

# Classification of Personalization Functions for E-Commerce Applications

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Daniel Risch, Petra Schubert, Uwe Leimstoll

*University of Applied Sciences Northwestern Switzerland  
Institute for Information Systems*

*[daniel.risch] [petra.schubert] [uwe.leimstoll]@fhnw.ch*

### **Abstract**

*Personalization is an interdisciplinary topic that has been discussed in the literature of marketing and information systems as well as in other research areas. In this paper we present findings from a longitudinal research project on personalization of e-commerce systems. The findings were taken from interviews and software development projects with company partners (action research). In a first step personalization functions are classified according to their order of appearance along the buying process. In a second step they are grouped into subcategories. There is no single strategy for selecting successful personalization functions as the suitability varies depending on parameters like industry, number of customers or product range. The main contribution described in this paper is a classification framework for existing and emerging personalization functions for e-commerce applications. This framework provides an extensive overview on personalization functions that can be used to individualize and improve human-computer-interaction both in B2C and B2B e-commerce environments.*

## **1. Introduction**

Personalization is about the interaction between a company and a customer on a one-to-one basis in order to match user needs. As a result personalization is intended to maximize the customer value (for the vendor) and the benefit (for the customer) at the same time. Due to the interactive characteristics of Web-based applications – compared to other media such as newspapers, television, or radio – the Web is particularly suited for personalized services.

Personalization is an interdisciplinary topic that has been discussed in the literature of marketing and information systems as well as in other research areas. Most definitions of personalization implicitly point to individualized recommendations of items. This paper takes a broad view on personalization introducing an application-oriented framework for personalization functions which includes but is not limited to recommender systems. We will provide a well-structured framework for the classification of personalization functions in B2C as well as in B2B e-commerce environments by means of the so called “Personalization Map”. To the best of our knowledge no such framework has been provided up to now.

In section 2 we provide some common definitions, discuss related work in the field of personalization and present our research question for this project. In section 3 we describe the research methodology that we used. Section 4 contains the basic concepts of personalization followed by the introduction of the Personalization Map (our basic framework of personalization functions). Having discussed the limitations and application aspects in section 5 we summarize the results and provide an outlook into future research.

## **2. Definitions, related work and research question**

This section provides an overview on common definitions for personalization heading to the broad definition we used in our research project. Deitel et al. [8] 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. [13] 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”. Adomavicius/Tuzhilin [2] summarize in that “personalization tailors certain offerings (such as content, services, product recommendations, communications, and e-commerce interactions) by providers (such as e-commerce Web sites) to consumers (such as customers and visitors) based on knowledge about them, with certain goal(s) in mind.” These definitions imply a close relationship between personalization and the recommendation of items. Even if recommender systems are undoubtedly an interesting part of personalization there are many other personalization functionalities that are geared at an improved customer loyalty.

In its most common form, a personalization function can be defined as the combination of profile data with personalization techniques to ease and support human-computer interaction [28]. Examples for such functions are personal shopping lists, customer-specific assortments or extensive checkout support (cf. section 4). Therefore we decided to follow the broader definition of personalization provided by Riecken [17]: “personalization is about building customer loyalty by building meaningful one-to-one relationships; by understanding the needs of each individual and helping satisfy a goal that efficiently and knowledgeably addresses each individual’s need in a given context.” The possibilities of personalizing the user interface were pointed out by Peppers/Rogers [15] as well as Allen et al. [4].

Over the past years there has been a lot of research in the broad field of personalization focusing mainly on recommender systems [19, 3, 10], privacy concerns [1, 16, 18], human-computer interfaces (HCI) [28, 5, 9] and personalization as a marketing approach [15, 14, 22]. These research attempts are very useful in specific areas but they did not come up with a classification scheme that helps to effectively classify the various kinds of personalization functions. Therefore, they are not further discussed in this paper. Our research intends to broaden the view on personalization and it is focused on the classification of applied personalization functions.

The research question leading this particular project was: “How can personalization functions for e-commerce applications be classified and presented in a well structured manner, helping companies and researchers to get an overview of existing and a classification scheme for emerging personalization functions?” The research methodology we used to answer this question will be explained in the following section.

### **3. Research methodology**

For the generation of findings portrayed in this paper, a combination of literature review, individual interviews with company representatives, company workshops, and case studies was chosen. The research group at the Institute for Information Systems which compiled the findings of this paper has been involved in a longitudinal, publicly funded research project about “personalization of e-commerce applications” since the year 2000. The project involved three different universities and ten companies that jointly worked on the development of personalization issues [cf. 26].

