

**Business Models  
for  
Cellular Phones with RFID-Modules**

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# 1 Introduction

## 1.1 Motivation

Our modern times are dominated by the aspiration for making daily life easier and business life more effective and efficient. In the last decades, two technologies changed life the way we know it forever. The first one was the invention of the worldwide web or internet. By the option to access information at any time, at nearly any place, hundreds of business cases were created. Some failed, some were successful. One successful business case, which had a breakthrough, is Electronic Business, or short E-Business. E-Business implies the initiation as well as partial or complete assistance, processing and maintenance of business processes using electronic and optical networks and devices. The internet initiated the change of how private persons and businesses communicated with and among each other. Worldwide about 1.2 billion people are using the internet daily.<sup>1</sup>

The second technology which changed our life is the introduction of Mobile Communication. With the introduction of cellular phones, everyone could reach and be reached at any time, any place. As the two technologies merged, a new form of business was born: Mobile Business.

Mobile business is a form of E-business; the only difference is that the user is mobile. Nowadays nearly everyone in industrial nations possesses a cellular phone and therefore is a potential customer of m-business. In Germany the penetration rate of cellular phones even reached 110 percent in 2007.<sup>2</sup> Worldwide more than 3 billion subscribers use their cellular phone regularly.<sup>3</sup> With a steadily growing availability of high speed data transfer services like UMTS, the turnover for data transfer in the mobile sector doubled from 2005 to 2006. With estimated 700 million Euros in Germany, m-business is a very profitable market.<sup>4</sup>

A penetration rate of more than 100 percent also has a flip side. Since 2001 the number of cellular phone subscribers is still growing, but the average growth tends to stagnate. As statistically everyone already possesses a cellular phone, new customers for mobile network operators can only be acquired by “stealing” them from a competitor.

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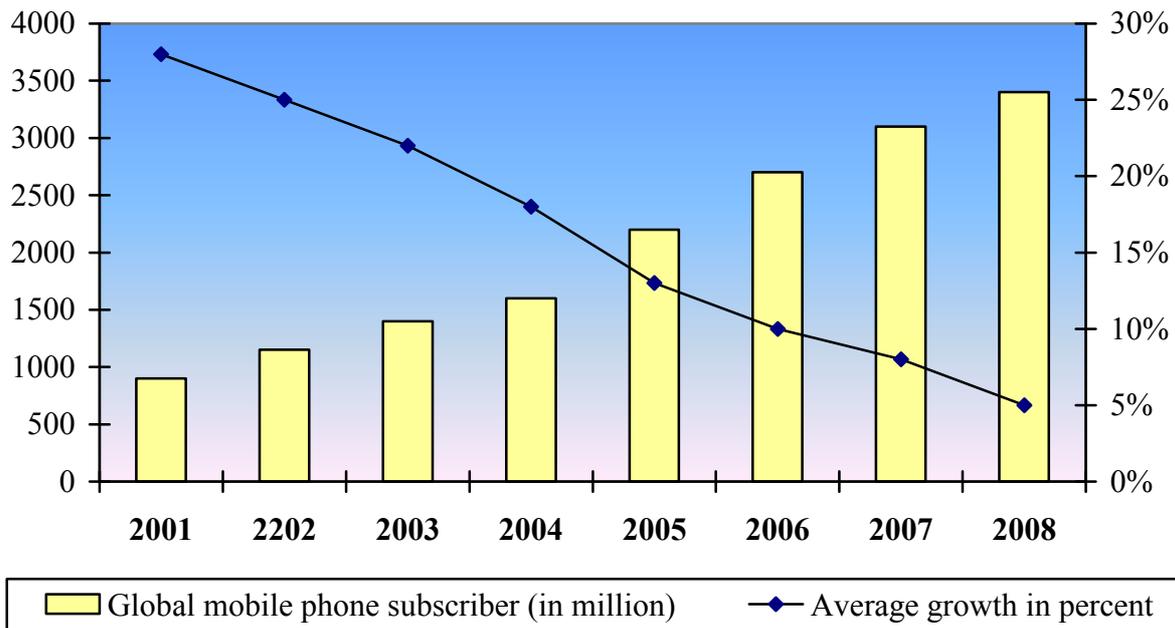
<sup>1</sup> See Internetworldstats [2007]

