data storage and operating systems that all influence how a mobile service is presented or if the services can be used at all. With more standardized services, processes and technology the solutions could become more user friendly and better specific mobile devices functionalities. An example is the Postbank mobile banking portal that is available for iPhone and standard mobiles. The iPhone version offers a much better usability and user friendly presentation than the standard mobile portal, but the services are nearly equal.

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