The research method that we used for the development of the Personalization Map is action research (as e.g. described by Cunningham [7]; Baskerville/Wood-Harper [6]; Kock et al. [11]; Lau [12]). There are two essential aims common to all literature on action research: to improve and to involve. Our research project on personalization was targeted at the improvement of current e-shop processes and design (improve). The employees of the partner companies were intensely involved in the design process (involve). The first version of the Personalization Map was developed in a series of workshops with the first project partner in the year 2001. It was repeatedly used and refined over the years with other partner companies. The process was thus cyclic, participative, qualitative, and reflective. As is typical for action research, we aimed at the following three areas: (1) improvement of practice, (2) improvement of understanding of practice by its practitioners, and (3) improvement of the situation in which practice takes place.

Our results are documented in a number of publications, for example a handbook on personalization [24], an empirical study on personalization [25], as well as papers on legal issues of personalized Web sites [23]. Beyond these publications, the output also comprises the implemented e-shops with their personalization functions, a checklist for legal requirements, and several case studies describing the results of the sub-projects. An overview of this longitudinal research on personalization can be found in Schubert [26].

Throughout the last six years, we added more than 100 personalization functions to the framework but it is probable that the map is still incomplete as new personalization functions are emerging over time. Due to the size restrictions we had to limit our discussion to one half of the Personalization Map.

## **4. A classification framework for personalization functions**

### **4.1. Figure and concept of the framework**

The activities of a customer when using an e-commerce application – especially an online shop – can be divided into two different activity groups. The main activity certainly is the buying process itself in which the customer selects and purchases goods. Additional to these activities modern online shops enable the customer to perform a range of complementary activities such as maintaining user data, monitoring purchases or changing the screen design to the user’s personal needs. According to these two groups of customer activities the underlying personalization functions belong to the buying process or are part of complementary activities (Figure 1). The alignment of the personalization functions in the Personalization Map is based on the classification framework shown in Figure 1.

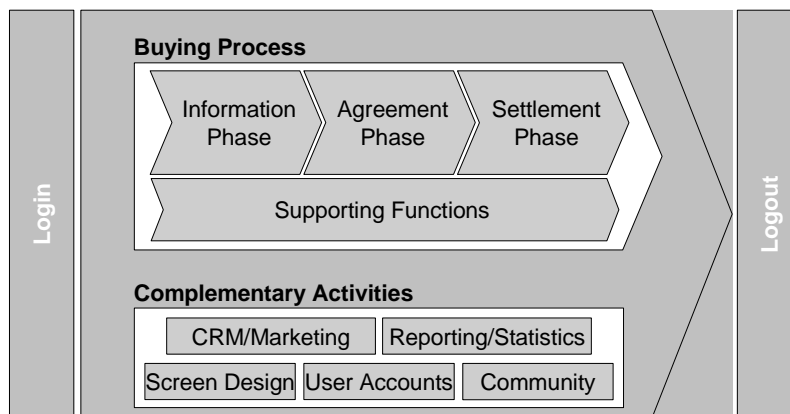


Figure 1: Classification framework

The buying process is divided into the following three phases [20, 27] (1) information, (2) agreement, and (3) settlement, and enhanced with overlapping supporting functions. In the information phase customers collect information about products and services. The agreement phase is geared at setting up a contract, fixing details like product specifications, price, delivery, method of payment, general terms, etc. The (physical/virtual) delivery of the product takes place in the settlement phase. The involved parties fulfill their obligations as agreed upon in the contract. For this reason it is also called fulfillment phase [21]. The “supporting functions” refer to functions that support the entire buying process.

The functions that belong to the complementary activities may support the human-computer-interaction between the customer and the interface. The login and logout bars on the left and on the right point to the fact that personalization should start after a customer has identified himself (login) and should end with the user leaving the store.

#### 4.2. The Personalization Map

The first step of each personalization project is the identification of the personalization features that need to be implemented for an individual online merchant or e-service provider. In order to facilitate the process and to structure the discussion, we developed the Personalization Map (Figure 2). This mind map contains a structured view of the world of personalization functions. The following paragraphs describe the branches of the mind map and their specific contents.

As shown in the classification framework, on the top level, we distinguish between functions for the “buying process” (left hand side) and functions for “complementary activities” (right hand side). The two parts contain 9 different branches. Due to space limitations we confine ourselves to only describe the functions related to the order process (left hand side of the Map).