<sup>2</sup> See Bundesnetzagentur [2007a]

<sup>3</sup> See EITO [2007, p. 23]

<sup>4</sup> See Bundesnetzagentur [2007b, p. 75]

### Mobile Phone Market Development 2001-2008



**Figure 1.1: Development of Cellular Phone Subscribers and Average Growth from 2001 to 2008;**  
**source: own on basis of Accenture [2007, p. 6] and EITO [2007, p. 23]**

Furthermore, the price for phone calls with the cellular phone dropped by 54 % in the last 10 years.<sup>5</sup> That indicates that mobile network operators need to look for new profit opportunities. Besides offering lower prices; new services and investing in new technologies is a strategy to achieve customers' loyalty and create new ways of profit making. Cellular phone manufacturers are facing a similar situation. To get the owners of cellular phones to buy a new cellular phone, the new model has to be more attractive than the one possessing. For this reason cellular phone manufactures are looking for new technologies which they can integrate into the cellular phone to let them become more desirable.

A technology that has the potential to meet these expectations is Radio Frequency Identification (RFID). The hype about this technology reached its peak in the last two years, and gave way to realistic rating of its potential. For end consumer use, among others contactless smartcards found its way to mass market. Using RFID technology and combing it with e-business opened the way for mobile payment. Nowadays contactless smartcards are used, besides mobile payment, for access control. RFID also brings other promising advantages and chances for applications with great potential.

Bringing these three technologies together and creating a ubiquitous mobile device, will created new operational areas.

<sup>5</sup> See Bitkom [2006a]

