

On Providing One-to-One Marketing with Customers' Privacy in Stationary Retail

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Abstract

Electronic commerce has provided retailers with effective instruments to deploy one-to-one marketing over the internet. While the increasing use of sensors, RFID tags and other technologies enables the deployment of one-to-one marketing also in stationary retail stores, initial experiments in realizing personalization in this setting have shown that customers' acceptance is low, as services require personal data to be collected, thereby raising imminent privacy concerns.

In this paper, we argue that one-to-one marketing in stationary retail and privacy do not constitute a dichotomy, but can be brought together by focusing on individualized services solely built upon context information and techniques to allow customers to control the collection and usage of such context information.

1. Introduction

Since the commercial inception of the World Wide Web in the early nineties, retailers have made great strides in leveraging the electronic interactive channel to deepen customer relationships. After simply copying offline-product catalogues into the Internet, more and more enterprises use the Internet today as a direct interaction medium with their customers [9]. In particular, recommender systems, once used by a few precursors, became a strategically indispensable business tool [3,14]. Retailers such as amazon.com, barnesandnoble.com or quelle.de successfully recommend goods on the basis of their customers' buying behavior, increasing the purchase likelihood and, in doing so, boosting sales of their websites [20].

In stationary retailing, one can likewise notice a strong orientation towards the individual needs of customers in recent years. Especially the success of loyalty programs and customer cards has proven to be a considerable growth factor on the widely saturated markets for fast-moving consumer goods in USA, EU and Japan [23]. The development in ubiquitous computing technologies, such as sensors, Wireless LAN, video cameras and RFID tags now enable an automatic identification of customers.

Numerous pilot projects have already become practice. (We refer to [18, 24] for an overview.) In consequence, a basis has been laid for deploying automated forms of one-to-one marketing into physical stores.

While technically feasible, retailers bringing one-to-one marketing into stationary retail are confronted with a general acceptance problem on the one hand and a specific privacy concern of customers on the other. The acceptance problem stems from the fact that retail customers are usually anonymous while shopping. Even though anonymity seems not to be an end in itself – cp. the widespread use of customer cards – it is without a doubt a long-established habit. Consequently, whereas the identification of customers through their IP address is – with a rough degree of accuracy – always possible and accepted in E-Commerce environments, a traditional retailer has to actively gain his customers for their willingness to accept an automatic identification. Regardless how high the hurdle is, retailers have to cope with this uncertainty. Moreover, beyond this general acceptance problem, a number of studies show that users fear UbiComp technologies, such as RFID tags, sensor networks and techniques to correlate multimodal data, as they can be misused for surveillance, thereby leading to the loss of control over their personal data [5,12,16]

In this paper, we argue that it is possible to provide one-to-one marketing with customers' privacy. To this end, we first categorize services according to the quality of input data they require into *personalized*, *individualized* and *universal services*. Based on this, we show that individualized services are an interesting alternative for retailers, as, by focusing on context data instead of personal data, they minimize privacy problems, thereby improving customer acceptance. Furthermore, noting that most skepticism on the part of customers' are due to missing control mechanisms regarding retailers' operation [4], we propose the concept of *privacy evidence* as a means to find possible violations of privacy policies and report on its main characteristics.

The remaining of this paper is structured as follows. In Section 2, we describe the current change underway in the stationary retail and characterize services for one-to-one

marketing as to the quality of data they build upon. In Section 3 we show the special meaning of context data for improving matchmaking between customers and items in stationary retail, while in Section 4 we elaborate on the privacy issues involved in the deployment of one-to-one marketing in stationary retail. We provide our solution to these issues in Section 5 and provide an outlook of our work in Section 6.

2. Customized Services for Individual Customers

Optimizing the Shopping Experience

In most of the developed countries (OECD), food shopping formats such as big supermarkets, hypermarkets or supercenters have reached an important market share in the last decades [8] [21]. These formats mainly distinguish from others such as corner shop or discounter in two aspects: Because of rationalization and economies of scales the product range and the total sales area have increased and the number of sales clerks to get advice from (e.g. product information) have drastically decreased. Thus, consumers are faced with thousands of products in a store and have to walk far to find them today. Since they have to rely on product information written down to the labels, differences between products within a category are frequently not perceived. Due to this background, the question obviously arises whether recommender systems and other personalization techniques successfully applied in traditional E-Commerce can create added value for customers in stationary retailing, too. In this manner, for instance, stationary retailers could overcome the mainly impersonal nature of the shopping experience by treating each customer more individually [16]. Although such electronic communication within a store does not mean two exclusively communicating human beings, it is even a one-to-one interaction: the shopkeeper becomes able to remember details about each customer's preferences and characteristics and to use that knowledge to provide more customized and therefore better service. In some respect, this can be described as the return of the corner shop nearby, i.e. of a time point when a retailer knew each of his customers or at least was able to watch and treat them accordingly.