Table 1 indicates the personalization functions applicable in the information phase. Search functions can be pre-configured to the individual needs of a user (ready to click on e.g. “show required air and water filters for Jonathan Archer High School in Washington”).

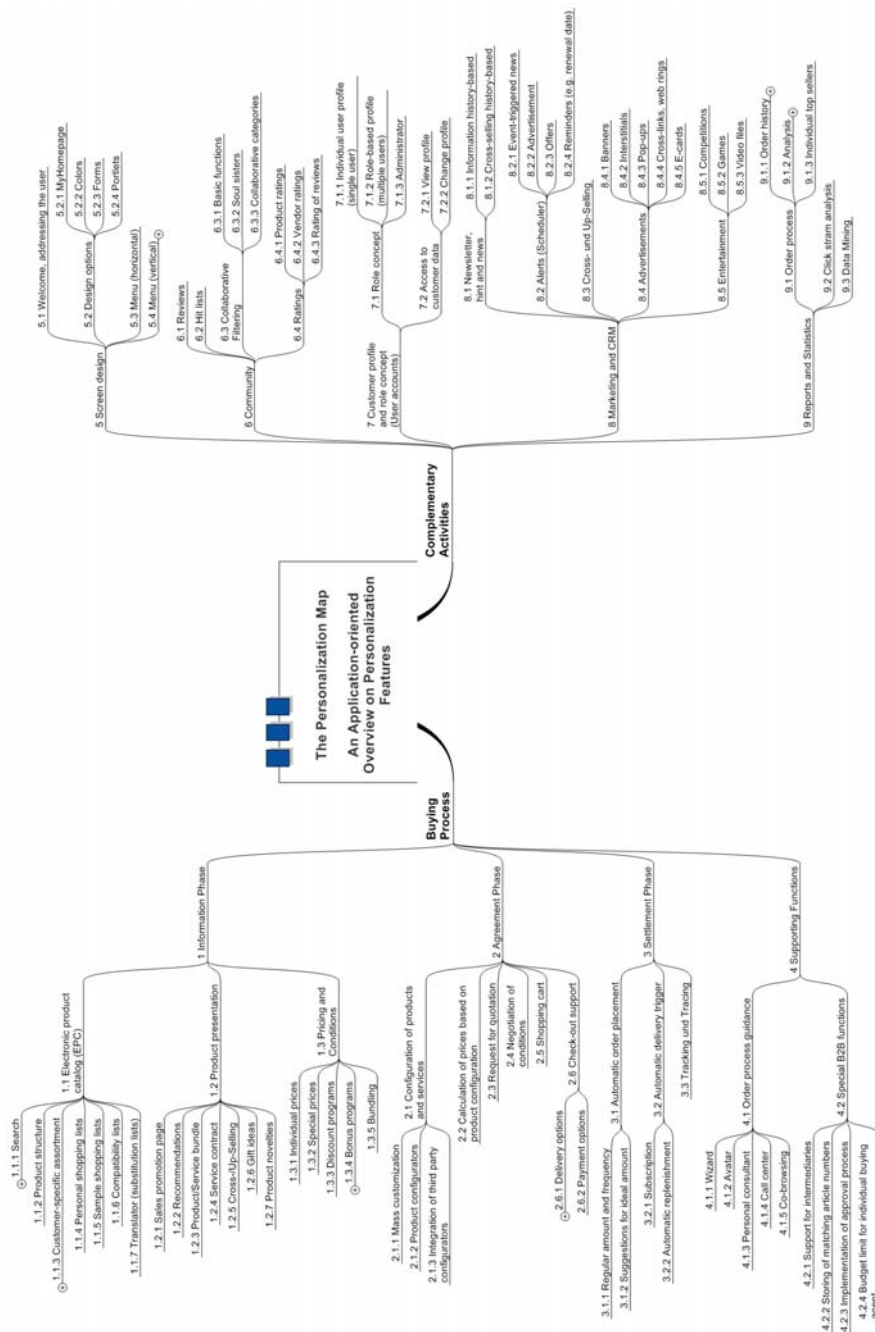


Figure 2: The Personalization Map

Customer specific assortments save selection time and make the buying process easier and faster for non-frequent buyers. Limited assortments that are optimized for a company reflect the choices and defaults of the central purchasing department. Often they are the result of negotiations (master agreement) and were implemented into the e-shop by the supplier. An important personalization function is the assortment for current equipment. In general, limiting the amount of displayed products from an existing vast choice of products is a first step to save time in the selection process.