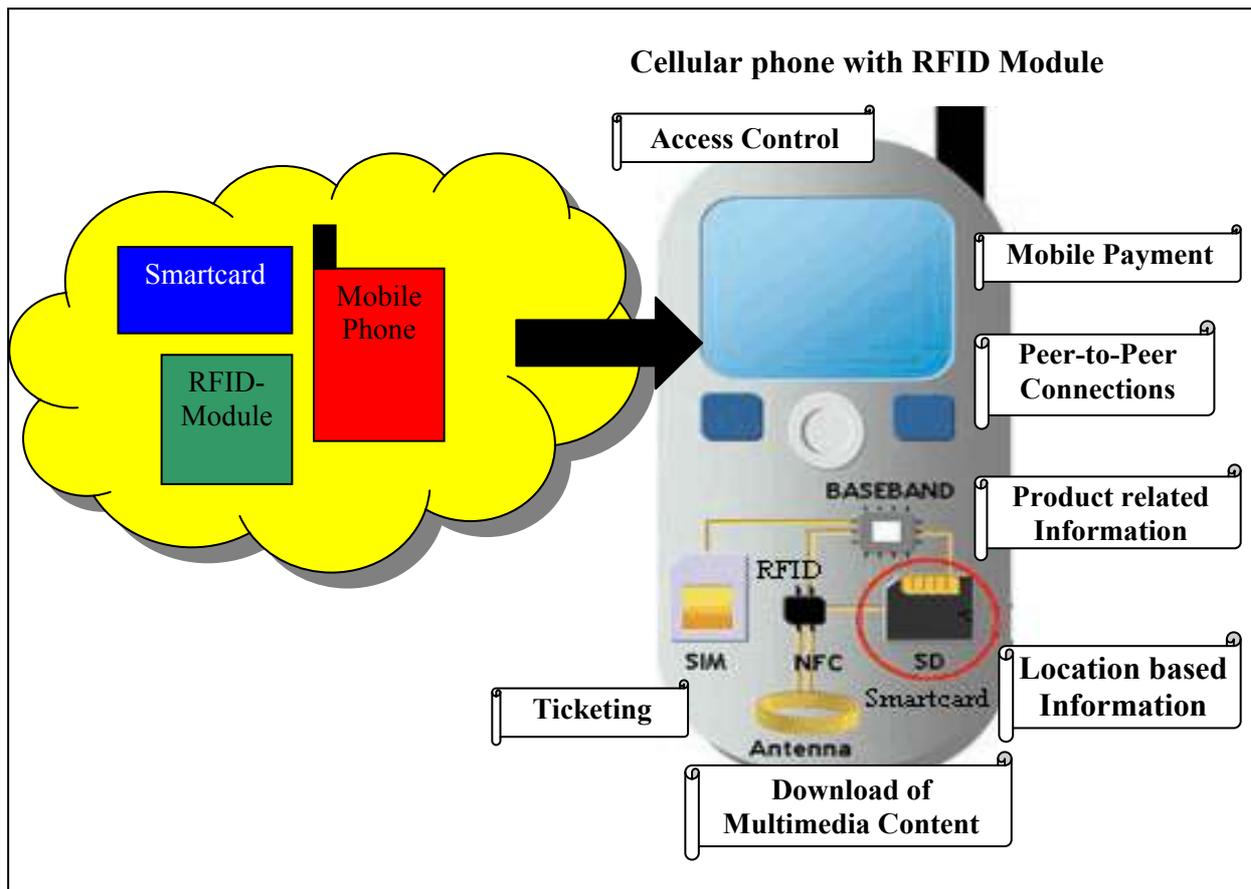


Figure 1.2: Fusion of Technologies and Birth of Cellular Phone with RFID Module; source: own (phone picture modified from original: anon. [2006a])

A cellular phone with a RFID module could be the answer for new way of making profit for manufactures, mobile network operators, financial institutes and provider of applications for the use of cellular phones with RFID module.

A cellular phone with a RFID module could be used for various applications, including access control, ticketing, mobile payment, peer-to-peer connections, downloading of product related or location based information and multimedia content. The future perspective of this invention is promising and evaluating business models for it is inevitable.

## 1.2 Research Question and Objective

The evaluation of state of the technology regarding cellular phones with RFID modules is one of the questions that are going to be answered. This will be done by presenting alternative ways of realizing the fusion of RFID technology and cellular phones.

The main focus is on evaluating possible business models for cellular phones with RFID modules. The business models are described concerning their architecture, evaluated regarding the value they can bring for the users and stakeholder, and furthermore, their chance

of having a commercial roll out is investigated. Presenting current trials, which are investigating the future prospects is part of it, as well as presenting own thoughts. Since there are only small data and facts concerning the topic, conclusion can only be acquired by logical thought and drawing comparisons.

For an expertise opinion on the topic of chances of success of business models for cellular phone with RFID modules, a survey with experts from different fields concerning RFID and cellular phones has been performed. In the survey the issues of costs, profit, potential success and acceptance of different business models is discussed and evaluated.

### **1.3 Structure**

This document is divided into six chapters, appendix, and additional information as well as copies of all internet sources on a CD-ROM.

The first chapter gave an introduction in the motivation for the topic of this document. Bringing the two technologies that changed the daily life together, creating business models and evaluating them is simultaneously the research question and objective.

The second chapter consists of the definition of business model, cellular phone and RFID and providing background information. For the use of the term business model, an own definition is created. Cellular phones will be defined and classified. The technology of RFID will be presented, and advantages and drawback of the different forms of RFID will be discussed. After introduction of first test of combining RFID and cellular phones, the term Mobile RFID Phone is introduced and the first models are presented.

Chapter three contains business models for Mobile RFID Phones. Current trials are presented and experiences evaluated. Later in the chapter own thoughts of possible business models are presented and explained in detailed with the aid of flowcharts.

In chapter four the results of a conducted expert-questionnaire are presented and evaluated. Under the aid of these results final conclusion for business models are drawn.

In chapter five problems that could be face while implementing future business models for Mobile RFID Phones are discussed. Finally a summery of the document will be given with a short outlook on the future of this emerging technology.

assembly” procedure.<sup>162</sup> Other potentials, concerning cost reduction, are seen in the using conductive ink to print antennas directly on the tag.<sup>163</sup> In the same field, the product labeling in supermarkets etc, are problems expected for the time of change from barcodes to RFID labels. In the transition period either both labels or hybrid scanner could be used.<sup>164</sup>

Before business models for Mobile RFID phones can be introduced, user related issues must be solved. For this, more use cases have to be tested with user studies, existing studies have to be validated and results published. Furthermore revenue generation for key stakeholders have to clarified.

