

University of Applied Sciences Northwestern Switzerland School of Business



CollECTeR Europe 2006

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Collaborative Electronic Commerce Technology and Research Background of CollECTeR Europe 2006 in Basel, Switzerland

The CollECTeR series of conferences (http://www.collecter.org/) was established to link research centres at universities to form a basis for collaborative research in Electronic Commerce.

Conference Topic 2006: Collaborative Business

The "networked economy" challenges organizations to consider the use of Collaborative Business, namely the combined deployment of groupware and e-business infrastructures. Mobile computing technology and collaboration support have reached a level that makes a seamless integration of communications and data processing economically feasible. This constitutes our notion of Collaborative Business: the timely bundling of communication, coordination, and collaboration activities.

The focus of CollECTeR Europe 2006 is on new forms of Customer Relationship Management (CRM) – including mobile CRM – that cover the whole value chain and use new working modes. This concerns questions related to the optimisation of channels, the improvement of customer acquisition and retention, and after-sales contacts and services.

Aim

CollECTeR Europe 2006 is a forum for researchers to present and discuss their current and ongoing work. In order to stimulate a lively discussion the number of participants is limited to approx. 30 people. The aim of the event is to bring together researchers and practitioners to discuss foundations and industry potentials of Collaborative Business. This includes the exploration of the effective deployment of novel technologies and services.

Contributions are grouped into sessions covering the following topics:

- Digital archiving, privacy and property rights
- Personalization
- Markets and business processes
- Mobile and ambient business
- Communities and Work Group Collaboration
- Social systems
- Security devices and secure communication

All paper submissions to CollECTeR Europe 2006 represent the original work of the authors. There were no rigid guidelines regarding paper size for the final research papers. We asked to submit between 6 and 8 pages.

The social event, the conference dinner, lunches and breaks were sponsored by Ecademy, the National Network of Excellence of the Swiss Universities of Applied Sciences for E-Business and E-Government.

Basel, June 2006

Petra Schubert and Daniel Risch

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Personalized Commercial Web Sites

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Abstract

Personalization is an interdisciplinary topic that has been discussed in marketing and information systems as well as in other research disciplines. In this paper we present findings from a longitudinal research project on personalization of e-commerce systems. The findings were taken from interviews, empirical studies, and implementation projects with company partners. There is no single strategy for a successful personalization feature: each company needs to find its own unique selling proposition. The projects showed that once this USP has been identified it can be used for building up lasting relationships with customers. There is a need for further research into personalization issues – even if there are companies like Amazon, eBay or Broadvision that already demonstrate how it can work.

1 People Want to Be Addressed Personally

Personalization is an interdisciplinary topic which has been increasingly addressed in research papers, particularly at conferences on marketing and information systems. The fact that personalization has so many facets and does not fall into a specific domain makes it hard to perform a literature research on the topic. Personalization is targeted at the fulfilment of a special customer or user requirement. It can be aimed at people as well as organizational roles in companies (e.g. a purchasing agent). Personalization in our understanding starts *after the login*. The process is context sensitive (regarding the output for a certain user) and requires learning (by the system). The interface between the customer and the system is the «point of interaction» (POI).

The author assumes that there are two reasons behind the growing attention for the necessity to address customers (or users) personally: (1) from a *marketing perspective* the increased need to offer the best product or service for a single customer thus preventing the customer from switching to a competitor and (2) from an *information systems view* the increasing computer power which makes it possible to store and process data electronically.

This paper presents the results of six years of research in the field of «Personalization of E-Commerce Applications». The activities started in the year 2000 with an empirical study about the current state of personalization in E-Commerce applications run by SMEs [Leimstoll/Schubert 2002]. The findings showed that although there were companies such as Amazon and eBay that effectively demonstrated how personalization

works, only very few companies in Switzerland were able to implement similar features into their Web environments. The companies that took part in the survey showed deficits in strategy as well as a lack of technical readiness in their information systems and databases. Nevertheless, most companies acknowledged the importance of a personal relationship with the customer and indicated that personalization issues would be approached with high priority in the future. The empirical results encouraged the research team to approach companies that would want to work on the further development of their electronic shop environments. Together with these partners we developed a project method for the design and introduction of personalization components which was prototypically tested in three cases.