Existing equipment (e.g. printers, filter, and installations) can be either pre-defined with sales agents during the initial customer meeting or can be automatically recorded during the purchase process (in case the same supplier offers equipment and accessories in the same e-shop). Once the equipment is known, the shop can limit the product choices to products related to this equipment (e.g. printer-toner type).

Pre-defined product lists (favorites) help inexperienced employees (they only get a selection of the “right” products for their company). Personal shopping lists facilitate recurrent buys and can be named according to their purpose (e.g. quarterly\_toner\_purchase\_for\_marketing\_department). They can be created by the users themselves whereas sample shopping lists are pre-defined by the administrator – usually a person from the purchasing department.

Similar to the specific assortment for existing equipment, compatibility lists show complementary articles for items that the buying agent selected in a previous purchase. A translator function can hint at possible substitutes for products which an employee is about to buy – e.g. in case they are currently out of stock or there is a temporary special price available. This can be used as a marketing means for trials or leftovers.

The products and services presented in the e-shop are specifically targeted at a single customer. In order to generate personalized product presentations, certain knowledge about the user is required. These functions are dependent on the provision of significant (implicit or explicit) customer profiles. The first Web page after a successful login should contain personalized product offers. A dedicated sales promotion page should also be embedded in the general navigation menu of this user. Recommendations for products and services are generated on the basis of the user’s preference categories. The most common sources of preference categories are transaction profiles (previous purchases) or the user’s interaction profiles (click stream). Product/service bundles comprise different (user-adequate) components that – after combining them – appear to be a monolithic good (e.g. a luxury car including a mobility guarantee). The components can be provided by different vendors. Service contracts can be customized for customers according to their special needs (e.g. frequency, duration, extent of service). Cross-selling refers to the current context (status of the order process). Depending on products that the user has looked at or placed in the shopping cart other (alternative or complementary) products are offered on the screen. Up-selling refers to the display of more expensive, higher class products whereas cross-selling implies supplemental or matching products. Amazon even offers corresponding second hand goods sold by customers (down-selling). Customer profiles can also be used to generate gift ideas provided that the customer is willing to share his or her wishes with other users (grant access rights). When buying presents for a known friend (who is a customer at the same e-shop) the system can perform a check on the products already owned by the presentee. The user can be informed about product novelties according to his taste (e.g. a new book in a series of books that he already owns).

Pricing is one of the most common forms of personalization. Usually, prices vary according to the status of the customer (amount of purchases per year, long-term customer, etc.). Special prices are granted to companies which have a master agreement with the supplier (B2B). Discount prices are granted for placing large amounts during a certain period or for ordering at a specific time (e.g. when stocks are to be cleared). Bonus programs are a well-known marketing measure in B2C e-commerce where customers can either collect bonus points (as a kind of currency) or receive special coupons based on their buying behavior. They are often rooted in a physical customer

(value) card (e.g. Migros Cumulus Card, Coop Supercard). The bundling of products (guided by the user profile) can lead to discount prices (e.g. “buy two for the price of one”).

Table 1: Information phase

| 1 Information phase   |   |
|---|---|
| <b>1.1 Electronic product catalog (EPC)</b> <ul style="list-style-type: none"> <li>1.1.1 Search               <ul style="list-style-type: none"> <li>1.1.1.1 Pre-configured search</li> <li>1.1.1.2 Criteria-based search</li> <li>1.1.1.3 Full-text search</li> <li>1.1.1.4 Structured search</li> </ul> </li> <li>1.1.2 Product structure</li> <li>1.1.3 Customer-specific assortment               <ul style="list-style-type: none"> <li>1.1.3.1 Limited (optimized) assortment</li> <li>1.1.3.2 Assortment for current equipment</li> <li>1.1.3.3 Pre-defined products (favorites)</li> </ul> </li> <li>1.1.4 Personal shopping lists</li> <li>1.1.5 Sample shopping list</li> <li>1.1.6 Compatibility lists</li> <li>1.1.7 Translator (substitution lists)</li> </ul> | <b>1.2 Product presentation</b> <ul style="list-style-type: none"> <li>1.2.1 Sales promotion page</li> <li>1.2.2 Recommendations</li> <li>1.2.3 Product/Service bundle</li> <li>1.2.4 Service contract</li> <li>1.2.5 Cross-/Up-Selling</li> <li>1.2.6 Gift ideas</li> <li>1.2.7 Product novelties</li> </ul> <b>1.3 Pricing and Conditions</b> <ul style="list-style-type: none"> <li>1.3.1 Individual prices</li> <li>1.3.2 Special prices</li> <li>1.3.3 Discount programs</li> <li>1.3.4 Bonus programs               <ul style="list-style-type: none"> <li>1.3.4.1 Bonus points</li> <li>1.3.4.2 Coupons</li> </ul> </li> <li>1.3.5 Bundling</li> </ul> |