Today's marketing systems in stationary retail are able to hand out coupons to customers that are personalized based on what they bought today or over the past year using a loyalty card. But they are pitching the customers *after* they have finished shopping. Electronic forms of customer communication as described below have the potential to improve existing marketing techniques at a decisive point: They let marketers reach consumers *while*

they are in the shop, that is, they pitch products at the very moment the consumers are making purchasing decisions. In such manner, retailers obtain a promising option for boosting sales. A study conducted in Germany in 1999 shows that more than half of all purchase decisions (55%) are made in the store, as opposed to before the shopping trip [11]. At the same time, advertising in classic media is becoming less and less effective [11] [22]. As a result, retailers can sell this online-access to customers within the store to Fast Moving Consumer Goods (FMCG) manufacturers. Irrespective of what kind of customized services a retailer will provide, acceptance and success of the marketing instrument can immediately be measured.

Customization needs appropriate Communication Channels

Due to electronic communication channels, retailers are able to interact individually with customers at marginal costs in Internet environments. Applying recommender systems and customized services in general in conventional retail stores therefore firstly requires comparable electronic forms of communication. The increasingly use of information technology such as Wireless LAN or RFID systems in stationary retailing now means the availability of electronic one-to-one communication channels. In stationary retail stores such as the 'Extra-Future-Store' in Germany, computers with a touch screen attached to a shopping cart are deployed as personal shopping assistants (PSA) [15]. Today, these devices are equipped with a barcode reader and customers can interact with the retailer's information system over WLAN. Future forms of interaction may include customers using their mobile phones to communicate with RFID-tagged products and the retailer's information system [16]. Another form of individual customer communication is possible by using so-called Info-Terminals. The terminals are also linkable to the store's IT infrastructure via WLAN [15]. Advertising displays are an increasingly widespread form of in-store customer communication. They are controlled centrally by WLAN and are attached, for instance, to the ceiling in several locations in the store. They can display advertising messages or show videos [18].

Customized Services needs Customer Data

Assuming that customizing services such as personalized product recommendations is promising and the necessary technical infrastructure is available, the question remains how to customize which services. The first step begins with the electronic communication infrastructure, since it does not only enable the communication of a once created product recommendation to single customers, i.e. delivering of personalized information to consumers. It has also

great influence on matching appropriate content to individual consumers, i.e. especially on data collection and building customer profiles [3]. The Internet, for instance, enables customer identification through IP address or a cookie, capturing more information about the customer through e.g. a web log, and recalling additional information about a customer once identified, e.g. through real-time database access [14]. With access to customer profiles (personal data) and the tools to analyze data in real time, online-retailers are therefore able to match individual customer valuations at marginal costs. As a result, the Internet as electronic form of customer communication has substantially changed the way of personalization itself [3] and made an important contribution in order to generate and provide customized information. As the Personalization Pyramid in [16] shows, three ways of tailoring services to customers can be distinguished in retail environments applying electronic forms of customer interaction, i.e. in today web-shops as well in future stationary retail stores.

Universal, Individualized and Personalized Services

The first way of tailoring services to customers are *universal services* such as searching for products with certain characteristics: A single customer can ask the position of an item within the store, additional product information or which items are on special offer this week. Such universal information is in principal identical for all customers. The personalization element consists of the particular time point at which the information is communicated to a single customer. Neither personal nor context data are absolutely necessary for such universal services.

Individualized services constitute a second way of tailoring information to customers. The use of several ubiquitous computing technologies such as sensors (seismic, acoustic, motion, and radar) or RFID-tagged items enables uncovering characteristic attributes of customers: For instance, the age of a consumer can be approximately estimated because of items that have been added to the shopping cart. Depending on the precision and combined with further context information such as moment of purchasing decisions, way and speed walking through the store, duration of the shopping stay, current position of shopping cart, time and date, a profile of the customer can be generated. After having identified characteristics of the customer with a certain probability, the retailer is then able to derive from this specific needs and finally choose an adequate individualized service: Thus, a high “dwell time”, i.e. the time inspecting a specific product can indicate a need for additional product information. As a result, retailer’s information systems would send a message to the customer’s personal shopping assistant or mo-

bile phone: Are you looking for additional product information concerning product X? Providing customers additional product information might be very effective because a relevant group of people leave the store without buying something [11]. And today, the retailer does not know the why. Moreover, a long duration of the visit indicates a need for more shopping experience and therefore a high likelihood for the success of cross- and up-selling recommendations. A lack of orientation (pacing around) can mean a need for “optimized route through the store”.

Online retailers such as amazon.com [19] or quelle.de¹ analyze the surfing behavior of their customers. Depending on the buying situation, a recommendation engine then creates suitable supplementary offers and product recommendations on the fly. However, how the different context data works together and which quality can be reached is already at its beginning in stationary retailing. Tests in real environments hardly exist and the scientific treatment of these topics is still modest.