At an early point of the project we decided to focus on integrated systems where an e-shop component would run as an extension of an ERP system. The objective was to reuse the existing ERP functionality for the selling process (so far used by the sales people) and adapt it to the customer interface. The requirements of the partner companies made it evident that stand-alone Web shop environments without a connection to an existing ERP system would *not* work for companies in the long run.

The intention of this paper is to give an overview of the findings from the last six years and encourage IS researchers to continue research in this area. The paper starts with a literature review displaying the diversity of the topic. The following chapter presents the personalization methodology that was developed with practitioners. Selected specific examples of personalization will be shown. The final chapter discusses the need for more research on personalization based on the findings gained up to now.

2 Literature Review and Research Methodology

2.1 Personalization and Mass Customization

Although computers store large amounts of data during the transaction with customers, there are still few web sites that offer a user-friendly, personalized interface that makes efficient use of the information stored on the system or in other user-related databases of the company.

There are two main streams of publications: publications on *mass customization* on the one hand and on *personalization* on the other hand. *Mass customization* is generally geared towards the manufacturing process (the area of engineers). It deals with the configuration of products using standard components. Dell is the most prominent example of a company that has used this approach for its business success selling computers which are configured by the customers. *Personalization*, on the other hand, is geared at the communication process (the area of marketing experts). When applied in the Web browser, it can be used to present a personal shopping environment, including navigation, design, and product presentation (cf. Fig. 1). Amazon is a prominent example for a personalized e-shop including product recommendations, personalized newsletters, wish lists, and recently even a watch list (for new products by favourite artists).



Fig. 1: Mass customization and personalization

Deitel et al. [2001] define personalization as using «information from tracking, mining and data analysis to customize a person's interaction with a company's products, services, web site and employees». Mulvenna et al. [2000] understand personalization as «the provision to the individual of tailored products, service, information or information relating to products or services. This broad area also covers recommender systems, customization, and adaptive web sites». Personalization can be used for all kinds of channels, from paper-based mailings, call centres, to Web interfaces. Personalization is usually implemented at two levels: at the level of the *interface* through which the user interacts with the content, and at the level of the *content* itself [Vassiliou et al. 2003]. The possibilities of personalizing the user interface have also been described by Peppers/Rogers [1997] as well as Allen et al. [2001].

Davis [1987] refers to mass customization when «the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously they can be treated individually as in the customized markets of pre-industrial economies». The advantage is that individualized or personalized goods can be provided without the high cost surpluses (and, thus, price premiums) usually connected with (craft) customization [Piller/Schoder 1999].

2.2 Personalization and Individualization

As can be seen from the definitions, personalization is about selecting or filtering information objects or products for an individual by using information about the individual (his customer profile). The information displayed on the screen is specifically tailored for the user. From a technical point of view, meta-information of products or information objects is matched against meta-information of users (stored in the customer profile). Personalization can be tailored to a person group or to a specific individual. In the latter case, where the information or products are only customized for one single individual we speak of *individualization* as a special form of personalization. Personalization uses information about customers. The general term for stored customer information is «user profile» or in the context of electronic shopping «customer profile». There are various ways how e-shop operators can cultivate customer profiles e.g. «historically» by storing (1) interaction with the Web site (click stream), or (2) purchase transactions, or «explicitly» by asking (3) for preferences, or (4) ratings, or (5) by recording contextual information (e.g. time, date, place). What formerly seemed to be possible only for the corner shop whose storekeeper knew all her clients personally, reaches a new potential in the online medium where every client leaves traces and thus «teaches» the system how to treat him differently from the other customers. This form of personalization becomes feasible with the use of predefined rules, which can be built into ecommerce environments. These automatic personalized Web sites do not achieve the high quality of corner shops but they help to establish a personal dialogue with the customers tying them closer to the electronic offer. Additionally, the time spent by the client to «teach» the system leads to increased switching cost. The underlying assumption is that the customer really *wants* to be addressed personally.

The ability to deliver personalization rests upon (1) the acquisition of a «virtual image» of the user, (2) the availability of product meta-information and (3) the availability of methods to combine the datasets in order to derive recommendations for the customer.