Table 2 indicates the personalization functions applicable in the agreement phase. The configuration of products and services allows the customer to choose from a given set of components and services. In this step, the customer composes the final product/service. The Web site guides the customer through this process. Mass customization sites allow the selection of attributes (e.g. color, size) for mass products (e.g. Lego bricks). Product configurators support the assembly of complicated products. Their underlying databases contain information about components including structural design and interoperability. Personalized configurators remember and recall settings for specific users (e.g. “my company only buys IBM PCs”) and learn from past purchases (e.g. the store knows the shoe size after the first purchase). In the end, each customer receives an individually customized product based on individual tastes and needs (e.g. price, functionality, etc.). Just like the customized assortments, configurators reduce the burden of choice and are thus a valuable aid for non-frequent or non-sophisticated buyers.

Special software modules for price calculation help the user to identify the right product for her (e.g. a personal life insurance). They can also help in finding the ideal amount and frequency of items ordered (e.g. depending on delivery costs and discounts). Personalized calculators make use of profile information (existing contract, fixed prices, budget, etc.).

The software modules for the “requests for quotations”, the “negotiation of conditions”, and “the filling of the shopping cart” make use of the current customer profile. Valuable aids in this context are suggestions (e.g. pre-defined delivery address can be selected for the correct calculation of delivery cost in the quotation), auto-completion of fields (budget limits, individual prices), and pre-defined options (“same conditions as for last purchase”).

There are various possibilities of helping the customer in the last step before placing an order (check-out support). As a rule, a customer should never make a selection or indication twice. After choosing wrapping, dispatch type, shipping date, shipping address, billing address once, the system should come up with default settings/suggestions the next time the user is about to proceed to the checkout. These suggestions can then be changed and the changes should be added to the database. The same applies to payment options. This is an area where B2B and B2C transactions are quite different. Whereas options for private end consumers are usually credit card, advance payment, debit card, invoice/debit direct, pay-by-call, or Internet payment systems (such as PayPal, FirstGate, Click2Pay, or others), the most frequent way of payment settlement in Swiss B2B e-commerce is the invoice. A useful extension of the B2C credit card is the so-called purchasing card (allows certain limitations for the purchase of product categories, e.g. alcohol).

Table 2: Agreement phase

| 2 Agreement phase  |                                 |
|--|---------------------------------|
| <b>2.1 Configuration of products and services</b>        | <b>2.6 Check-out support</b>    |
| 2.1.1 Mass customization                                 | 2.6.1 Delivery options          |
| 2.1.2 Product configurators                              | 2.6.1.1 Wrapping                |
| 2.1.3 Integration of third party configurators           | 2.6.2.2 Dispatch type           |
| 2.2 Calculation of prices based on product configuration | 2.6.2.3 Shipping date           |
| 2.3 Request for quotation                                | 2.6.2.4 Shipping address        |
| 2.4 Negotiation of conditions                            | 2.6.2.5 Billing address         |
| 2.5 Shopping cart  | 2.6.2 Payment options           |
|  | 2.6.2.1 Advance payment         |
|  | 2.6.2.2 Debit card              |
|  | 2.6.2.3 Invoice/debit direct    |
|  | 2.6.2.4 Pay-by-call             |
|  | 2.6.2.5 Internet payment system |
|  | 2.6.2.6 Credit card             |
|  | 2.6.2.7 Purchasing card         |
|  | 2.6.2.8 Financing/leasing       |

Table 3 indicates the personalization functions applicable in the agreement phase. The automatic compilation of an order is a typical personalization feature. The frequency and amount of orders are often constant over time. This allows the customer to set conditions for orders which then only have to be accepted in the moment of placing the order. Over time, the e-shop can come up with suggestions regarding amount and frequency of future orders.

It is even possible to go one step further, allowing the e-shop to automatically trigger the delivery of products. In the case of a regular “subscription”, orders are generated for a constant amount in a regular frequency. Today, we also encounter “automatic replenishment” based on dynamic customer requirements. The ultimate integration between supplier and customer is called Efficient Consumer Response (ECR) – a term commonly used for a tight EDI integration between two or more partners of the value chain.