The third way of tailoring services to customers are personalized services. Retailers can offer them to known customers according to their previous purchases or their similarity to other customers [17]. Personalized services require identification of the consumer and personal data as input factor. After having identified a customer - e.g. through information from the loyalty card inserted to the personal shopping assistant - items similar to the customer’s past preferences can be recommended. Such recommendations require the building-up of consumer profiles which should include the information describing who the consumers are (such as name, gender, date of birth, and address) and how they behave in a way that is most relevant for the particular recommendation (e.g. facts derived from past transactions: favorite product category or the value of the largest purchase). Another approach are *collaborative recommendations* which recommend items to a customer that customers with similar tastes and preferences have liked in the past. For this, purchase records are analyzed by data mining methods. Finally, recommendations can be realized in several ways by combining collaborative and content-based methods [17]. At the same time, knowing items that have been added to the shopping cart, i.e. using context data as depicted in [16], can also improve recommendations. Already today, customer relationship

¹ Just two months after the launch of its new Recommendation Engine, an intelligent software solution that recommends customers appropriate add-ons to the products they have chosen, the online shop obtained first successes: “The rate of cross selling articles in the marketplace requests has increased ten-fold”, says Nicole Enzesberger, Manager Quelle Neue Media. <http://www.prudsys.com/Presse/Pressemeldungen/?0042>.

management (CRM) software facilitates the collection of data from multiple touch points between a firm and its customers [14].

3. Meaning of Context Data in Stationary Retail

A key issue in developing personalization applications is constructing accurate and comprehensive profiles of individual customers based on the collected transactional and demographic data about them. Such profiles should provide the most relevant information describing who the customers are and what their preferences are. Traditionally, customer profiles consist of simple factual information. For example, this information may include a customer's demographics, such as name, gender, date of birth and address, or be derived from the past transactions of a customer, such as the largest purchase value made and an average time spent at a website [2]. This factual information is usually combined into a record of values to form a factual profile that is typically stored in a relational database, one record per customer. However, simple profiles specified through collections of facts have been proven to be insufficient in certain recommendation applications in certain industries (such as financial services, travel, and telecommunications) [2]. Currently, more advanced profiling techniques are developed [3].

Besides with improving customer profiling, the matchmaking technology of "recommender systems" became an important research area since the appearance of the first papers on collaborative filtering in mid-1990s and the popularization of this technology by amazon.com and others. Today, many recommendation technologies provide their offerings based solely on the consumer information (and information about the offering) while ignoring additional contextual information [3]. However, in many applications the utility of an offering (such as a product) to a consumer may depend on the context in which it was offered. It may also depend on the people with whom the product will be consumed or shared, along with the circumstances under which such sharing will take place [16]. In such situations, simply recommending items to consumers may be insufficient; the recommender systems would have to weigh such additional contextual information as time, place, and the companions of the consumer when recommending products [3]. Including context awareness can improve the system's matchmaking abilities. Meanwhile, recommender systems using "real-time" context-data such as "click stream" or "time" are becoming more and more widespread in e-commerce en-

vironments.²

The status quo in stationary retailing is still far away from that in e-commerce environments. Present retail stores use transaction data alone or combine it with personal data gained by a loyalty card program in order to be aware of customer preferences. The data mining system may then point out certain patterns such as which items are frequently bought in combination or which items are frequently bought by families.³ However, today's marketers can consider at best only historical relations between users and items. They are not able to incorporate the contextual information into the recommendation process [16]. Retail companies are not aware of the current preferences and goals of consumers visiting the store.

As showed in section 2, UbiComp technologies now also enable electronic forms of customer communication and linking automatically identified customers with their profiles stored in a database in stationary retail environments. However, in order to improve matchmaking between customers and items, it is very crucial to use recommender systems including "real-time" context-data for several reasons. Firstly, recommending items to consumers like the ones they preferred in the past stay inevitable inexact in stationary retailing, because the purchase decision is only partly a priori determined. Secondly, recommendations based on collaborative filtering methods have achieved successful results in many applications. Collaborative methods find the closest peers for each consumer, that is, the people with the most similar tastes and preferences. But if the consumer frequently makes his purchase decision *in* the store, learning from other consumers is also partly useful. Thirdly, applying collaborative methods causes some further problems in stationary retailing. In such environments, the transaction data is extremely skewed in the sense that a large portion of sales is concentrated in a small number of hot seller items. Consequently, collaborative filtering recommenders usually recommend hot sellers while rarely recommend cold sellers [13].

4. Personalized Services and Privacy Problems

The more a customer's preferences are known the better services can be customized. The use of personal data through real-time database access to customer profiles together with available context data means a high level of knowledge about a customer's buying behavior and finally a certain probability of matching a single service with a

² See <http://www.prudsys.com/Presse/Pressemeldungen/?0042>.