In cases of using services of application providers, the ownership of the RFID tag and its content has the provider. The data gets transferred by the mobile network operator and used by the mobile subscriber. Accordingly, a trusted relationship has to be established among these three parties.<sup>165</sup>

For the business model product related information with the aid of EPC, a standard for NFC and EPC needs to be introduced.<sup>166</sup>

Before mobile payment can be introduced to mass-market, a standard between financial institutes and mobile network operators for billing should be deployed.<sup>167</sup> How revenues will be generated is not yet defiantly answered. Mobile operators want to work together with credit card issuers and to find ways of making profit from a commercial rollout of the Mobile RFID Phones.<sup>168</sup> The operator could charge a fee to the financial institute each time the mobile network is used for filling up the account on the phone. Other way could be the putting the credit card information on the SIM card and balance accounts by the telephone bill. Problematic is the differences of the SIM cards in regards to the memory space and configuration. Here are interoperability problem expected. The financial institutes and mobile operator should find a satisfying solution with a win-win situation to avoid creating barriers for the implementation of Mobile RFID Phone applications.<sup>169</sup>

## 6 Summary

Based on the current situation of mobile network operators and cellular phone manufactures, it was depicted that new sources of income are needed in order to counteract the stagnating

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<sup>162</sup> See Oelschläger et al. [2004, p. 143]

<sup>163</sup> See Lahiri [2006, p. 23]

<sup>164</sup> See Seifert [2006]

<sup>165</sup> See Park et al. [2006, p. 928]

<sup>166</sup> See Wiechert et al.[2007]

<sup>167</sup> See Balaban [2006]

<sup>168</sup> See O’Connor [2007]

<sup>169</sup> See Balaban [2006]

rates of growth in the cellular phone sector. In most industrial nations, a penetration rate for cellular phone subscribers of more than 100 percent is reached, which results in steadily smaller profit margins. These circumstances indicate the motivation of mobile network operators and cellular phone manufactures to invest in new technologies in order to create new fields of income. After creating a definition for business models and presenting the different models of cellular phones, the technology which has the potential to create new profit sources was introduced: Radio Frequency Identification, or short RFID. The basics of RFID were explained and the components classified. After presenting the advantages and drawbacks of the different forms of the component, reasons for the most promising frequencies and hardware were given. Due to the fact that the range of High Frequency is standardized worldwide with 13.56 MHz and the advantage this frequency, namely low power consumption, it seems that this frequency has the most potential to be used in combination with cellular phones. The different kinds of RFID tags, passive, semi-active and active, were presented and their characteristics compared. For mass use, passive tags with relative small memory are expected to be used since they are the cheapest in production. For special application, active tags can be used, since they can perform special operations, like equipped with a sensor, scanning the environment. After describing the components of a RFID reader, including a short historical introduction, the benefits of integrated RFID modules were identified. The option that RFID modules and cellular phone are partially using the same resources, offers promising possibilities concerning mobile payment with cellular phones with RFID modules and its user convenience. Combining cellular phones and RFID modules could create the new fields of income for the mobile network operators and the cellular phone manufactures. Already existing models of these devices were presented and the term “Mobile RFID Phones” was introduced. For better understanding all cellular phones, regardless to the kind of RFID module, and the frequency it operates in, are referred to as Mobile RFID Phones. By presenting examples of the usage of the Mobile RFID Phones in the Asian market, and the activity from governmental side to deploy the technology to mass market, the potential of the new device and possible application was underlined. Furthermore the most common form of RFID concerning end users was presented in the second chapter. Near field communication (NFC) is a technology which operates in 13.56 MHz and enables the device to at either as a reader or a tag. Also peer-to-peer connections can be established with both devices being active. By integrating contactless smartcards, a already successful deployed technology, into the Mobile RFID Phones, access control, ticketing and mobile payment are becoming promising applications for the use of Mobile RFID Phones. Currently, only Nokia

is producing a Mobile RFID Phone, based on NFC, for the mass market in the western world, namely Nokia 6131 NFC. Other manufactures developed Mobile RFID Phones, but they are only used for trials so far. Nevertheless until 2008 it is expected that 40 percent of cellular phones shipment will be Mobile RFID Phones.