Mass customization can be implemented in electronic media environments using a predefined rule system which combines the advantages of mass production (the same e-shop and the same product catalogue for all clients) with the strength of made-toorder production (personalized web pages and customized products). *One-to-one marketing* is the embodiment of personalization in marketing [Peppers/Rogers 1997]. The underlying idea is to serve and address every customer according to his or her specific needs. Customer Relationship Management aims at supplying every employee (or even the client himself e.g. in an e-shop) with the relevant information at the right time with the aim to be able to offer individualized services. *Permission Marketing* is the idea of giving the customer the chance to select the kind of marketing message he or she wants to receive [Godin 1999].

The collection and use of customer information has a downside – collecting customer specific data has often a smack of spying and sniffing around [Gentsch 2002]. Other effects of careless data collection activities are intentional false statements which lead to bad data quality and therefore useless customer profiles [Treiblmaier/Dickinger 2005]. The importance of privacy and security aspects in the field of CRM has been pointed out in a recent survey by Salomann et al [2005].

Due to the ubiquitous nature of the Internet, electronic commerce does usually not stop at borders – most of its legal issues involve international legal regulations (unless the Web site explicitly excludes customers from foreign countries). The use of information about customers involves legal questions which have been addressed in a previous paper [Schubert et al. 2006].

There is an ongoing discussion on privacy that is closely related to personalization. Cranor [2003] discusses *privacy risks* associated with personalization in e-commerce applications and provides an overview of principles and guidelines to reduce these risks. He identifies the following privacy concerns: (1) unsolicited marketing, (2) system predictions are wrong (incorrect conclusions about users), (3) system predictions are too accurate (system knows things nobody knows about user), (4) price discrimination, (5) unwanted revelation of personal information to other people, (6) profile could be used in a criminal case and (7) government surveillance.

With the above mentioned information from literature in mind, we started the development of a methodology for personalization projects.

2.3 Research Methodology: Experiences from Industry Projects

The research methodology which was used to generate the findings portrayed in this paper is a combination of literature reviews, two empirical surveys, interviews with companies, company workshops, and case studies.

Since the year 2000, researchers at the Competence Center E-Business Basel (University of Northwestern Switzerland) have been involved in a longitudinal, publicly funded research project about «personalization of e-commerce applications». The project involved three different universities and ten companies that jointly worked on the development of personalization issues. The author fulfilled the role of the leading project coordinator and project manager.

The research resulted in a number of publications, for example a handbook on personalization [Schubert/Leimstoll 2002], an empirical study on personalization [Schubert/Leimstoll 2004], as well as articles on legal issues of personalized Web sites [Schubert et al. 2004/2006]. Beyond these publications the output also comprises:

- The implemented ERP/e-shop software containing personalization functions. The pilot companies (e-shop vendors) as well as their IT partners (ERP vendors) benefit from these software modules. Some of the new software modules have been included into the standard ERP software system (so other ERP customers will also profit from them).
- Four case studies describing the projects of the personalization project and their results [available at: www.e-business.fhbb.ch/publications].
- A collection of personalization functions with detailed descriptions (a so called «personalization map»). The personalization map is used for evaluation phase of a personalization project («finding the right features for a specific company»)
- A checklist on legal requirements for the application of personalization techniques

The experiences from the project showed that for most companies there is *only one or two personalization feature(s)* that qualifies to become a USP for the company. Personalization requires learning and reflects learning about the customer. This is why in some cases using the personalized software system really makes a difference for the customer (as compared to the Web sites offered by competitors).

3 The Process of Personalizing Customer Interfaces

3.1 Customer Profile Life Cycle

The mechanism that drives personalization is the learning process during which information is collected about the customer and used to tailor products or services to the needs of the individual or user group. Seen from a technical level, personalization can be divided into four steps (cf. Fig 2):

Step 0 – Modelling Customer Profiles (requirements analysis)

- Step 1 Data Input
- Step 2 Data Processing
- Step 3 Information Use

The techniques for capturing customer profile information vary and often require the active engagement of the customer. There are different possibilities to acquire information about a customer: (1) the user maintains the user profile herself (*explicit* input) or (2) the system monitors the user in her browsing or shopping behaviour and determines her interests from using information clustering techniques (*implicit* input).