Tracking allows the customer to check the delivery status of a *current* delivery. Tracing, on the other hand, enables an *ex-post* analysis of the path of delivery. These services are usually supplied by third parties (DHL, FedEx, Postal Services, and others).



Table 3: Settlement phase

|  |
|--|
| <b>3 Settlement phase</b>                    |
| <b>3.1 Automatic compilation of an order</b> |
| 3.1.1 Regular amount and frequency           |
| 3.1.2 Suggestion for ideal amount            |
| <b>3.2 Automatic delivery trigger</b>        |
| 3.2.1 Subscription                           |
| 3.2.2 Automatic replenishment                |
| <b>3.3 Tracking and tracing</b>              |

Supporting functions (Table 4) are not related to one specific phase but can rather be found in all phases of an electronic purchase transaction. There are multiple ways for offering guidance to the user. Wizards are written instructions that guide the user through different steps of the order process usually by asking questions like “Do you want to perform the following action?”. Avatars are virtual representations of sales clerks that may appear as moderators, consultants, or entertainers. They can automatically appear in certain situations or be manually invoked for consultation. They are intended to provide a human-like interaction with the computer. Personal consultants help the customer to find a specific product or service. The customer can interact with the consultant by posing questions. The words are interpreted by the server and pre-defined answers are given. On some Web sites there are buttons that open a telephone connection to a person in a call center. In a co-browsing session, an employee takes the customer virtually “by the hand” by sharing the screen (they both see the same things) and controlling his keyboard and mouse. This way the employee can teach the customer how to effectively navigate the system.

B2B e-commerce has a further potential for specific personalization features. Online merchants are increasingly integrating business partners into their e-shop environments. They also offer e shop functionality to re-sellers (shop-in-shop concept). Products are ordered in the e-shop of one company and are actually delivered by another company without the awareness of the customer. For this reason, the selling company needs to define its “appearance” on the Web site (e.g. stationary, logo, address, invoice information, etc.). In order to facilitate procurement matching article numbers can be stored on the sell-side server giving the buying agent the possibility to use the internal article numbers for placing orders (they usually know them by heart). The customer’s approval process can also be implemented into the e-shop. Once the order has been entered into the system the supervisor will be asked to confirm the release of the order (e.g. by sending an e-mail with the link to the order information). The same applies for the limitation of budgets or product categories for certain employees. Once they have e.g. reached a monthly limit the automatic processing of orders is stopped.

Table 4: Supporting functions

|                                   |   |
|-----------------------------------|---|
| <b>4 Supporting functions</b>     |   |
| <b>4.1 Order process guidance</b> | <b>4.2 Special B2B functions</b>                |
| 4.1.1 Wizard                      | 4.2.1 Support for intermediaries                |
| 4.1.2 Avatar                      | 4.2.2 Storing of matching article numbers       |
| 4.1.3 Personal consultant         | 4.2.3 Implementation of approval process        |
| 4.1.4 Call center                 | 4.2.4 Budget limit for individual buying agents |
| 4.1.5 Co-browsing                 |   |

## 5. Limitations and application

The Personalization Map presented in the previous sections provides a convenient framework to classify personalization functions along the buying process. All functions shown in Figure 2: support the human-computer interaction in a shopping environment. Although we are aware that the functions presented in the Personalization Map will never be complete in the sense that it will contain *all* possible personalization functions, it stimulates a general idea of what is possible and of what could be appropriate for a specific e-commerce application. There will never be an implementation of all functions into one single e-shop. A personalization endeavor is a selective process in which each company needs to find the appropriate functions for its given context. In our personalization projects we found out that it is not the most sophisticated but the most purposeful function that has the greatest impact on customer satisfaction.

## 6. Summary and further research

The Personalization Map contributes to existing literature by classifying personalization functions according to their order of appearance in the purchasing process. The provided framework is a valuable means for personalization projects with the aim of identifying suitable personalization functions as well as classifying new or previously unknown functions.

The trigger for coming up with this personalization overview was the need for a common understanding of all possible personalization functions at the beginning of the personalization projects mentioned above. The most important findings regarding the Personalization Map are:

- There is no standard procedure for the selection of personalization functions in a given context. Every company has to identify the most appropriate personalization functions for its own e-commerce environment.
- Every measure that supports the customer in interacting with a user interface based on previously stored, user-specific data is part of personalization.

The Personalization Map in its current form contains a (still incomplete) picture of the universe of personalization functions. We will continue to enhance this overview adding new functions that emerge. Future research will be used to validate the classification framework. We have recently started five new projects with company partners in which the Personalization Map will be applied and validated.

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