In chapter three business models for Mobile RFID phones were presented and introduced. Important drivers for the implementation of this technology will be the advancement, advantages and benefits that Mobile RFID Phones will bring. For successful adoption of this technology by the users and therefore the deployment of the devices and application, added values for all stakeholders have to be created. For the users subjective value through the use of Mobile RFID Phones must be generated in form of more convenience, easy usability and additional services, like product related or location based information. Most potential is seen in the use of Mobile RFID Phones for mobile payment, using the device as a credit card, and ticketing at public transportation. Worldwide several trials and pilot projects are currently running and first results have been presented. The feedback of the users is throughout positive, which resulted in the first commercial rollout of applications for Mobile RFID Phones. In Hanau, Germany, the bus routes can be officially used with Mobile RFID Phones, as well as certain stores and restaurants. Other public trials have resulted in the demand from the populations for more options to use the Mobile RFID Phones.

Next to the already invented business models for Mobile RFID Phones, new business models are presented. With the aid of flowcharts, possible scenarios for the use of Mobile RFID Phones are visualized. Using the devices for services like taxis could create a win-win situation. The customer could profit from the convenience of mobile payment and additional information, and the supplier of the service by more efficient use of his resources.

Using the Mobile RFID Phone for accessing product related information is another scenario that is presented in detail. With standardization of NFC and EPC the products could be well defined and product related information could be downloaded by using the stores WLAN or through the internet. Similarly location based information could be accessed this way. Information about places of interest and sightseeing could increase the attractiveness of the local region and be a driver for the local economy.

The fourth chapter is dedicated to an expert questionnaire. To evaluate the position of Mobile RFID Phones and potential application or business models, several experts from different fields regarding RFID, were asked of their appraisal concerning several topics. The result

where presented in charts and evaluated. Concerning the time frame Mobile RFID Phones need to be ready to be deployed, three thirds see the technical requirements to implement applications for Mobile RFID Phones in large scales, ready within the next two years.

Rated as most promising business models for Mobile RFID Phones are, product related information as well as ticketing and mobile payment.

To the question to which party of the stakeholder of Mobile RFID Phones will bear most of the costs for its implementation, the experts are convinced that retailers and provider of application have to pay most of the costs and the users are expected to pay nothing or only little. Concerning which party will gain the highest profits, the results show that mobile network operators are seen as the winners of the commercial roll out of Mobile RFID Phones. Finally as ending of the fourth chapter, the drivers for the user's acceptance of Mobile RFID Phones were evaluated. Key factors are seen by the experts in the convenience of the applications compared to traditional ways. Another important driver will be the price for the use of the applications. The user's payment reserves are not expected to be very high. Security and privacy issues are not of big influence, according to the opinion of the experts.

In chapter five problems in implementation of business model that needs to be solved are recapitulated. Missing standard for NFC and EPC needs to be introduced in order to realize the application product relate information. For mobile payment, mobile network operator and financial institutes need to agree on payment methods and how both sides can make profit without either of them loosing control over their costumers. And finally the price of RFID tags, currently at about 10 cents, is needed to drop to 5 cents a piece. The low price is needed in order that potential providers are more attracted in investing in the deployment ion order that an infrastructure for Mobile RFID Phone's application can be created, which will make the use of the devices more desirable and convenient for the users.

Summarizing the results of the experiences of trials, and adding the prognoses of the experts asked to rate the potential of business model for Mobile RFID Phones, pictures a promising future for this emerging technology. At different places on the earth, groups like NFC Forum, SToLPaN and NIDA are working separately but together on the same goal: creating standards and frameworks to path the way for business models for Mobile RFID Phones.