1) Explicit information input (also called «reactive» approach)

One way to gather data is to *explicitly* ask the customer to fill in her preference profile. This can be done by selecting preferences from a *classification scheme* provided by the Web site or by explicitly rating products or information items from which the likes and dislikes can be derived. Examples for services offering personalization based on explicit information inputs are MyYahoo and the Amazon Recommendation Center.

2) Recording customer activity (also called «non-reactive» approach)

Shops usually record transactions in *databases*. This can be done both online and offline. Large Swiss offline companies such as SWISS, Manor, Migros or Coop have introduced membership card programs to identify customers during their purchase transactions and to keep an identified log on their transactions (e.g. Migros Cumulus Card). These card programmes are based on different kinds of «currencies». Airlines use miles and offer free trips, UBS has a special Keyclub programme with plenty of specials (products, events, activities – provided by partner companies), the Manor MyOne card «pays» with discount coupons, Migros' Cumulus Card offers a one percent discount at the POS, the Coop Supercard is based on points that can be transferred into special giveaways. All these companies «pay» their customers for revealing their individual shopping behaviour. In an e-shop, however, vendors collect this kind of information «for free». This is an advantage that needs to be harnessed.



Fig. 2: Customer Profile Life Cycle [following Schubert/Leimstoll 2002, 21]

In addition to information about *transactions*, online shops store information about the browsing behaviour of customers. Page visits can be tracked and the time a customer spends on a particular page can be stored. The main problem with the tracking of browsing behaviour is the identification of the user. Since the information about the IP address of the requesting client is often insufficient for identification due to the use of dynamic IP addresses (e.g. different proxy applications or dial-ups) current sites try to solve this problem with the help of setting local browser cookies (which an increasing number of users declines). This is one of the reasons why – in our projects with partner companies – users were required to login before the actual recording started. Fig. 2. provides an overview of the *customer profile life cycle* as proposed by Schubert and Leimstoll [2002].

In their paper "Motivating Human-Agent Interaction: Transferring Insights from Behavioural Marketing to Interface Design" Spiekermann and Paraschiv [2000] point to the fact that personalization of user interfaces depends on the intensity of the interaction with the user interfaces. The more information about preferences is available from the user the better the computer can react. The benefit that a customer can take from an e-commerce service depends largely on the readiness of the customer to actively provide information. If a customer provides false information, the recommendations derived from this data tend to be useless. The main reason for demotivation is the missing «learning» from user interaction.

3.2 Customer Data is Spread Throughout the Company

Information about customers is spread throughout the company. Different departments often work with different software systems which again are based on various databases. Only few companies have managed to introduce a uniform view of all the information stored in the company. Even fewer have a universal user interface at their disposal. The access to information involves power and people are often reluctant to share their information with others – even when working in the same company. In interviews with company representatives, we often heard statements such as «we cannot use this information because it *belongs* to a different department and they are not ready to share it with us». This kind of «departmental egoism» is a hindrance to customer relationship management and requires management attention.

Fig. 3. shows a structural view of the information that is stored in databases using different applications. In order to best serve the customer and achieve a high level of personalization, the e-shop requires access to all customer-related information. The information about the customer needs to be structured using a *common classification scheme*. The scheme provides the meta-data that is needed to match customers with products. It is also used to derive possible customer interests from the click stream (pages accessed). This activity requires each Web page to be annotated with the metadata from the common classification scheme.