³ <http://www.cs.ubc.ca/labs/db/mining.html>.

single customer. But although personalized services are naturally more sophisticated than individualized or universal services, processing of personal data and the binding of them with context data means a considerably disadvantage: they can lead to severe privacy problems.

Although the economic potential of personalized services in stationary retailing seems lucrative for retailers and customers, retail groups have slowed down their activities in this area. While Wal-Mart combined RFID-tagged articles with video surveillance, the German Metro Group tried to establish customer loyalty cards with embedded RFID tags [5]. However, after the sharp criticism of privacy activists, Metro decided to drop the use of RFID tags in customer cards and Wal-Mart also stopped their RFID-based surveillance.⁴ An analysis of the decisive privacy concerns shows that the loss of control over personal data worries customers [12]. For instance, according to a survey of more than 1,000 U.S. consumers, two-thirds identified as a major concern the likelihood that RFID would lead to their data being shared with third parties [4]. Finally, capturing and collecting personal data is heavily regulated in the EU. Collecting personal data therefore may cause considerably costs in order to ensure acting in compliance with legal requirements.

5. Individualized Services to Avoid Privacy Problems

One way to circumvent the privacy problems intrinsic to offering personalized services is to focus on individualized services instead. The rationale is that while personalized services require sensitive data that can be traced back to a particular customer, in individualized services sensitive data can be either completely dispensed with, or employed in a way such that pinpointing the particular customer associated with the collected data becomes infeasible. In consequence, advantages both to customers and retailers are at hand. From the customers' viewpoint, the omission of personal data leads to more willingness to use individualized services and, eventually, improved acceptance of the overall system. From the stores' perspective, the use of individualized services brings the advantages of one-to-one marketing without bothering about the privacy issues.

However, solely refraining from personalized services solves just part of the problem. The service provider may still process data in a way that it is possible to single out particular individuals out of the whole set of customers, thereby violating the privacy policy claimed to be adhered to. Indeed, most of the skepticism on the part of clients

arises from the fact that they do not receive any evidence that the underlying system works according to the claimed privacy policies [Ref]. To circumvent this problem, below we report on a technique we have been experimenting with in the context of the pilot project *info.wine.de*. The idea is to allow customer to check whether the collection of (context) data complies with his/her privacy policy, thereby improving the confidence on the system's behavior.

Avoiding clients' direct identification

Personal data stands for attributes that uniquely identify a customer. Considered alone, most of the data items do not suffice to identify an individual. However, considered in combination with other data items, these pieces of information single out a customer out of the whole. Hence, the idea is not to do away with personal data completely, but to record it in a way that does not allow the identification of a customer. That is, the relationship between the individual and the profiled data should be eliminated and impossible to reconstruct. For this, *pseudonymized profiles* are imperative [7]. The idea is that the number of customers to which the profile could possibly be associated with – the so-called anonymity set – is sufficiently large to avoid precise identification.

Privacy evidence

To improve the confidence and acceptance on the system, we propose the concept of *privacy evidence*. Intuitively, the idea is to allow customers to specify the policies to regulate the access and usage of their profiles, as well as the data items that can be recorded in it. (Examples of such policies include, e.g., that only selected RFID data can be captured or that the profile cannot be accessed for marketing purposes.) When interacting with the environment, a number of events are recorded as entries in log files. In fact, we assume that every event is recorded, so that log files offer a complete digital representation of the activity in a system. At some point in time, possibly after leaving the store, the customer employs a trusted device or terminal to retrieve the log view containing all the log entries related to the actions upon his/her profile. Based on this, the customer visualizes the collected data and starts a third-party audit process to check whether the policies previously agreed upon have been adhered to, thereby issuing the corresponding privacy evidence. Privacy evidence thus consists of the entries related to the customer and the result of the audit.

To realize privacy evidence, the following technical building blocks are necessary: a *policy language* to express privacy properties; *log views* to allow the visualization of recorded activity; a *secure logging* to ensure the

⁴ <http://www.bigbrotheraward.de>.

authenticity of recorded data and protect it against manipulation; and an *automated audit* process to check the adherence to policies on large data sets. We refer to [6, 7] for details regarding the realization of privacy evidence.

6. Conclusion

We tackle the question of enabling one-to-one-marketing in stationary retail without threatening the privacy of customers. Our thesis is that retailers should focus on individualized services, i.e. services for which only context data is required. To our knowledge, our investigation sets on a novel approach to realizing privacy-aware one-to-one-marketing. Previous attempts to address this issue focused on the deployment of privacy-enhancing technologies (e.g. privacy-aware data mining, Hippocratic databases). Instead, we put forward the simple abdication of personal data, as well as tools to allow users to get evidence as to the collection and usage of such context data.

7. References

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