The process of personalizing a website or an e-shop as shown in Fig. 3 starts with the interaction between the user (no. 8) and the e-commerce application (no. 7). The user also interacts with other applications or services of the company (no. 6, e.g. call centre, store) or external sites and services (e.g. market surveys). Data generated from these interactions is represented by the dashed line on the right. Data generated by the interaction between user and e-shop is represented by the solid line on the left. User related data is usually stored in different data bases and heterogeneous formats (no. 1). Data objects that contribute to a better understanding of individual user needs have to be identified (input data). These data objects are (E)xtracted from the original source, (T)ransformed into a pre-defined structure and finally (L)oaded into a centralized data warehouse for customer profiles (INPUT PROFILES, no. 2). The resulting data warehouse contains data about user profiles, products and page content as well as information about this data (meta-data, no. 3). In order to use customer profiles in an e-shop or in other applications, the information needs be processed (no. 4). This can be done using two different approaches: (1) Rule-based processing works on an if-then basis, (2) automated processing applies data mining approaches for discovering previously hidden patterns (cf. knowledge discovery in databases, KDD). Data mining is the process of storing and interpreting data recorded in business processes, e.g. a POS transaction. Whereas data mining addresses all kinds of real-world business processes, web mining focuses especially on data accrued from the Web. Data mining is the extraction of interesting and potentially useful information from user activity on the Internet [Kimball/Merz 1996; Spiliopoulou 2000; Adomavicius/Tuzhilin 2001]. The results of the processing algorithms are stored in well-structured data marts containing individual profiles and content (no. 5). The content of these data marts (OUTPUT PROFILES) can be used as input for all kinds of applications (no. 6 and no. 7) and can contribute to improve user interfaces and services.



Fig. 3: A technical view on personalization

The starting point for a personalization project is the identification of all customerrelated data available in the company (level 1 in Fig. 3). Data sources and data objects need to be selected. The term «data source» refers to any repository containing customer-related data objects. Most companies store a lot more data than they actually use. Therefore, it is important to identify particular data objects that contribute to a better understanding of individual customer needs.

Customer relationship management systems are a valuable source for personalization as they are optimised to support the relationship with the customer. CRM systems store all kinds of information about the customer ranging from basic information such as name and address to the full history of company-customer interaction (e.g. inquiries, purchase transactions, claims). The databases contained in CRM systems are a valuable information source which can be harnessed for personalization. Most CRM systems are built upon existing software for enterprise resource planning (ERP). ERP systems comprise a whole class of software products which are geared at the automatization and control of business process throughout the whole company. They supply software modules which support almost all critical business processes and departments (e.g. accounting, procurement, human resources, sales, production, and logistics). The ERP databases are another valuable source for personalization since they contain the critical company information namely product catalogues, customer database, sales figures, accounting, and the like. In recent years, ERP systems have been further developed to meet the requirements of the Internet. In the last three years, traditional ERP functionality has been extended into the Internet environment. Customers can directly access data in the ERP system using Web interfaces. ERP systems which have been equipped with these new e-commerce interfaces have been coined «ERP II» by Gartner Group.

After selecting the appropriate databases, the information is loaded into an information warehouse. An information warehouse contains the result of an ETL process, an extended, improved and optimized representation of products, sales and customer data. They are usually used to process raw data for later use in executive information or decision support systems (EIS or DSS). In the context of our project these databases are an important source for personalization.

3.3 INPUT/OUTPUT Profiles and Marketing Rules

Fig 4. shows an example for the matching of customer profile and product profile. In this example, the information is collected from the e-shop (registration and click stream), and combined with offline information from the customer value card and responses of the customer to certain marketing measures. The customer profile is based on the same meta-information from the *common categorisation scheme* that the company uses to classify their products. Products are grouped into product categories, price categories and product groups. Events have additional tags such as region, type, and others.

The example shows the application of three marketing rules on a specific customer. The customer enters the homepage of «her» e-shop (after the login). The implemented scripts on the homepage display three individualized product offers: (1) tickets for a tennis event, (2) the latest Nike indoor tennis shoes, and (3) further links to current fantasy DVDs. These rules apply because the customer has bought tennis equipment in the past and has shown an above-average interest in DVDs in the area of fantasy.



Fig. 4: Matching Customer Profiles with Product Profiles: An Example.

4 Research Results

4.1 Case Studies: Implementation of Personalization Software in Three Companies

The following figures show screen shots from the company projects. As mentioned above, the project work showed that there was no single strategy for a successful personalization feature: each company needed to find its own unique selling proposition.

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Vendor of printer equipment:

Customer-specific product selection. Customer only sees the equipment for devices that he/she owns.

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Each user in a hospital has a different budget for the procurement of medial products. The budget limits can be individually set by the system administrator.

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754150	148313 090		EPSON SO20036	Tintenpatrone Stylus Color	color 670 Seiten	löschen
754155	148313 100		EPSON SO20034	Tintenpatrone Stylus Color	schwarz 820 Seiten	löschen
754142	148313 120		EPSON S020039	Tintenpatrone Stylus 800	schwarz 2 Stück	löschen
864240	148313130		EPSON	Toner-Modul	schwarz	löschen

Reseller of printer equipment:

Resellers can enter their own matching article numbers for their products. Their end customers can then use their product numbers although the orders are places in the original seller's shops.

4.2 Methodology for Personalization and Personalization Mind Map

The fist step of each personalization project was the identification of the personalization features that needed to be implemented for the individual project partner. In order to facilitate the process and to structure the discussion, we developed a personalization mind map (Fig. 5). The mind map contains a structured view of the world of personalization functions. It is beyond the scope of this paper to present the contents of the

mind map. For a detailed description of the personalization features contained in the map the reader is referred to [Schubert/Leimstoll/Risch 2006].



Fig. 5: Personalization Mind Map

The personalization features in the mind map are structured according to the buying process and complementary functions (Fig. 6).



Fig. 6: Personalization Functions

5 Discussion: Why is there a need for more research on personalized Web applications?

Amazon and eBay are examples of new economy companies and are pure online players whose business models are solely based on the application of Internet technology. The programming of personalization functions is an integral part of their business model. However, the contained knowledge is not publicly available. It represents a USP for these companies. European companies will need to acquire their own knowledge in the art of personalization in order to be able to compete in the battle for online customers. Besides, the Amazon approach is mainly focused on (a) collaborative filtering and (b) the relationship with private end consumers (B2C). Most companies go further also looking at other personalization mechanisms (e.g. procurement support) and optimizing B2B commerce transactions which represent the major part of all online transactions. The potential of B2B e-commerce has been pointed out e.g. by Naville and Pfitzer [2001].

Assuming there is no need for further investigation of the personalization of e-commerce applications would be like claiming we do not need to search for new pain killers once that Bayer had brought out its first pain killer product (Aspirin) on the market. Personalization is a knowledge requiring process that cannot be easily copied by looking at the output (e.g. the Amazon user interface). If European online vendors do not want to give way to American Internet companies such as Amazon they need to acquire the knowledge behind personalization functions themselves and transfer it to the business world. There is a second reason why Amazon differs from most companies: Amazon is a pure online player. There are many «real world» companies that have extended their business into the online realm, adding an e-shop to their existing distribution channels. These companies face a history of information systems. Their data is scattered among different operational systems with many heterogeneous databases (cf. Fig. 3). They are confronted with the problem of (1) selecting, (2) transforming and (3) optimizing their multiple data sources into one accessible homogeneous data source (enhanced with meta-data) – unlike Amazon which is a pure online player and started with an optimized database for a pure online shop.

In summary:

- Companies need to acquire the knowledge that is hidden in the Amazon system.
- Companies need to go beyond the fragmented approach of collaborative filtering.
- Most companies face a different starting position since they are not pure online players and are confronted with an existing IS landscape that needs to be harmonized.

The company Broadvision offers e-commerce software that was developed from the ideas of two marketing researchers: Don Peppers and Martha Rogers [1997]. The software is commercially available and could be used by companies. Broadvision involves high investment costs. It is not suited for small or medium-sized companies. The software offers a shop environment including all databases that are needed to store information about customers, products and Web content. It is thus optimized for pure online businesses. Besides, Broadvision offers a static rule engine where marketing rules can be defined. It does not offer pattern exploration or any kind of explorative mechanisms for data analysis. Marketers may set their rules – the system performs the output based on these rules.

In summary:

- Broadvision software is not suited for most companies since it does not natively integrate the existing databases.
- Broadvision software is too expensive for most companies.
- Broadvision software allows for static rule setting but not for explorative profile mechanisms.

Future research will have to take a closer look at the generation of customer profiles and rules. The homogenization and accessibility of customer information will be one of the major topics of future information management. Personalization is only one possible use in this context. In future personalization projects, we also intend to measure the return on personalization (ROI) from an economic perspective (increase in customer base, increased sales, etc.).

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